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Horseless Age

VOLUME 18 OCTOBER 3, 1906 NUMBER 14

Packard



Before a single "Packard 30" was delivered four cars were driven 50,000 miles, including the Detroit-Chicago-Detroit run of 606 miles in 20½ hours and the work of the Glidden Tour patrol car.

Price (in standard colors and equipment) - - - - - - **$4,200,** f. o. b. Factory
Special Colors, Upholstery and Equipment, Extra.

Packard Motor Car Co., Dept. 1

Member Association Licensed Automobile Manufacturers. DETROIT, MICH. New York Branch 1540 Broadway.

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LOOK FOR Engineering Number

WHAT WAS THE EQUIPMENT OF EVERY CAR IN THE VANDERBILT CUP TRIALS?

WHAT WILL BE THE EQUIPMENT OF EVERY AMERICAN CAR IN THE VANDERBILT CUP RACE?

Diamond Wrapped Tread Tires

ON ALL OF THEM.

Could there possibly be an endorsement more deeply significant?

Did you notice what Le Blon said?

"Positively the finest tires I ever rode on."

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"I never dreamed that tires could be so fine."

The record Diamond tires made in the trials is the foundation of these enthusiastic expressions from the great French drivers and from others. It has never been equaled in any country.

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VOLUME 17 JANUARY 3, 1906 NUMBER 1

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WINTON MODEL-K



GET STARTED RIGHT

Ever hear of a man selling a good, big car and buying a cheaper one instead?

But you know of many who have disposed of their cheap cars and bought better ones.

So the tendency is all one way. All the experienced motorists (who have had cheap cars) seem to be doing the same thing.

And there's the best of reasons for it.

The cheap car isn't cheap at all. It only looks cheap.

The cheap car is an expensive proposition before you get through with it.

Ask anyone of experience about his repair bills, his delays on the road, his agonies in hill climbing, his humiliation over limited passenger capacity, under-powered motor, cheap materials, etc., etc.

And benefit by his experience—START RIGHT.

Why waste your first season's enjoyment and a wad of money?

Buy a good car FIRST. It's just as easy to run; it doesn't make you sorry every time you try to use it, and it costs many, many dollars less in use for repairs, and so on.

Besides, a good car, like the WINTON MODEL K, gives you a prestige and an enjoyment that a cheap car never could and never will.

The WINTON MODEL K costs $2,500 new, and you are done paying for it then.

Tested materials; ground cylinders, pistons and bearings; the "Shooting" oiler; ignition that starts the motor from the seat; velvety, non-jar, non-breakable transmission; patented and exclusive Twin springs and Pneumatic governor; a car of dashing style—these are the things that make the WINTON MODEL K worth $3,500 or more.

Yet we sell it at $2,500 because, with our perfected manufacturing methods, we can do so at a profit.

When you investigate the WINTON MODEL K—at the New York Show or elsewhere—you'll agree that it is all that a good car should be.

Volume 1 of "Automobiles Dissected" (free on request) gives the inside facts.

The Winton Motor Carriage Co.

CLEVELAND, O., U. S. A.

ember A. L. A. M.

We shall exhibit in New York at the Madison Square Garden Show ONLY, January 13-20, 1906.

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The Simplest Engine in the World

THE TWO-CYCLE ELMORE

When you understand that the two cycle Elmore engine does away with 18 to 20 parts on each of the four cylinders, and absolutely eliminates all inlet and exhaust valves, with their attendant mechanism, you'll agree with us, won't you, that this is the simplest engine in the world?

Do we need to point out that this also reduces the cost of operation and up-keep to the minimum, and makes the Elmore the most economical as well as the simplest engine in the world?

From whatever standpoint you examine the two cycle Elmore, equally impressive and sensational features present themselves. The four cylinder car produces approximately as much power as would eight cylinders of the four cycle type—produces it in a continuous and unbroken application that will carry the car **indefinitely on the high speed** under any and all road conditions.

Again, it is the most successful self-starting engine in the world. Again, you can cut out one, two or three cylinders at will with both spark and gasoline. With one cylinder cut out the difference is imperceptible except in speed; with two cut out—barely noticeable. Do you see the economy of this?

Again, you can throttle the Elmore Engine on the high speed down to **two** miles an hour. Again, the Elmore will take a 16 per cent. grade on the high speed with approximately as much ease as it travels on the level road.

It starts with a smooth, gliding motion that is delightful, and dips down and over uneven spots with a minimum of jolt or jar.

The four cylinder Elmore at $2,500.00, and the two cylinder Elmore at $1,500.00 are two cars whose manifold exclusive features demand your most serious consideration. Learn all the wonders of the two cycle type by getting in touch with the nearest Elmore agent or by writing for our new descriptive catalogue and books of information.

THE ELMORE MFG. CO., = 1004 Amanda Street, Clyde, Ohio

Members A. L. A. M.

Compound DOCTOR'S STANHOPE

12-15 H. P., $1,400



Jos. E. Root, M. D.
No. 67 Pearl St., Hartford, Conn.

December 12, 1905.

Mr. Schull, Manager E. H. V. Co.:

Dear Sir—I thought it might be of interest to you to know how my "Doctor's Stanhope" was progressing.

I am pleased to voluntarily state that it is 'way beyond my expectations, high as they were. You understand I'm a "greenhorn" at running a motor car, and it's pulled me every day in town and out, on my professional rounds, always brings me home—never had to go to a garage or repair shop for adjustments, etc., goes through the cold and snow (the latter with chains on) just the same. It continues to ride as easy and warm as a hack. My total running expenses for my first month, ending December 8th, were $8.86. Upwards of six hundred (600) miles were covered.

Thanking you for furnishing me with such a competent, durable and elegant machine, I am,

Yours, etc., Joseph E. Root, M. D.

The E. H. V. CO., Middletown, Conn.

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General Tendencies in Design and Construction as Seen at the Paris Show.

By Joseph Tracy.

(*Continued.*)

FANS.

The prevailing type of fan is of the four blade, belt driven variety. Adjusting the fan to take up the slack of the belt is accomplished in many ways. An idler pressed by a spring on the fan belt is very common. The fans are usually driven from the crank shaft nearly always by flat belts. There are a few cars which have fans in the flywheel, as well as behind the radiator. There are also some cars having thermo-siphon cooling, which do not use any fan.

MOTORS.

Cylinders are cast in pairs and individual cylinders seem to be about equally numerous. There seems to be a growing tendency, when the cylinders are cast in pairs, to separate the barrels below the water jacket. Six bolts are usually employed to hold down a pair of cylinders and four bolts to hold down individual cylinders, although on a few of the larger cars as many as eight bolts are used on individual cylinders.

Instead of casting the cylinders solid throughout, many builders leave a large opening on the top of the water jacket, through which the core is removed, and which is usually closed by a polished brass plaee. The caps over the valve chambers are in most motors screwed in by means of hexagon wrenches, which fit the plug either externally or internally.

Cylinder heads and cylinders are without exception cast integral. To the writer's knowledge there is not one car at the exposition which has separate cylinder heads. Sheet metal water jackets of brass or copper are not in evidence on any of the cars, although fitted by a few of the companies who build motors alone. It is the general practice to have the cooling water from the pump enter the jacket between the exhaust valve chambers from underneath, and to leave the jackets at the tops of the cylinders between the inlet valve chambers. The exhaust pipe in most of the cars is a single pipe of large diameter, into which are branched the separate exhaust pipes from each cylinder.

Mufflers are apparently not much larger in diameter than they have been in the past, and are very generally swung across the car near the rear of the chassis. Much greater attention has been given to carrying the exhaust pipe in such a way that it will be well removed from wood, water or gasoline pipes; also to the fastenings which hold the muffler on the frame.

Many of the new models are fitted with vent pipes from the crank chambers. In many cases these vent pipes are combined in one. Inspection plates are rarely provided for examining the crank shaft. An exception to this rule is furnished by the Darracq.

Exhaust and inlet valves are placed at opposite sides of the cylinder about as often as they are placed on the same side. The inlet valve in the cylinder head, actuated by rods and rocker arms, is seen in a few cars, notably on the six cylinder Napier. The automatic inlet valve has almost disappeared, except on single cylinder voiturettes.

The springs on the exhaust and inlet valves are mostly of the old Panhard or Mercedes type, with their lower ends hooked in a slot through the valve stem. The two to one gears are, in nearly all the new models, enclosed. In some of the smaller cars, however, they are only protected by a shield in front.

The cam shaft housings on the new cars of practically all the leading makes are of the "tunnel" type, which necessitates the cam shafts being pushed in from one end of the crank chamber when the motor is being assembled. Split cam shaft housings or boxes are evidently going out of fashion, except on the small and cheap motors. The motor is usually carried on four legs, which sometimes rest on the main frame and sometimes on a sub-frame.

Several of the most prominent manufacturers have not fitted governors on the coming year's models. The throttle can be controlled from the steering wheel, by an accelerator pedal, and in most cases also by the clutch pedal. When the clutch is withdrawn it closes the throttle to a point determined by the position of the adjusting nuts on the throttle rod or spindle. When the clutch is allowed to engage it opens the throttle to an extent determined by the position of the throttle handle (which is nearly always on the steering wheel). The car will therefore run along at a certain speed which will depend on the amount of gas which passes the throttle. If it is desired to increase the speed suddenly the accelerator pedal can be pressed, which results in opening the throttle wide. When the accelerator pedal is released the throttle closes to its former position and the car resumes the speed at which it was traveling before the accelerator was pressed.

Most of the new model motors are fitted with "decompressors," which either reduce or annul the compression when the motor is cranked by hand. "Decompressors" are almost a necessity on all the larger sized motors.

The greater number of high powered cars at the Salon are equipped with metallic clutches of one kind or another. The plate clutch is the most common. The medium and small sized cars have leather faced cone clutches almost without exception. The leather clutches are also seen on one or two of the larger cars, notably on the 40 horse power De Dietrich and on the Hotchkiss. Universal joints are very often seen between the motor and gear boxes.

Gear boxes are swung from cross members or from the main frame in the greater number of cars. Even Panhard has given up the sub-frame for the gear box. On the cars of 20 horse power and less three speeds are the rule, although there are perhaps two exceptions. On the larger cars, however, there are nearly always four changes of speed. The selective or Mercedes system, in which there are two sliding trains, is entirely displacing the progressive or Panhard type. All the leading cars, including Panhard and Mercedes, have direct drive on the high gear. Panhard allows his secondary shaft to come to rest on the high gear, but Mercedes does not. Practically all gear boxes are fitted throughout with ball bearings. A few cars, including



Luc Court Separable Chassis.

This frame permits of more than one type of body being used with one set of machine The engine clutch, gear box, and one-half of the propeller shaft are carried on a complete fram to which the front axle is secured in the usual way. The countershaft and driving mechanism on the other part of the frame, which is extended forward as far as the radiator, and is firs secured by four locking bolts. The ends of the propellor shaft mesh with each other, and the brake gear is all carried on the rear portion, so that the two details go together in a few moments.

Panhard, have three point suspension for their gear boxes.

On chain driven cars with long chassis the differential shaft and case are not in the same box as the sliding gear, but are placed rather back on the frame and the differential is connected by a short shaft, which sometimes has universal joints, to its corresponding shaft in the gear box. This style of construction has been adopted in order to bring the differential shaft sufficiently close to the back axle to give the proper distance between the chain centres.

The foot brake is usually placed on the shaft between the differential and the gear box.

CARBURETORS.

"Automatic" carburetors are seen on all machines, even on motor bicycles. For heating the carburetor water is much more generally used than heated air entering through the inlet pipe. Heating by means of a branch from the exhaust is very seldom seen. Carburetors fed by pressure and carburetors fed by gravity are used to about the same extent. Many cars have strainers, either in the carburetor or in the pipe between the carburetor and the gasoline tank. Arrangements for flooding the carburetor without raising the bonnet are provided on nearly all the new models.

LUBRICATION.

Covered oil feed by a mechanically driven pump is used on practically every car, down to the single cylinder voiturettes. The oil pumps are driven in various ways, some by cams on the rear ends of the cam shafts, some by small cranks on the ends of the same shaft and some by worm gear, from the cam shafts. A few makers, among them Panhard, still use the belt driven type of pump, a few use gear pumps, C. G. and De Dion, for instance. The latter circulates the oil to the various motor bearings from a well in the bottom of the base chamber. The Fiat car uses a chain pump for each bearing to be lubricated. Many of the French cars feed oil only to the base chamber in two places. The Mercedes and the Italian cars lubricate the pistons and cylinder linings, as well as the base chamber, by separate pipes. None of the cars make any provision for keeping the oil heated in cold weather. A few have apertures cut in the dashboard at the back of the oil reservoir, so that the warmth from the motor will reach the oil. On account of the preponderance of ball bearings in the new models grease cups are used only to a very limited extent.

BODIES.

Greater weight, more room and more comfort and luxury are the rule in bodies. Nearly all the separate bodies on exhibition are of the closed type. Many of them are fitted with electric lights, mirrors and flower holders, and signaling system for the chauffeur. Judging from some of these creations builders expect that cars will be used much in foul weather as in fair.

Steam, Electric and Combination Cars at the Paris Show.

By Joseph Tracy.

GARDNER-SERPOLLET.

The Gardner-Serpollet is the most important steam car shown at the Salon. A number of changes have been made in the new model. The boiler is directly under the hood, the motor under the footboard and the tanks are hung below the frame at the rear end of the car. The boiler is of the usual Serpollet type. The greatest change, however, is in the engine, which, instead of being a trunk piston single acting machine, is now a double acting one, having the usual piston rods, glands, stuffing boxes, etc. The poppet valves are retained.

A novel feature on this make of car is the new feed water heater, which utilizes the exhaust from the engine and is located alongside the motor crank case. The ordinary "petit cheval" (as Serpollet terms his water and fuel steam driven pump) is retained, as is its automatic action, proportional to the steam consumption.

The new model Serpollet car does not differ in the least in general appearance from the ordinary gasoline car, and the condenser looks exactly like the radiator on a gasoline machine.

WEYHER & RICHEMOND.

This car is manufactured by a firm long established in boiler and steam engine construction. The car is of 15 horse power and looks exactly like a gasoline machine. The boiler is under the hood; the engine is in the middle of the car where the gear box is usually placed in a gasoline car, and the fuel and water tanks are at the rear end of the chassis. The boiler is heated by kerosene and is of the tubular type. There is a steam air and water pump fitted, the operation of which is regulated by a lever on the top of the steering wheel. The engine has four single acting cylinders with poppet valves. The engine and boiler are carried on a three point suspension. The brakes act on the four wheels.

KRIEGER ELECTRIC AND GASOLINE-ELECTRIC CARS.

The electric cars of this make are changed very little from last year's model, except in a few minor improvements in the motors and general make-up of the machine, such as the disposition of wires, fastenings, etc.

The gasoline-electric car of this make is also altered very little. A Richard-Brasier motor, having four vertical cylinders, is placed underneath the hood in front, exactly as it would be in an ordinary gasoline car, but instead of driving through gears the motor is coupled to a dynamo, which supplies current to two electric motors, each one of which drives a rear wheel. The motors are carried on the rear axle.

The plan is to run the motors below their normal load at ordinary car speed on the level, bringing them to their normal power, or even overloading them if necessary, under certain circumstances, such as speed bursts or when climbing hills.

This system has been fairly successful on some buses and trucks with which the Krieger people have been experimenting for the past year. The only drawback was that occasionally the motors were overloaded to such an extent that they were burned out.

THE DININ ELECTRIC CAR.

This firm are manufacturers of accumulators for electric ignition, and this year they have developed an electric runabout. It is a small machine, looking very much like a gasoline car, except that in place of the radiator there is a full panel in front, carrying an electric searchlight in the centre. A battery is placed underneath the hood, and a single electric motor underneath the floor boards, which drives the rear axle through a propeller shaft. The system of control is similar to that used on most other electric cars.

THE GALLIA ELECTRIC CAR.

These cars are two and three seated machines. The frame is made from channel steel. The steering is irreversible. The foot brake drum is on the armature shaft of the motor. There is also a brake on the rear wheels. Two forward speeds and reverse are obtained by different couplings of the accumulator. By means of a pedal under the driver's foot the car can be stopped, accelerated or slowed with great ease and without the slightest shock. The drive is by propeller shaft to a live axle. The batteries are good for from 50 to 70 kilometres without recharging, at an average speed of 18 kilometres per hour. By recharging during meal hours 80 to 100 kilometres per day can be covered.

There are several other electric cars on exhibition, but the ones just described can be taken as representative types.

COMBINATION CARS.

Considering the different advantages and disadvantages of electric and explosion motors, the Auto-Mixte Company have sought to combine the two systems in a car, which they have called "L'Auto Mixte." This car has a pressed steel frame, wooden wheels and pneumatic tires; the steering is irreversible. The rear axle is of the live type. In front, under a bonnet, is placed a four cylinder gasoline motor of 100 millimetres bore and stroke. The motor is cooled by the thermo-siphon system of water circulation and has a fan behind the radiator. All valves are mechanically operated. The ignition is of the make and break type, having a fixed ignition point. The carburetor is automatic and has an electric governor.

This engine is coupled direct to a dynamo, which acts either as a motor or as a dynamo, as may be desired, and which automatically makes the change when required. A magnetic clutch is provided between the dynamo and propeller shaft. There is a coil placed behind the driven member of this clutch. When a current flows through this coil it acts as a powerful electric brake, both forward and backward.

A storage battery is used which is placed



OTAV (ITALIAN) LIGHT CAR.

under the seat. This battery is claimed to be of a special construction and weighs 300 pounds. It is said that it cannot be injured by being discharged completely in a few minutes. Suitable measuring apparatus is placed on the dashboard, so that it can be plainly seen by the driver. A controller actuated by a side lever similar to a gear lever permits the motor to be started from the seat, and also gives the different changes of speed and the reverse.

The principle of this machine is that on a level road, or whenever a small amount of power is required to drive the car, the extra power developed by the motor, and not absorbed in driving, is taken by the dynamo and transformed into electrical energy, which is sent into the battery. When the battery is fully charged an electric governor stops the sparking and shuts the throttle of the gasoline motor, which, however, keeps on revolving as long as the car runs, the dynamo which has been automatically converted into a motor doing the driving until the battery has discharged, to a certain extent, when the electric governor again comes into action, and by opening the throttle and connecting the sparking apparatus allows the gasoline motor to again take up its share of the load.

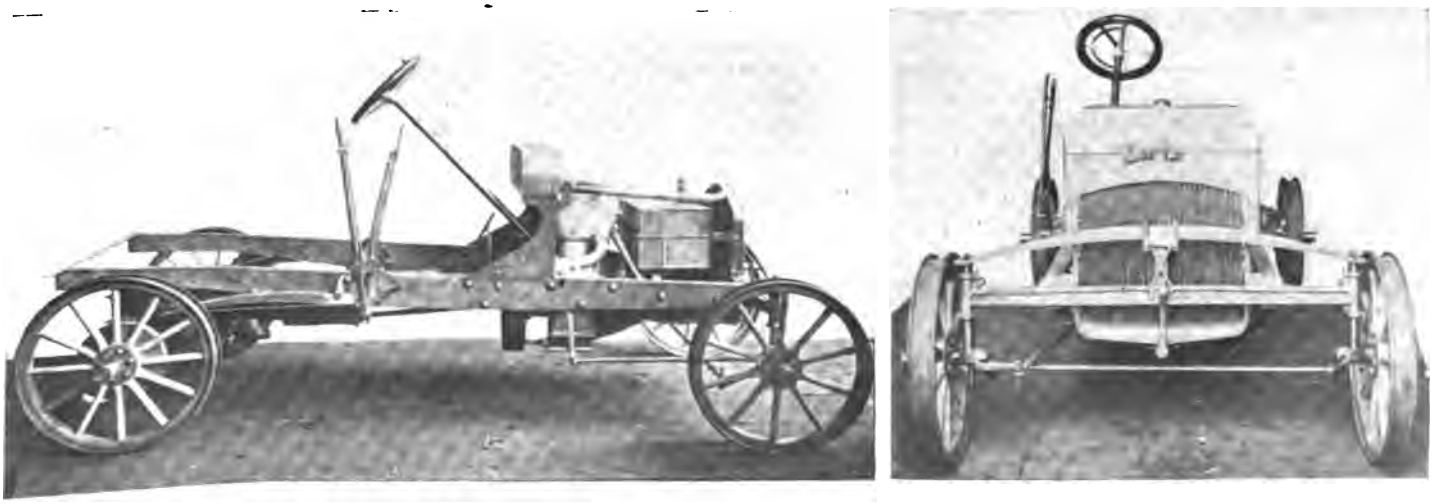
In case of emergency the effort of the dynamo acting as a motor and receiving current from the batteries can be added to the effort of the gasoline motor. This combination, say the builders, will supply about double the power of the gasoline motor.

Many people who have seen this car concede that it is the best attempt which has been made to solve the problem of a combination gasoline and electric car.

The Low Priced Car at the Paris Show.

Those who expected that the late Paris Show would offer anything sensational in the line of low price cars were doomed to disappointment. It is true that quite a number of low priced voiturettes were on exhibition, but none that appealed to the practical purchaser more than the several well known small cars that have been on the French market for a number of years, such as the De Dion, Peugeot, Gregoire, etc. These latter have already been described in these columns, and the latest models present absolutely no new features of note. Perhaps the most revolutionary design of a small car was the 7 horse power Sizaire & Naudin, several illustrations of which are shown herewith. This car is remarkable chiefly for the number of parts dispensed with in its construction, including the following: The front axle, gear box, spark and throttle levers, dashboard, brake pedal, one front spring and one-half of the rear springs.

This car has side frame members of wood, and the frame is suspended by a semi-elliptic cross spring in front and two quarter-elliptic springs at the rear. The frame is narrowed in front and is stiffened by substantial steel cross members. The entire power equipment is carried under a hood in front. The motor is a single cylinder upright, one of the high speed type, with mechanically actuated valves. Right in front of the motor in the side view of the chassis will be seen a prismatic box which comprises the gasoline tank in front and the entire ignition outfit in the rear. The ignition apparatus is thus quite close to the motor, and all wire connections are eliminated. The time of the spark is controlled automatically by a fly ball governor. The circulation of the cooling water is obtained by thermo-siphon action. A vertical tube radiator is located at the front of the engine space, and a transverse water tank forms the upper portion of the dashboard. The radiator consists of cast brass headers and side frames, the headers being connected by about fifty small diameter copper tubes. One of the most curious features of the car is the front construction. A front axle proper is entirely dispensed with, and its place is taken by the front cross member of the frame, which is extended and provided with vertical hubs at its outer ends, adapted to slide over upwardly extending rods on the steering spindles. The change speed gear is incorporated with the driving gear on the rear axle, and consists essentially of a triple bevel gear on the differential case and three independent bevel pinions on the driving shaft, any of which



SIDE AND FRONT VIEW OF A LIGHT AND LOW PRICED FRENCH CAR (SIZAIRE & NAUDIN).

can be secured to the shaft by means of an operating device at the driver's seat. The drive is therefore direct for all three speeds. The car is fitted with a clutch consisting of a single metal disc pressed against the rear flat surface of the flywheel by a coiled spring. The clutch is disengaged by a pedal, the continued motion of which applies the brake. The car is steered by a hand wheel through a back-lock mechanism with automatic adjustment for wear. The connecting links of the steering system are also provided with compensating springs to avoid all back lash.

Another attempt to solve the problem of the light and cheap car is due to the Officine Turkheimer of Milan, Italy, who exhibited a very light runabout under the trade name of "Otav." The construction is rather crude, and reminds one of the productions of "bicycle graduates" in the earliest years of the automobile movement, though there is no doubt that the car may render fairly satisfactory service on well paved roads. The greatest attention seems to have been directed toward reducing the weight to a minimum. The frame consists of channel section pressed steel side members, the web being drilled with holes over its entire length, as is customary with racing cars. The road wheels are of the bicycle type, 28 inches in diameter and fitted with 2 inch tires. The motor is a single cylinder, vertical, air cooled one, with suction operated inlet valve. The cooling is effected by means of a fan in front of the motor which forces a blast of air through an aluminum jacket down upon the cylinder head and valve chamber. The power of the motor is transmitted by chain to a countershaft, and from there by trapezoidal belts to the rear wheels. The use of belts renders a differential unnecessary, it is claimed, and it appears that the clutch is also dispensed with. Two speeds are provided, the high being a direct drive from the motor to the countershaft. The gasoline tank occupies the position usually accorded to the radiator, and is built with a funnel shaped opening through which the cooling air is drawn in by the fan. Lubrication is effected by means of a pump which draws from a supply tank of 2½ quarts capacity. The weight of this car is 440 pounds.

At the first meeting of the Sports Committee of the Automobile Club of France, held in Paris, to discuss conditions for the big race which will be held in France next year, it was decided to inspect the Fontainebleau circuit. The advantages of this course are its proximity to Paris, its good roads, and the fact that no neutralization would be necessary. It was also agreed that not more than four cars of any make should be entered; and if the number of engagements was very large, the number would be reduced to three. In the case of one firm working under license from another, only a limited number of cars could represent these houses.

Clutches at the Paris Show.

In a recent article by C. Faroux in *L'Auto* the improvements in clutches revealed by the Paris Show are dealt with. By way of introduction he states that until recently the majority of manufacturers employed the type of clutch consisting of a female and a male cone, the latter entering into the former. The male cone was covered on its outer surface with a facing of leather which insured complete adhesion when the clutch was in the position of engagement. It was only necessary to press upon a pedal to counteract the pressure of the clutch spring, and the two cones were thrown out of contact, the motor then continuing to run without driving the car. This type of clutch has two important advantages, viz., its simplicity and its low cost of construction; on the other hand, the following objections are raised against it: (a) it insures progressive action only by gripping and slipping, which results in rapid wear of the leather covering; (b) it renders it practically impossible to use the flywheel as a fan; (c) the movable part must of necessity be comparatively heavy and have considerable inertia, which introduces difficulties in connection with the operation of the change gear; (d) it produces end thrust against the bearings of the motor shaft and the first motion shaft of the transmission.

These various objectionable features having been determined by experience, designers had a choice between two solutions of the clutch problem—they could either eliminate the disadvantageous features of the ordinary cone clutch or they could adopt some other type of clutch. We will briefly review the various arrangements they have adopted in their cars in order to realize one or the other of these desiderata. But before proceeding it may be of interest to state that the objectionable features of cone clutches above enumerated increase in importance with the power to be transmitted.

The list of those who adhere to the old type of clutch is quite important. Brasier, Renault, De Dietrich, Peugeot, C. G. V., Delaunay-Belleville, Delahaye, Hotchkiss, Ader, Gillet-Forest, Decauville, Hurtu, Wolseley, etc., still continue to use the leather faced cone. The almost general provision of an extension of the motor shaft, which takes up the end thrust of the clutch spring without transmitting it to the gear case, has already resulted in the elimination of one of the disadvantages of this classical type of clutch. As regards progressive action, the solutions of the problem presented are of a diverse nature.

In a general manner the clutch is rendered progressive by placing flat springs under the leather facing of the male cone, or, what seems preferable (Renault), by sawing into the female cone (secured to the flywheel) at several points of its circumference. The sectors thus formed are bent slightly inward, in such a manner that their outer ends come in contact with the cone first when the clutch is engaged, whereby progressive engagement is insured. The Delahaye clutch is also well worked out. Ader employs a new and original method to obviate gripping. The two cones are solid or closed, so that in the position of engagement the intermediate space forms a closed chamber. During the process of engagement of the clutch the air is therefore compressed, and having no other outlet for its escape than around the cone, the cone is carried along for an instant through an extremely thin gaseous layer, whereby a progressive action is obtained without wear on the clutch surfaces. De Dietrich also has a new feature embodied in his clutch mechanism, the clutch pedal first throwing a clutch brake into operation, an arrangement the advantage of which is evident.

As concerns the certainty of action of cone clutches there were quite a number of solutions. Some makers had locking bolts near the centre of the flywheel, while others provided driving fingers near the circumference of the wheel. Both systems have certain disadvantages, which are briefly as follows: In the first case the driver experiences some difficulty in unclutching, the entire effort of the motor being applied to the clutch bolts; in the second case, the clutch fingers being subjected to a high linear speed, they are often broken. Brasier has found a happy solution of the difficulty. He makes his leather faced cone of such a diameter and angle that it is of sufficient capacity to about transmit the whole of the power. Then he determined the distance at which the supplementary locking bolts must be placed, in order that they may not be under too great shear nor be subjected to too great linear speed.

Cornilleau & Saint Beuve, who use a leather lined inverted cone clutch, have provided a ratchet arrangement, operated by the clutch pedal, which permits of starting the motor from the driver's seat. At the Wolseley stand was found an interesting clutch attachment. Upon throwing out the clutch the male cone is retarded by a leather covered brake shoe, whereby the shocks on the gear teeth are diminished. It may be added that in many cases the male cone has a certain amount of play with respect to the female, often obtained by means of a ball and socket joint, the object being to avoid straining the shafts.

As will be seen from this brief review, the leather covered cone clutch has been materially improved, and it appears doubtful whether it will be possible to make it still better in the future. All its disadvantages have been eliminated with one exception—the great inertia of its movable part.

The recognition of this fact led to numerous investigations and experiments which have resulted in the introduction of metallic clutches, a type which has gained considerable ground since the last show. These clutches were known before the advent of the automobile, and the Megy, Julien and Bonnafous clutches are familiar to all mechanical engineers. The Julien, which has been adopted by some automobile manufacturers, consists of a cylindrical drum and

an expandible circular flat spring, faced with leather and actuated by means of a bell crank through the intermediary of flexible washers. This is quite an interesting mechanism, and many of the present clutches are based on a similar principle. Metallic clutches may be divided into the following classes:

1. Disc clutches.
2. Expanding segment clutches.
3. Helical clutches.
4. Band clutches.
5. Block clutches.

We will consider these different types in succession.

Disc clutches have been adopted by the firms of Panhard, Bayard-Clement, Clement-Gladiator, Aries, Itala, Berliet, Rapid, Motobloc, Bianchi, Mendelssohn, Rebour, etc., all these being based upon the principle of the Hele-Shaw clutch. The firm of De Dion-Bouton employs an entirely distinct form of disc clutch. Speaking generally, a large number of discs (forty to sixty) are assembled inside the hollow hub of the flywheel. All the even ones, for example, are secured to the flywheel by means of one or more keys on which they are adapted to slide, and all the uneven ones are fixed to the first motion shaft of the transmission. A light spring presses the discs in contact and insures their driving, since by increasing the number of surfaces pressed one against the other one diminishes the pressure necessary for effecting the drive.

The clutches of this type are naturally progressive and operate just as slowly as desired. The frictional surfaces may be placed in a bath of oil, which diminishes the heating effect and greatly reduces the wear.

In order to still further develop the advantages of the disc clutch Professor Hele-Shaw has recently taken out a new patent, constituting in reality an addition to his former patent. According to the new specifications, the discs, instead of being flat, are corrugated, whereby the extent of the surfaces in contact is still further increased. It appears that this clutch has been adopted by the Fiat firm.

Another ingenious arrangement deserves to be mentioned. Hautier secures automatically progressive action by means of a differential mechanism in which a central pinion, operated by the motor, drives a set of planetary pinions which are also in mesh with an internally toothed ring. The planetary pinions drive the change speed gear, but only when a brake operated by the clutch spring holds the internally toothed ring stationary. If the spring is adjusted to only a slight tension the brake will not instantly stop the toothed ring, but owing to the V slot into which the brake blocks engage the ring is stopped gradually and eventually held securely, thus insuring a perfect clutch effect. The adjustable tension of the spring, therefore, permits of rendering the clutch just as slow acting as desired, in order to obtain extremely smooth starts.

The expanding segment clutch is used on their 1906 chassis by the firms of Rochet-Schneider, Martini, La Buire, Desgouttes, Pilain, Brouhot and Motobloc. This type of clutch operates in the same manner as the enclosed metallic hub brake. Clutch and brake are really different applications of the same mechanism. Desgouttes spreads the segments by means of an eccentric, and his clutch appears to be very substantial. On the La Buire chassis the two motions of clutching and unclutching are obtained by means of a rotary sliding piece carrying a fork, which embraces the ends of a lever pivoted to the ends of the segments. Brouhot employs with excellent success his extensible pulley, to which he has added an elastic spring coupling similar in operation to the Raffard coupling for dynamos. Pilain produces the expansion of the segments by means of two oppositely threaded screws in a single piece. All of these clutches should be and are operated in oil, which reduces wear and heating.

The helical clutch which was first used by Lindsay, and which is based on a principle similar to that of the Lemoine brake used by the artillery, is applied on the Mercedes chassis. The engineers of the Unterturkheim firm have found it thoroughly satisfactory, and seem to have become quite expert in the manufacture of the helical spring. This type of clutch has this year also been adopted by the Pipe firm.

The band clutch, a good example of which is found on the 1906 Mors chassis, operates in the same manner as a band brake. The thin steel band is drawn tight upon the drum by means of a conical sliding collar on the first motion shaft of the transmission, forced in the direction of the engine by the clutch spring. This clutch is extremely accessible, readily adjustable and its moving part has only a small amount of inertia. This type of clutch appears to have a great future. [This clutch has been used for some eight years in this country by Haynes and the Apperson Brothers.]

Contest Organized for Seat Starting Devices.

The Technical Committee of the Automobile Club of France, on December 20, at 10 a. m., proceeded to examine and receive demonstrations of the devices entered for the competition of apparatus for starting vehicle motors from the driver's seat. The first device to be tested was that applied to the Mors vehicle, which operated well. The committee then proceeded to examine the other devices entered, but finding that most of the motors to which they were fitted were hot, it was decided to postpone the tests until the afternoon, leaving instructions with the competitors to allow their motors to cool. The tests were continued at 2:30 p. m., and most of the devices worked well. A report on the tests was read before the Sports Academy on December 21. The Deutsch prize was awarded to the "Cinogene," manufactured by Isnard of Grenoble. We expect to print a description of this device soon.

Motors in India.

Vice Consul Piatt, of Dublin, calls attention to an article which appeared in a recent issue of the *Moniteur Officiel du Commerce de Paris* on the motor trade in India, which will interest those engaged in that industry in that country. Complaint is made that the French manufacturers of motors in their dealings with India employ English agents, and that these agents naturally discriminate against all makes in favor of those of Great Britain. What is said about the style of cars adapted for India should be carefully noted by manufacturers. The article in part follows:

"During the last two years motor cars and motor cycles have been used in such rapidly increasing numbers in Calcutta, Bombay and Madras that several French firms, having consulted their consul general, are now taking steps to open a vigorous campaign. Already Calcutta possesses an essentially French garage and depot. The traveler of another firm, being convinced of their utility, has consigned a large number of motor cycles to another Calcutta agent, while the representative of a third French firm is studying the possibility of the general use of motor boats on the delta of the Ganges. All are agreed that the reliability trials which have been organized have demonstrated in no uncertain manner the value of motor traction and considerably hastened its development.

"During the fiscal year just passed, 1904-5, 128 cars entered Calcutta, in spite of the fact that Bombay is a much more favorable port of entry. From the rapidity with which the cult of the bicycle has spread throughout India, it is reasonable to predict a similar expansion for motor cars. The native is no opponent of progress. He has accepted the change from oil lamps to electricity without the least sign of fear or hostility. He does not analyze matters, but profits without questioning from labors the magnitude of which he is totally ignorant. In short, he is a fatalist whom nothing can astonish, but he is quick to see the advantage of the motor and to familiarize himself with its working. Thus there are already in Bombay garages hiring out cars as a part of their business, and it appears these never lack work.

STYLE OF CARS REQUIRED.

"Cars for India must be built as high as possible, in order to clear obstacles on the road and to be usable across fords and overflooded roads, which are very common during the rainy season. Engines with flywheels a few inches above the ground would be utterly useless. Secondly, the carriage work must be light and strong, and the engine and gears simple and easily accessible. Thirdly, the price should be from $900 to $1,250, and the cars should be exhibited at a centrally situated garage; and every opportunity given to likely customers to thoroughly examine every detail. Speed is apparently quite a secondary consideration."

Experiments With Motor Vehicles in the Quartermaster's Department, U. S. A.

By F. P. Avery, Captain U. S. A.

It is along no flowery way that the Quartermaster's Department of the United States Army has carried its experiments with motor wagons. On the contrary, many thorns have been met and some have been passed on the rocky road of experience, and today an interesting fight is being fought between inexperience on one hand and imperfect machinery on the other, and although not entirely abandoned, the department must receive much encouragement before any extensive use of the automobile in its service will be made.

Trouble in this department began in 1903, when the Commander of the Department of Texas requested that he be furnished with a motor wagon for use at Fort Ringgold, in hauling freight and passengers from the nearest railroad station, Hebbronville, a distance of about 75 miles. The road was very sandy. It took twelve mules and three drivers six days to relay and make the trip. It was thought the trip could be made by a motor wagon in "two daylights." A similar road had been inspected by an automobile expert and pronounced practicable for the auto; and officers familiar with both roads said the Ringgold road was the better of the two.

SELECTION OF THE WAGON.

The question arose as to the best kind of motor to use on this route, and inquiry by the Quartermaster's Department developed that an electric wagon would weigh 5,000 pounds, cost $3,700, cost $25 (estimated) per month to run, and run 30-35 miles, at 8 miles per hour, on one charge. Steam was not recommended because of the impure water in that section, which it was thought would injure the boilers. The gasoline motor was left for selection, and it was recommended that a wagon of about 5,000 pounds weight, with a speed of 20 miles an hour, be adopted. Solid tires were specified. No top was fitted, but provision was made to use wagon bows and cover the wagon with a tarpaulin. It was recommended that the wagon should be suitable to carry light or heavy loads or men on improvised seats. The wagon was to cost about $3,000.

This requisition having been approved by the department, inquiry was made among the different factories for a motor wagon fulfilling the requirements specified. It was ascertained that a factory in the West had a stock dray that seemed to fill the bill. Briefly described, it was a heavy dray with a double opposed horizontal motor 7x8 inches, developing 24 horse power at 750 revolutions per minute; artillery wheels 40 inches in diameter; solid rubber tires 4½ inches wide; the usual front seat for the driver; body with wire screening; extra seats, headlights, tools, etc., at a price of 000.

nteresting descriptions of the various parts and performances of this machine were furnished the department; cuts showing the wagon pushing two box cars along a railroad track, one showing the wagon running up a 40 per cent. grade, and others of the same sort. The examination proved satisfactory and a wagon was ordered. The wagon was completed as ordered and stood satisfactory tests in the ice and snow near where it was built, was accepted and shipped South, with an experienced operator to run it.

THE TRIAL AT HEBBRONVILLE, TEX.

Arriving at Hebbronvbille, the operator looked over the road, and at once pronounced it impracticable for the wagon. However, the wagon was loaded and an attempt made to navigate the sandy waste of the lower Rio Grande. The result was decisive and positive, admitting of no doubt. The machine was hopelessly stalled less than half a mile from the station, where it had to be unloaded and worked back to the station, and was eventually shipped to San Antonio to try out on the harder roads in that vicinity.

Reports from Hebbronville show that failure was due to the driving wheels slipping in the dry sand and digging into it, letting the wagon down so as to bear on its differential, although there was about 12 inches clearance at that point.

It was thought by some that a wider tire would obviate the trouble, but the operator in charge thought not, and said that even if the car would run with a wider tire the drifting sand would so clog the running parts that it would be a matter of a very short time before the machinery would be utterly ruined.

THE TRIALS AT SAN ANTONIO, TEX.

The tests at San Antonio developed another reason why the motor wagon is not adapted to military service, viz., the lack of technical knowledge in regard to them. Reports from this station show that it was unsatisfactory. "From its variable action and complicated machinery inseparable from such a motor. * * * Hard to estimate how much the unsatisfactory condition is due to inherent defects and how much to lack of skill in operating. * * * It would sometimes slow down and stop on 10 per cent. grades, and would stop at times on a level road. * * * Only good results secured when running at highest speed on level roads." Even then it would frequently acquire a hot box to stop itself by when no other excuse seemed available.

The defects itemized by the department at San Antonio were: "Tires not wide enough; mechanism crude; defective batteries, dynamo weak; body defective; blow holes in crank shaft; sparking points brass instead of platinum; muffler cast iron, blew out; defective oiling system; sand was found in all bearings; was difficult to start, requiring from twenty minutes to two hours' cranking to start when cold, and always started hard when warm."

CONDEMNED AND SENT TO WEST POINT.

The wagon was finally sent to West Point, N. Y., and an expert from the factory sent to overhaul it and report. He reported that the body was wrenched by a collision with something, as plainly shown by marks on it. He found the piston valve turned so as to cover its port at all times; the sparking finger bent, so as to put it out of action; the rear plug broken; the generator out of adjustment; the batteries too weak and the oil feed stopped up.

After replacing the defective crank shaft and correcting the other defects the wagon was loaded with 3,000 pounds of freight and hauled it up the steep Dock Hill at West Point without a hitch. The car has since been in regular service there, and, while no official report has been made on it, it is generally understood to be giving satisfactory service. Thus ends an experience in the Quartermaster's Department.

REQUIREMENTS OF THE QUARTERMASTER'S DEPARTMENT.

The capabilities of the motor wagon on hard roads are known as well in this department as elsewhere, and it is conceded that when the work to be done requires the services of more than three mules the motor wagon is the cheaper on these roads; but this is not all that the Quartermaster's Department must consider. This department is responsible for the transportation of all supplies of the army in time of war as well as in time of peace. It would be folly for the department to develop and use a system of transportation in time of peace that could not be used in time of war. The old and well tried adage, "In time of peace prepare for war," most certainly applies to this department. The only time the department has to perfect its system is in its use and practice in peace times; and the six mule team, with the old and well tried army wagon, with its ugly bows and canvas cover, has never been improved upon.

An army does not travel on blue stone, macadam and turnpikes in war time. It goes anywhere, everywhere, across plowed fields, through swampy meadows, over sand hills, crosses deserts, climbs mountains, goes over all kinds of country, and the ever patient, hard working Quartermaster's Department must follow and deliver the goods. With its tents, baggage, food supplies, cooking utensils, ammunition, etc., it must be there.

The wagon that carries the load cannot follow the highway (provided there is one) and stop there. The company to which the load belongs may be a mile from it, across a cultivated field, a boggy meadow or a sandy waste. It must be able to cross the drainage ditches, travel on the soft, cultivated ground, through the brush and sand, and deliver its load at the foot of its company.

When a motor wagon is found that will do this work the Quartermaster's Department will be the first to accept it, and until then it will continue to rely upon the faithful Governmental mule, with its musical horn.

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Review of the Year.

The year 1905, while it has brought no radical changes in automobile design, has nevertheless witnessed great improvement in the products of American automobile works. Automobile manufacturers seem to have realized that cheapness is not an essential in securing an extensive market for cars, and the tendency during the year has been almost entirely toward better though more expensive methods of construction. Perhaps no more convincing example of this tendency could be mentioned than the almost universal adoption of pressed steel frames on all cars selling for over $1,000. Only two years ago the angle steel frame was still the rule on American cars of all sizes; and while, aside from its crudeness, it was fairly satisfactory for cars of low power, the constant increase in the horse power of motors rendered frames of this type either weak or abnormally heavy. The four cylinder sliding gear car, which was already in the ascendancy the previous season, has made further progress during the course of the year, and now even all the more important Western manufacturers, who devoted themselves most persistently to the so called American types of cars, have at least one four cylinder model. The market for two passenger runabouts is now controlled by a relatively small number of powerful concerns, and the smaller firms and new comers in the industry devote themselves by preference to the large car, which accounts for its rapid development.

In the case of most of the larger manufacturers designs have become fairly settled, and confidence in the future stability of design has been strengthened so much that a great deal of capital is being invested in special tools and equipment. Numerous parts that were formerly made from castings or built up from a number of pieces are now made integral drop forgings, which are lighter, stronger and in the end less expensive to make. Motor cam shafts furnish a good illustration of this tendency. One year ago, we believe, there was not a single car made in this country which had its cams integral with the shafts; now there are at least half a dozen cars that embody this feature, which in another year will probably become almost universal for high grade cars. Of course, before it was certain that the design was right and would probably not require to be changed for a number of years at least, it would have been folly to go to the expense of the necessary dies and fixtures for turning the shafts. The same thing applies to front axles and stationary rear axles, which are now frequently drop forged, of I section.

Another instance of the gain in improved methods of construction is the adoption of the grinding process for finishing cylinders, pistons, crank shafts, and, in fact, all important bearing surfaces of a car. Along with the grinding process many manufacturers have introduced the practice of hardening or case hardening wearing parts, which will have an important effect on the wearing qualities of their vehicles.

Another question that has received serious attention during the past year is that of proper materials for the construction of the different heavily loaded parts of cars, particularly the change gears and their shafts. Unless steels of high tensile strength are used in the construction of the transmitting members of a high powered car the car becomes unduly heavy, which is objectionable, particularly on account of the great strain it imposes on the tires. Until recently carbon steels were considered good enough for all purposes in motor car construction, but it is now recognized that alloyed steels offer important advantages in certain parts; and in line with this cons eration the Association of Licensed A mobile Manufacturers have establishe testing laboratory in order that the

terials offered and furnished by steel makers, etc., to their members may be properly tested. Individual manufacturers, moreover, have, in several instances, also installed material testing plants, which show the great importance attached by them to the quality of the metals employed. The American steel trade is finally responding to the demand for special high tensile steel for this purpose, and it will not be long before American builders of high grade cars will cease to be handicapped in this respect as compared with their European competitors.

Another subject that has received attention from one of the trade organizations the past year is the fuel question. To the commercial leaders of the industry, who assume the responsibility for the millions of capital invested in it, the fact that the great industry which they are engaged in building up is entirely dependent upon a fuel the supply of which is in the hands of a monopoly, and is also limited by natural conditions, must be somewhat disquieting. From a practical standpoint, gasoline, aside from the slight danger involved in its handling, is a highly satisfactory fuel for internal combustion motors, and there appear to be no prospects of discovering a more suitable one; but in view of the possible limitation of its supply it would be highly important if only a tolerably satisfactory substitute for gasoline could be found or developed.

In the field of automobile tires the season of 1905 saw a very extensive adoption of the separable rim type of tire. Early in the year one of the largest manufacturers of automobiles placed a contract for his entire season's demand with one of the manufacturers of this type of tire, and his example evidently found many followers. The number of different makes of this type of tire on the market increased considerably during the year. The extensive adoption and use of these tires led to a thorough recognition of their shortcomings as well as their good points, and as a result important improvements are announced for the 1906 season.

COMMERCIAL REVIEW.

To the automobile industry as a whole 1905 has certainly been a prosperous year. Most of the manufacturers had their new models ready comparatively early, thus avoiding the mistake of 1904, and some began delivering even before the shows. Altogether the production must have been nearly double that of the previous year. Few manufacturers met any difficulty in disposing of their production, and in these few cases it was usually due to extreme backwardness in delivering, which resulted in the cancellation of many orders. As a result of the generally good business conditions few failures occurred in the industry as compared with former years, while a great deal of new plant was erected for the manufacture of automobiles and parts.

The commercial type of vehicle received much more attention during the past year than ever before, in spite of the great demand for pleasure vehicles. Quite a number of well known manufacturers brought out distinct types of commercial motor wagons, and several firms were organized to manufacture commercial vehicles exclusively. Motor omnibus, mail and express lines were established in considerable numbers in some parts of the country. The total sale of motor delivery wagons, stages and trucks during the past year probably falls not far short of the total sales of such vehicles before that period.

A discussion of the commercial development of the automobile industry during the past year could not be well closed without some reference to the rapid increase in the number of garages throughout the country. There is now hardly a town of over 5,000 inhabitants that has not at least one establishment where automobiles are sold, stored and repaired, and in the more important cities many specially designed and substantial buildings have been erected for this purpose. In the largest cities, like New York and Chicago, garages are gradually being removed from the side streets to the main thoroughfares (Broadway in New York, Michigan avenue in Chicago), thus indicating the importance of the automobile business in modern commercial life.

Causes of Noise in Air Cooled Motors.

The impression seems to be current that air cooled vehicle motors are as a class more noisy than those of the water cooled type. Whether this belief is warranted as regards air cooled motors in general, or whether it is true only of certain popular examples of this type of motor, is not easy to say; but the fact remains that the air cooled engine bears a reputation for somewhat less quietness of operation than does its water cooled competitor.

There are several possible causes which may contribute to render the air cooled motor noisier than its rival. An air cooled cylinder is usually very thin, is almost always cast separately, and, not being stiffened by the presence of a jacket filled with water, may be considered to form a structure of rather less rigidity than a water cooled cylinder, with its more massive construction and its envelope of water. It is quite possible that the air cooled cylinder is thus more readily set into sonorous vibration by the hammering of the valve mechanism and by the detonation of the charge than is the water jacketed cylinder.

Air cooled cylinders being operated at extremely high temperatures, the entering charge, through the combined effect of compression and the heat from the walls, is generally upon the very verge of self ignition when the spark takes place. Inflammation of the charge is thus very rapid upon ignition being effected and the initial explosion pressure increases very suddenly producing a relatively sharp blow upon the structure, which, being of a more resonant character than the heavier and more irregularly shaped water cooled cylinder, conduces to a stronger resonant effect. Since the valves of almost all air cooled cylinders are located directly in the head they are of necessity operated by means of push rods and rocker arms. This form of valve gear is in general much noisier than the direct acting push rod, acting upon the valve end, so generally used upon water cooled engines, which carry their valves in pockets. The use of this form of valve gear upon air cooled engines and the fact that the cylinder structure to which it is attached more readily takes up vibration than does a water cooled cylinder may have some bearing upon the question of noise.

An air cooled cylinder is generally studded with cooling ribs, pins, combs or other applied metallic portions which may conceivably take up the sonorous vibration of the cylinder itself and intensify them. It is believed that this question of noise in air cooled motors is of sufficient importance to warrant careful investigation. The buying public is very sensitive to unnecessary noise, and the popularity of a car is very considerably dependent upon its quietness of operation.

The technical section of the French Automobile Manufacturers' Association, upon being consulted by the A. C. F., has pronounced in favor of speed contests in 1906. In view of this decision the Automobile Club de France will probably organize a race in addition to its tire race.

The Motor Car as an Aid to Hunting in Texas.

By F.

The adoption of the automobile by the Houston, Tex., sportsman as a means of conveyance in his hunting jaunts is interesting to those following the progress of the motor car. The topographical conditions are especially favorable to the employment of the automobile in that the city is situated in the level lowlands, and on every side may be found the finest of hunting and fishing. In addition to this, fine macadamized or shell roads radiate from the city in every direction through the heart of the hunting and fishing territory. To the south runs a shell road extending along the banks of Buffalo River to La Porte, thence along the bay shore to Seabrook on Clear Lake. At La Porte the finest duck shooting in Texas may be found. To the east of Houston three macadamized roads run to the San Jacinto River bottom, one of them touching at Humble, the oil field. In the river bottom both birds and big game, including deer and bear, are abundant. To the north run four or five gravel and shell roads through the prairie lands, crossed here and there by small streams and wooded patches. To the west some half dozen gravel roads extend to the rice fields and Brazos River bottom. On any of the roads the automobilist may find smooth traveling for from 15 to 50 miles.

Until a few years ago the Houston sportsman was wont to make weekly trips, generally on Sunday, to some of the outlying districts, for a day of sport; but there were many, especially among the business classes, who were restricted by the lack of convenient transportation facilities. It is with this class that automobile hunting originated, and has since become popular. The originator of the idea, perhaps, is a well known sportsman and automobilist, who at first began making short trips to his rice farm on the Richmond road, some few miles west of the city, where he would often spend the afternoon shooting snipe or quail. The practice suggested the use of the car for more extensive trips, and since that time many of the Houston sportsmen have purchased cars to be used for no other purpose than that of hunting. At first most of the trips were short ones into nearby territory; but it is not uncommon now for the hunter to go the entire length of the county, and Texas counties are not small, in quest of sport.



Shooting Plover.

A trip which was made a year ago will show why the business man should prefer the automobile to the train or wagon in making a short hunting trip. A party, among whom was the foreman of the printing department of a morning paper and a reporter for the same paper, left Houston at 4 o'clock in the morning after the day's paper had been issued. The car was run out east of the city some 17 miles to the San Jacinto River bottom before daylight. With the dawn of day a fine buck was shot by one of the party. A short while afterward duck shooting was found in the bottom lakes, and after sun-up quail shooting was indulged in for an hour or so. The game was plentiful and the party secured a good bag in time to get back to town shortly after noon. In that manner these office men were enabled to get a few hours' recreation at outdoor sport without greatly interfering with their work, a thing that would have been impossible had they been obliged to wait on train schedules or to travel by buggy.

Last spring plover shooting from automobiles was extensively practiced. The plover must be shot from some vehicle, as he will fly too readily from a man walking. He pays no attention to the car, however, and will not fly from it. Good results were obtained by all the automobile hunters during the plover flight.

The hunting season lasts but three months in Texas, but after hunting comes fishing, with no restrictions whatever as to amount of catch or season. In the summer the fishing excursions to nearby fresh water streams are substituted for the hunting. An hour's run in a motor car will place the sportsman of Houston at either the home of the perch and bass or that of the salt water fish, including the fascinating tarpon.



An Easy Way to Get Where Game May Be Found in Plenty.

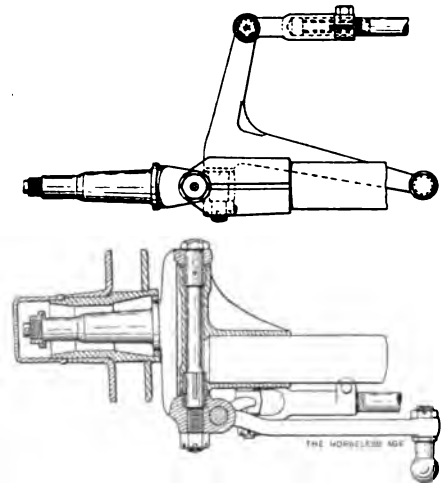
The annual automobile show of the A trian A. C. will take place in the Hort tural Building, Vienna, March 15-28,

New Vehicles and Parts.

The Oldsmobile Model S.

Considerable interest was attached to the announcement, made several months ago, that the Olds Motor Works, of Lansing, Mich., would enter the field with a four cylinder touring car designed on French lines. The Olds Motor Works are generally regarded as the originators of the American type of runabout with single cylinder horizontal engine and planetary change speed gear, which type of car is now in use in every quarter of the globe. The company had so far confined itself strictly to American types of construction—single and double cylinder horizontal cars—and it was, therefore, of interest to see in what manner its designers would work out the details of a car on French lines. The general features of this car have been known to the public for some time, but some of the details have been settled only recently, so that a complete description was not possible before this. The company have placed at our disposal drawings of almost every detail, so that those interested are enabled to inform themselves very thoroughly with respect to the construction of the car, from the description and illustrations.

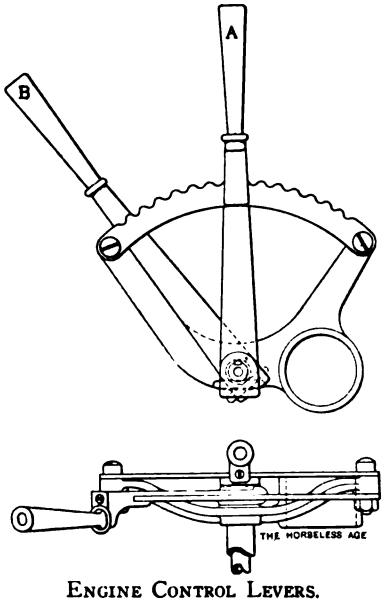
The car is steered by a hand wheel 16 inches in diameter and provided with a wood rim of oval section. The wheel is keyed to a tubular steering post which runs down through a sleeve secured to the dash. Secured to the lower end of the steering post is a square threaded steel worm surrounded by a babbitted nut, the babbitt being cast into a steel sleeve drilled with holes to prevent the babbitt turning in the steel. The sides of the steel sleeve are extended below the worm and connect by a pin and sliding block to a bell crank which transmits the motion to the steering knuckles. The screw and nut mechanism is enclosed in a casing which is provided with means of adjustment for wear, and with a grease cup to insure proper lubrication. The housing bolts directly against the main frame and the sub-frame. The steering knuckles are of the inverted Elliott type, and have very long vertical pivots. The drop forged steering arms are separate from the knuckles and are bolted to a lug formed on the lower branch of the knuckle fork. The joints of the connecting rod between the steering gear and the right hand knuckle are of the adjustable ball and socket type, while the joints of the tie rod between the two knuckles are of the forked type, the forked connectors being screwed and clamped to the tie rod. The front axle is tubular and has the drop forged steering heads pinned and brazed to its ends. The vertical steering head is provided with hardened and ground bushes for the pivot pin at both ends.



STEERING HEAD AND KNUCKLE.

The spark and throttle levers are mounted on a double sector secured to the steering post underneath the wheel. As seen from the drawing, the sectors are provided with rounded notches on their outer edge, into which engage spring pressed plungers within the handles of the levers. The shafts of the two levers are both tubular and concentric, and at their lower ends are provided with lever arms, connecting by links to the throttle and spark timer respectively. The throttle lever is connected with an accelerator pedal in such a manner that the speed of the engine can be adjusted by the lever and accelerated by the pedal, but as soon as the pedal is released the speed will automatically come down to the point determined by the lever adjustment.

The front axle is a bent steel tube, and the steering pivots are arranged to give an inclination of two degrees to the front wheels. The front wheels are fitted with Timken roller bearings in the hubs. The wheels are of the artillery type, 32 inches



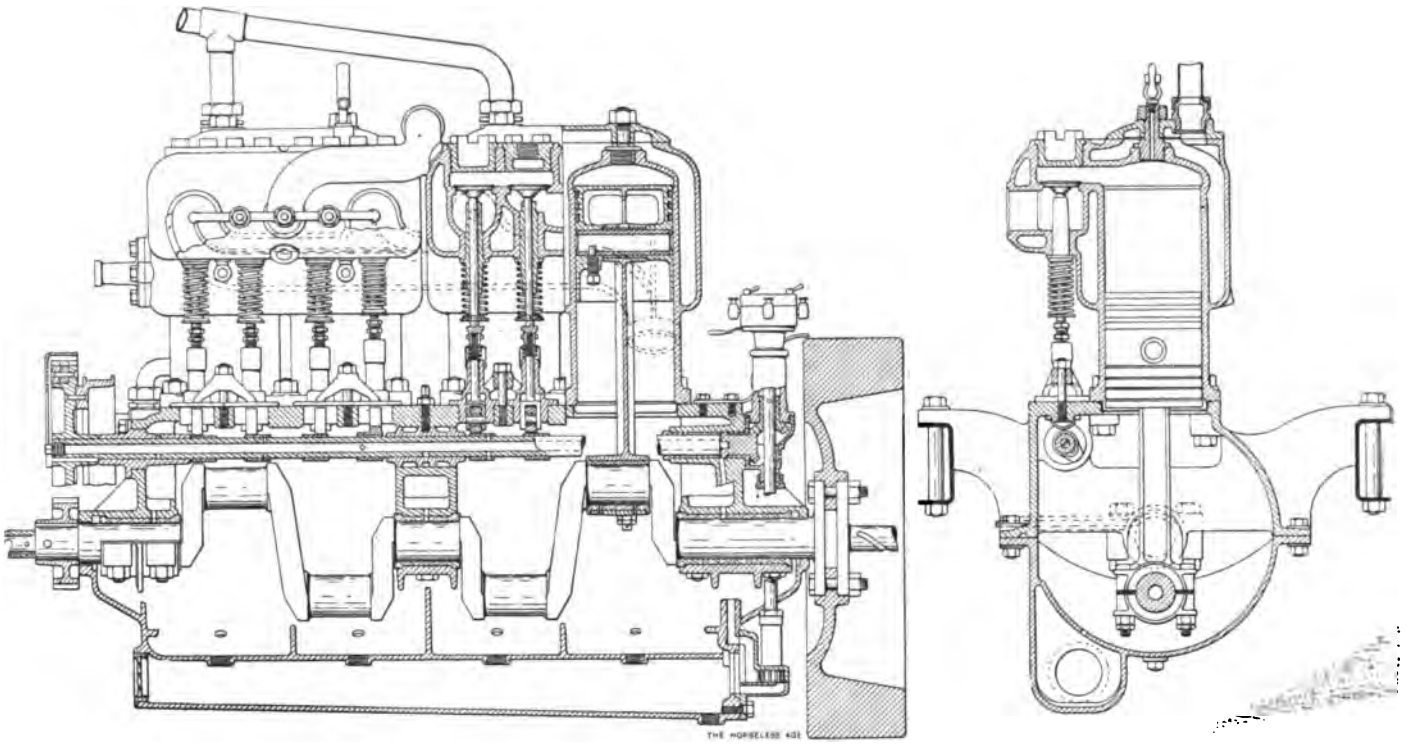
ENGINE CONTROL LEVERS.

A, Spark Lever; B, Throttle Lever.

in diameter, and fitted with 3½ inch front tires and 4 inch rear tires. The front wheels have ten spokes each, the rear twelve. The frame is carried on semi-elliptic springs, 36x2 inches front and 48x2 inches rear. It is of pressed steel construction, with channel section side members 3½ inches deep. A pressed steel sub-frame of the same section as the side frame is provided for carrying the engine and change speed gears. Sheet metal plates are securely riveted between the sub-frames and side members, which in conjunction with a half-cylindrical sheet steel shield bolted below and between the sub-frame entirely protect the motor and transmission mechanism from mud and dust. The car has a wheel base of 106 inches and a standard tread. Brackets are riveted to the sides of the main frame for supporting the mud guards and running board irons, the brackets being reamed out with a Morse taper reamer, and the irons clamped in place by nuts.

The cylinders are of 4¼ inch bore by 4¾ inch stroke, and the engine is rated at 24-28 horse power. The cylinders are cast in pairs with integral heads, valve chambers and jackets, and are formed with flanges at their lower ends by which they are bolted to the aluminum crank chamber. In connection with the joint of the cylinders to the crank chamber it may be mentioned that it is effected by cap screws with nuts, no reliance being placed on threads in aluminum. It will be noticed from the drawing that the water space of the jacket is very liberal, and that it completely surrounds the valve box. The top of the jackets is closed by a cover plate, which is clamped in place by means of two steel fittings, one in the centre of each cylinder head, into the outer end of which the compression cocks are screwed. These fittings are screwed into the cylinder heads, a flange on them abutting against a boss formed on the heads, and the cover plates are then passed over the fittings and clamped in place by nuts screwed over the outer ends of the fittings.

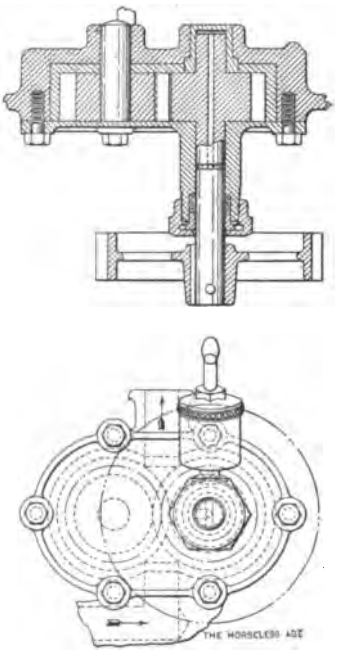
The crank is of the three bearing type, and is hung from the upper half of the aluminum crank chamber. It is made from a drop forging of special steel, and its bearing surfaces are ground to size. The front bearing is 3½ inches long, the centre bearing 3 inches, and the rear bearing 5 inches, while the crank pin bearings are 2¾ inches long. A flange is forged on the rear end of the crank shaft, to which the flywheel is bolted. The connecting rods are I section drop forgings, and are provided with separate caps at the crank pin end, shims being interposed between the head of the connecting rod and the cap in order to allow of ready adjustment for wear. An inspection of the drawing will show that the connecting rod is designed with a view to eliminate all unnecessary weight. The crank pin end is provided with a Parsons white bronze bushing, while the wrist pin end is provided with a hardened and ground steel bushing, the wrist



SIDE AND END SECTIONAL ELEVATIONS OF ENGINE.

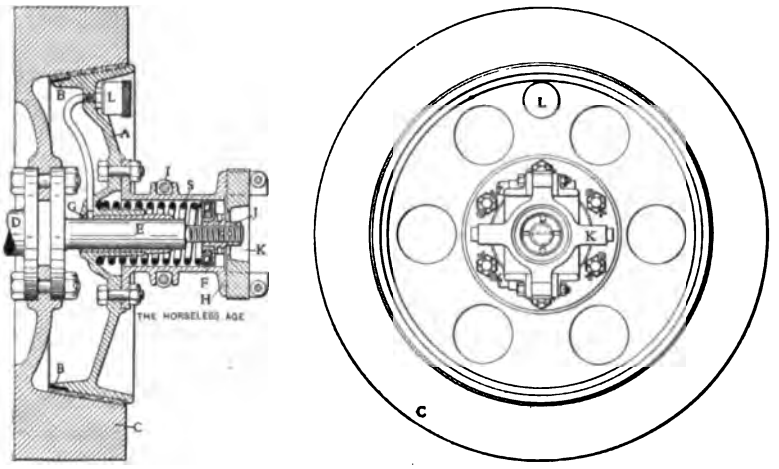
in being also hardened and ground, and nade hollow to reduce its weight. The vrist pin is held in place against lateral novement by a shoulder screw in one of he piston bosses, which is secured by a otter pin on the inside of the hollow wrist in. The pistons are 5 inches long, and are rovided with three rings with oblique oints, pinned in place. All of the rings re placed in grooves above the wrist pin, nd the lower end of the piston is cut with number of oil grooves. The crank cham- er is in two halves, and the upper half is rovided with six supporting arms, the ends f which rest on the sub-frame.

Both the inlet and exhaust valves are nechanically operated from a single cam haft, being located adjacent to each other t the side of the cylinders. The valves onsist of cast iron heads shrunk and iveted to hardened steel stems. The eads are turned with large tapered bosses n the under side to reduce the liability of he stem breaking at the joint with the ead. The openings over the valves are losed by inverted screw caps. The guides or the valve stems are pressed into holes rilled through the lower wall of the valve hamber, being held there by the press fit nd by the pressure of the valve springs. 'he valve springs at their lower ends rest gainst split washers and spring cup wash- rs. The play of the tappet rods is auto- natically taken up by small coiled springs hich surround these rods where they ex- end from the guides, the springs being overed by small pressed steel thimbles. y this means the top of the tappet rods is lways kept in contact with the lower end f the valve stems, and the noise of the alve mechanism is reduced to a minimum. 'he tappet rods are provided with adjust- able caps to allow of making adjustment for wear in the mechanism. The guides of the tappet rods are clamped in position by spider shaped yokes, one for each pair of guides, which are clamped down by a single bolt each. Very interesting means are used for preventing the guides from turning. The flanges of the guides resting against the wall of the crank chamber are of such diameter that those of adjacent guides practically touch each other, and the stud which secures the yoke in place being located between these flanges, semi-circular notches have to be cut in the circumference of each to allow the stud to pass, and this, of course, prevents the guides from turning. The lower ends of the tappet rods are forged and provided with cam rollers. The forks of the tappet rods are rectangular in cross section, and a snug fit in the guides, whereby the tappet rods are prevented from rotating. The cams are keyed and pinned to a hollow steel cam shaft. The cam shaft is driven direct from the crank shaft by a steel pinion keyed to the latter at its forward end and meshing with a composite bronze and fibre gear keyed to the forward end of the cam shaft. The cam gear pinion also meshes with a gear for the circulation pump. Secured to the gear of the cam shaft is an aluminum pulley from which the radiator fan is driven. The cam shaft is mounted in three bronze bushed bearings, and the two forward bushings are of such diameter that the shaft assembled with its cams and bearings can be slipped into place in the crank case from the forward end. The cam gearing is protected by a housing supported by studs screwed into the crank chamber wall.



SECTION AND ELEVATION OF CIRCULATING PUMPS.

An interesting system of lubrication has been worked out for the engine. At the bottom of the crank chamber, to one side, is formed a longitudinal oil well, which is provided with a bull's eye at its forward end, and drains toward the rear. At the rear end of this oil well is arranged an oil pump of the gear type, which is driven by a vertical shaft receiving its motion from the rear end of the cam shaft through a pair of mitre gears. This same vertical shaft is extended upward above the crank chamber, and at its upper end carries the ignition timer. By reference to the side sectional elevation of the engine it will be

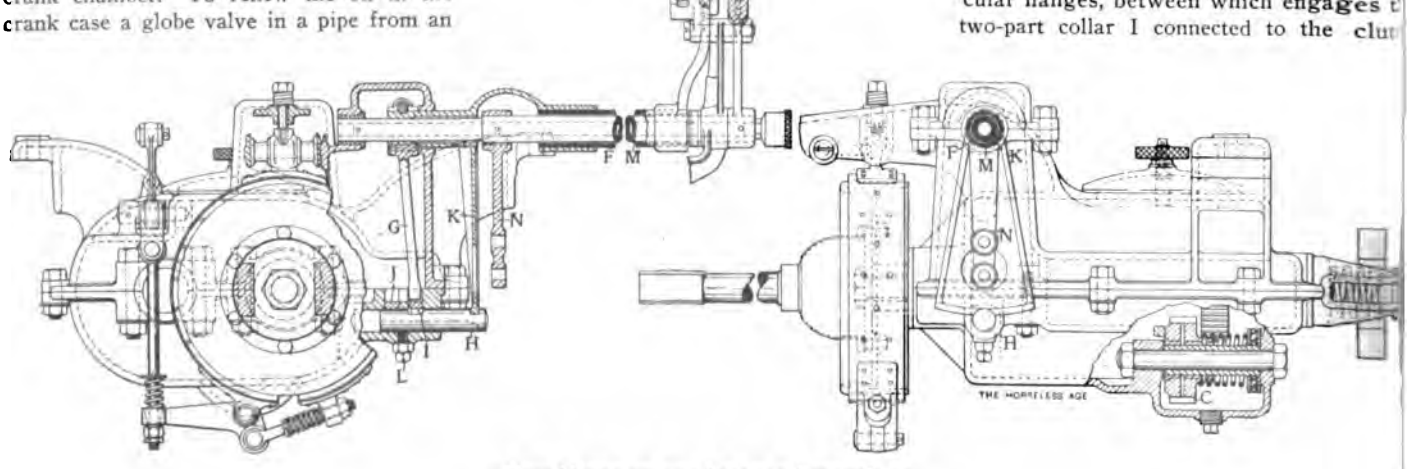


FLYWHEEL AND CLUTCH.

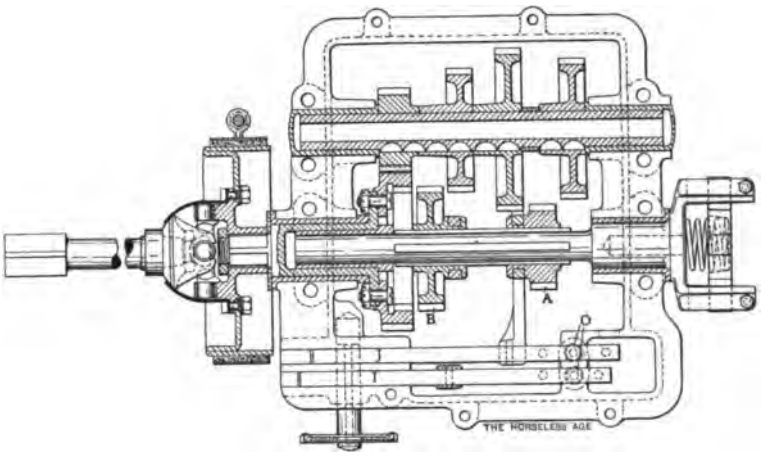
seen that the driving mitre gear has a solid hub which extends through a bearing at the end of the cam shaft, and connects to the cam shaft by a groove and tongue joint. The cam shaft can, therefore, be removed from the crank case without disturbing the gearing for the oil pump and timer. The vertical shaft comprises a Hookham coupling, which compensates any slight disalignment between the pump and the upper bearings of the shaft. The oil pump is bolted to the rear end of the crank case; it draws the oil from the oil well and forces it up through a duct drilled in the wall of the crank case and a groove cast on the under side of the flange of the upper half of the crank case, to the three main bearings of the engine and to the rear bearing of the hollow cam shaft. The oil at the latter point finds its way into the hollow cam shaft, and flows through it to the other cam shaft bearings. The bottom of the crank chamber is divided by partitions into four compartments to prevent all the oil running to one end when the car is on a grade. The centre partition wall is considerably higher than the two other walls. Drain holes are provided in the bottom of the crank chamber toward the side whereby the crank chamber communicates with the oil well, so as to insure a certain level of oil being maintained in the bottom of the crank chamber. To renew the oil in the crank case a globe valve in a pipe from an auxiliary oil tank to the case is opened. The connecting rod bearings and cylinders are lubricated by splash in the crank case.

A Holley carburetor is used, of the float feed automatic type, which is located at the right hand side of the engine, and connects by a brass inlet tube passing between the two cylinders to the inlet valves. The inlet passages are siamesed, and only one pipe connection is required for each pair of valves. The exhaust is conducted away from the engine through a four branch cast iron manifold, and the inlet and exhaust manifolds are held in position by yokes. Ignition is by jump spark, the spark plugs being screwed into the caps over the inlet valves. The ignition current is furnished by a storage battery, with dry cells for reserve. A quadruple vibrator coil is secured to the dash, and the timer, as already stated, is carried at the top of a vertical shaft at the rear of the engine. The cooling water is circulated by a gear pump placed in a recess formed in the crank case at the forward end. The pump chamber is formed in an original manner, in that two gear blanks (presumably flattened on the adjacent sides) are placed in the recess, and babbitt is poured around them, so as to insure a close fit without machining. The pump is driven by spur gears from the crank shaft, and a grease cup is provided for its lubrication. The driving gear of the pump is formed integral with its shaft, while the driven gear runs free on its shaft, which is a steel pin pressed into a hole drilled in the wall of the crank chamber, and held against coming out by the cover plate of the pump. The delivery of the pump connects by a pipe to the very lowest point of the cylinder jackets, and from the cover plates of the cylinder jackets the water flows through a tubular manifold back to the radiator, which is of the cellular type and located at the front of the engine space. A drain cock is provided in the pipe leading from the bottom of the radiator to the pump, which forms the lowest part of the cooling system. Back of the radiator is arranged a fan, which is carried upon a bracket bolted to the front cylinder, so that it is held very rigidly. This fan is driven by a belt from the cam shaft.

The clutch is of the leather faced conical type, and flat steel springs B B are placed under the leather facing at the smaller end of the cone A to insure smooth and gradual operation of the clutch. It will be noticed that the flywheel C is clamped between two flanges, one at the end of the crank shaft D and one at the end of a short shaft E, upon which the clutch cone A has a bearing and which also carries the ball thrust bearing F, taking the end thrust off the clutch spring. The clutch cone is of inches outside diameter and has a face of 3 inches. Its hub is provided with a bronze bushing G surrounding the shaft E, and to its flange is bolted a sleeve casing H, which surrounds the clutch spring S. Upon the outside of the spring housing, which transmits the power of the clutch, are formed two circular flanges, between which engages the two-part collar I connected to the clutch



TWO VIEWS OF THE CHANGE SPEED GEAR.



SECTION THROUGH CHANGE SPEED GEAR.

operating pedal by trunnions and lever arms. The pressure of the clutch spring can be adjusted by means of a nut J over the end of the shaft. The spring housing of the clutch connects to the gear box by a universal joint K. A grease cup L screwed into the web of the clutch cone supplies lubricant to the bearing G of the clutch.

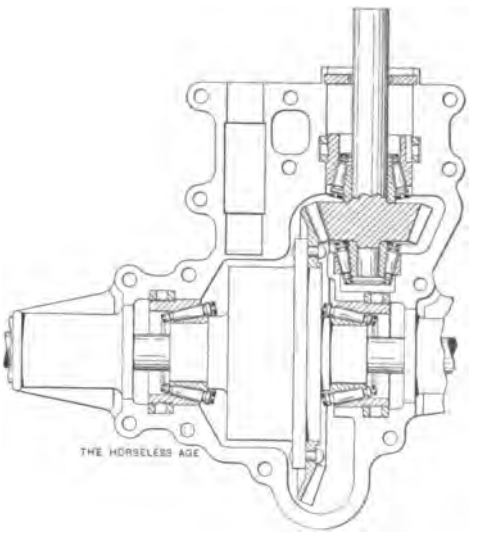
The change speed gear is of the sliding pinion type, giving three forward speeds and one reverse, the high speed forward being a direct drive. The gear comprises two independent sliding pinions, and is operated on the selective system by means of a shifting lever working on an H quadrant. The forward sliding pinion A in its forward position gives the reverse speed, and in its rearward position the low speed forward. The rear sliding pinion B in its forward position gives the intermediate speed, and in its rearward position, when its teeth engage with internal teeth on the gear wheel adjacent to it, the direct drive or high forward speed. The two sliding pinions move on four feather keys milled integral with the shaft. The lay shaft is hollow and the gears are secured to it by Woodruff keys. The pinions and gears are cut from solid banks of high carbon steel, with teeth of "six-eight" pitch. Both shafts are mounted in bronze bushed bearings of very liberal dimensions, the rear bearing of the first motion shaft being inside the shaft to which the propeller shaft is connected by a universal joint. The reverse pinion C is normally held out of mesh with its corresponding gear on the lay shaft by a coiled spring, but is automatically shifted into mesh with it by an extension of the shifting fork controlling the pinion A, when it is desired to engage the reverse gear. The spring which disengages the reverse pinion bears against a ball thrust collar. The journal on which the reverse pinion runs is supported at both ends.

The system of operating the two gear shifting rods and locking the one not used in position is most interesting. As shown in the illustration herewith, the gear shifting lever D is the innermost of the two side levers, the outer one, E, being the emergency brake lever. The lever D is secured upon the tubular shaft F, to the inner end of which is secured a downwardly extending lever arm G. The lower end of this lever arm is adapted to engage into notches cut in the two shifting rods I and J, respectively, by shifting the lever D sideways while in its neutral or central position. The shifting rods I and J are also provided with notches on their lower side, into which notches a sliding pin H is adapted to engage. This pin is cut with a slot in its upper side, which is directly in line with the lower end of the lever arm G, so that the rod with which the lever arm G is in engagement is free to move, while the other rod is locked in position by the pin H. The motion of the pin H is controlled by the sector K secured to the tubular shaft F, which engages in a slot at the end of pin H. This sector K, which does not prevent the rotary motion of shaft F and gear shifting lever D in any manner, insures that the locking pin H is shifted sideways whenever the gear shifting lever D is shifted sideways. The locking pin H is prevented from turning by being cut with a key slot in its under side, into which extends the point of a set screw L. The brake lever E is secured upon a tubular shaft M within the tube E, to which is secured a downwardly extending arm N, from which connection is made to the hub brakes. Two spring pressed balls O are provided under the sliding rods in the gear case to help find the correct position of mesh in changing gears. The balls work in hardened bushings and engage into part-spherical recesses on the under side of the shifting rods.

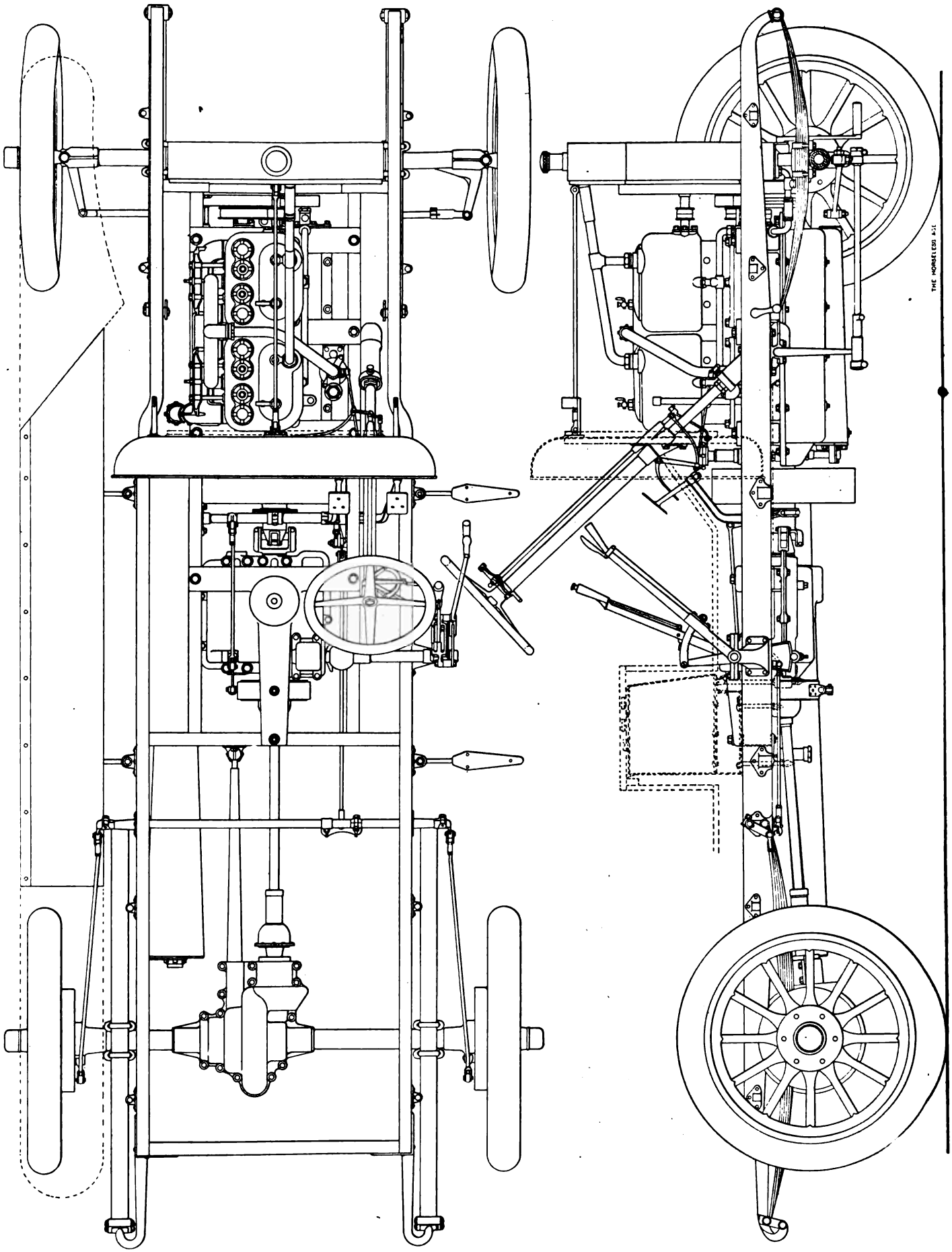
The gear case is made in two halves and provided with an inspection cover with quick acting lock. The gear box is supported on the frame on the three point suspension principle, the upper half of the case being cast with three supporting arms, two of which, at the forward end, rest on the sub-frame, and the third, at the rear end, rests on a cross member of the main frame.

The power is transmitted to the rear axle by a shaft with a (Spicer) universal joint at both ends. The rear universal slides on a square portion of the driving shaft. The driving bevel pinion is formed integral with its shaft, which is mounted on Timken adjustable roller bearings on both sides of the pinion. The same type of bearings is used in the rear axle. The differential is of the spur gear type, and its case is formed with an external flange, to which the driven bevel gear is secured by bolts. The driving gear case is divided horizontally, and between the two halves is clamped the rear end of the torsion brace rod, which is of tubular construction and has its forward end hung from a cross member of the frame. The rear axle shafts are encased in seamless steel tubes, which are secured at their inner ends in two substantially ribbed hubs formed integral with the lower half of the driving gear case, and have secured to them at their outer ends the hub brake carriers. The ends of the driving axle shafts are square, and fitted into square openings in the hubs of the driving wheels, the hubs being held in place by nuts and pins, which are covered by the usual hub caps.

The car is fitted with two independent brakes, one acting on the transmission shaft directly back of the gear box, and the other on drums bolted to the rear wheel hubs. The transmission brake, which is operated by foot pedal, is of the band type, consisting of a steel band lined with camel's hair, which can be contracted upon a pressed steel drum bolted to the universal joint by means of a bell crank and link mechanism. The brake band is supported on top by being hung from the rear supporting arm of the gear box, and is held off the drum when not applied by a coiled spring surrounding



BEVEL DRIVING GEAR.



PLAN AND ELEVATION OF OLDSMOBILE CHASSIS.



FRAYER-MILLER FOUR CYLINDER CAR.

41x2 inches, with six leaves; the rear springs are also semi-elliptic, 50x2 inches, with seven leaves. The frame is built up of channel section pressed steel members, the individual pieces being riveted together by means of gusset plates, which are pressed integral with the side members. There are five cross members in all, the front cross member being curved down to clear the front end of the motor. The car is fitted with internal and external rear hub brakes, the drums being 11½ inches in diameter by 2 inches face. The contracting brake is the service brake, being operated by a pedal, while the expanding brake serves as emergency brake, and is operated by a side lever. The latter brake is interconnected with the clutch. Both the internal and external brakes are faced with mineral leather, which is not affected by oil. The car is steered by means of a hand wheel through an irreversible mechanism. It is fitted with a five passenger side entrance tonneau body, and equipped with mud guards and continuous running boards. Extensions are provided from the front mud guards to the body, in order to prevent annoyance of the front seat occupants by splashing mud.

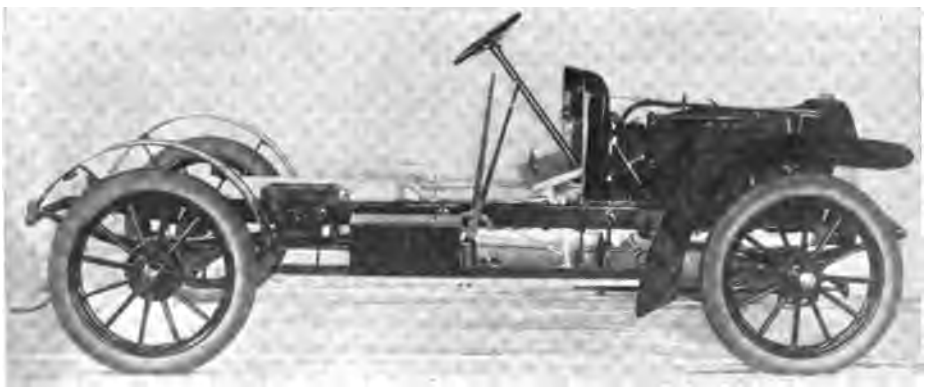
New Jackson Models.

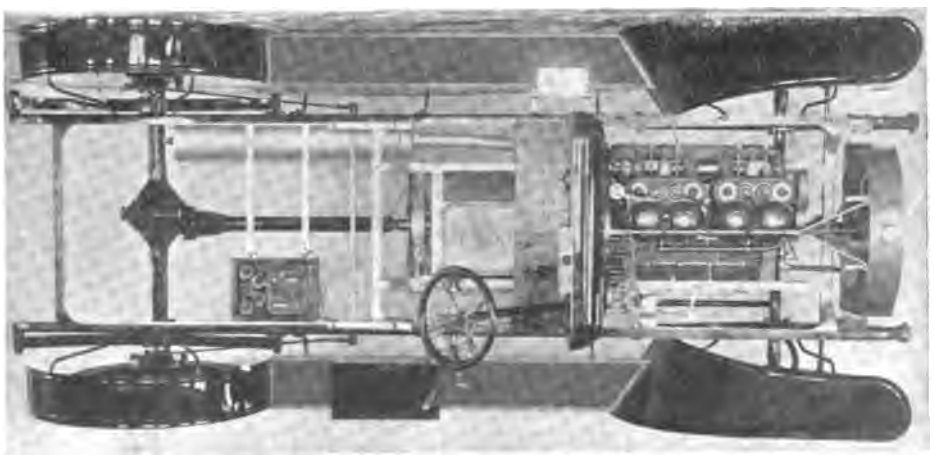
The Jackson Automobile Company, of Jackson, Mich., have entered the four cylinder field with a touring car (Model G) of interesting design, which will be exhibited at the New York and Chicago shows. The model has only recently been completed, and we are not yet able to show photographs of the car complete, but two views of the chassis are shown herewith. The body will be of the King of the Belgians style, with double side door entrance, and will be made of wood. A hollow steel dash will be fitted, faced with mahogany, to which the coil and lubricator will be attached. The normal seating capacity of the car is five.

The motor is of the vertical twin cylinder type and arranged in front under the hood. The cylinders are of 5 inches bore and 5 inches stroke, and the engine is rated at 40-45 horse power. The power is transmitted through a multiple disc clutch to the sliding pinion change speed gear, which affords three forward speeds and one reverse. From the gear box the power is transmitted to the rear axle by a shaft and bevel gears. The driving shaft is encased in a tube acting as a torsion brace, and is provided with only one universal joint, at the forward end.

The engine is lubricated by means of a Hill precision oiler secured to the dash and driven from the rear end of the cam shaft. The ignition is by jump spark, with current supplied by a storage battery under normal conditions and a dry battery in case of emergency. Both batteries are carried in a box on the frame. A quadruple spark coil is secured to the dashboard, and the ignition timer is carried at the top of a vertical shaft driven by bevel gears from the rear end of a cam shaft. The time of the spark is controlled by a lever on the steering wheel. The engine is water cooled, the cooling system comprising a radiator in front of the bonnet space, with a fan behind it, and a rotary pump. A supply of 18 gallons of gasoline can be carried.

The car is fitted with two independent brakes, a band brake on the transmission shaft directly back of the gear box and a double internal expanding brake acting on drums secured to the rear hubs. The latter brake is the emergency brake and is operated by a side lever, while the transmission brake is operated by a pedal. Steering is by hand wheel and a worm and sector back lock mechanism. The frame is of pressed steel construction throughout, with straight channel section side members car-





ELEVATION AND PLAN OF FOUR CYLINDER JACKSON CHASSIS.

ried on semi-elliptic springs at both ends, the rear springs being swung out from the frame. The engine and change gear box are carried upon a sub-frame. A sheet metal pan is secured to the under side of the sub-frame, to protect the engine, gear box and transmission brake against road mud and dust. The wheels of this car are 34 inches in diameter, of the artillery type, and fitted with 4 inch Diamond clincher tires. The car has a wheel base of 108 inches and a tread of 56 inches. Its weight complete is 2,400 pounds. Additional features of construction of this car may be seen from the photographs. The equipment includes two gas lamps, two side oil lamps, one tail light, tools, tire repair outfit, etc.

In addition to the above described four cylinder car the Jackson Automobile Company will manufacture a two cylinder touring car, known as Model D. This car will be fitted with a King of the Belgians detachable tonneau body with double side doors. The engine is of the opposed horizontal type with cylinders of 5¼ inches bore by 5 inches stroke, and is arranged crosswise on the car in front. The horse power rating is 20-24. This car is provided with a two speed forward and reverse planetary change speed gear with a multiple disc clutch for the high speed, and the drive to the rear axle is by shaft and bevel gears. Lubrication is by a Hill precision oiler with sight feed attachment placed on the dash. The jump spark system of ignition is used and the cooling system is the same as that on the four cylinder car. The gasoline capacity of this car is 18 gallons. The frame is of pressed steel construction. The car is equipped with a foot brake on the driving shaft and with emergency brakes on the rear wheel hubs. The wheel base is 100 inches; the tread standard, and the weight of the car complete is 1900 pounds. The car is fitted with 32 inch wheels, on which are 3½ inch Diamond clincher tires.

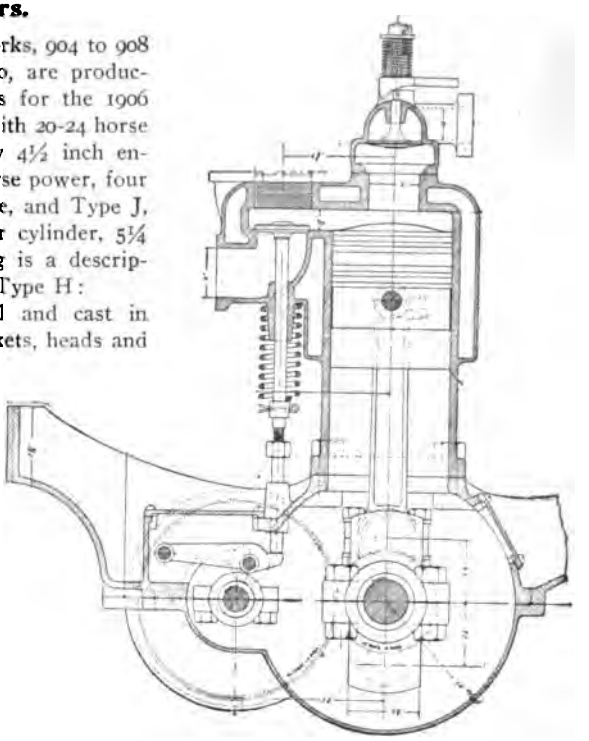
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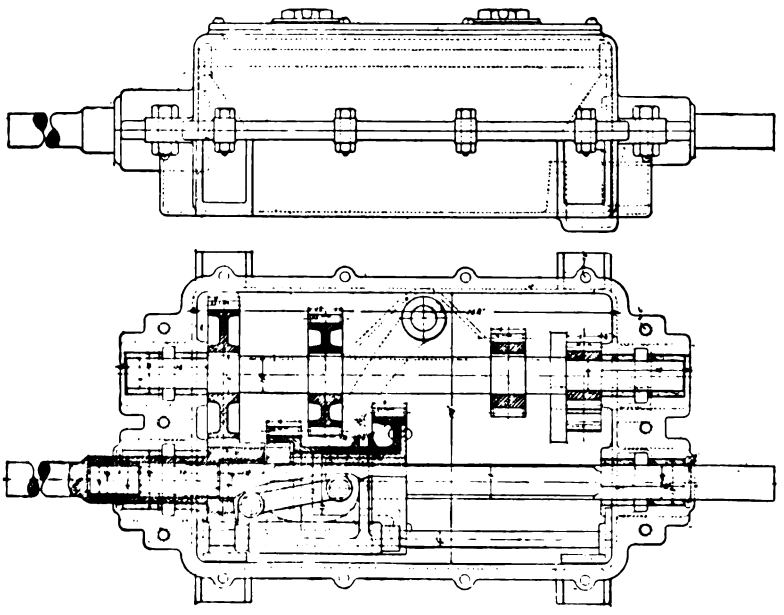
The cylinders are vertical and cast in pairs with integral water jackets, heads and exhaust valve chambers. All the wearing surfaces, such as the cylinder bore, the piston surface, piston rings, etc., are ground to insure a perfect fit and to prevent loss of compression. The pistons are ground by an improved method invented by Mr. Gaeth, on which a patent has been applied for. It consists in grinding the piston with the rings in place and held exactly in the position which they assume after being placed in the cylinders. This renders it unnecessary to spread the rings to slip them into place over the piston after grinding, whereby they are often sprung out of shape. Each piston is fitted with four rings, and has an oil groove cut into its surface.



End View of Engine.

The crank shaft is cut from a hand forged solid billet of high carbon steel, and has large wrist pins and very long main bearings. The cams and cam shaft gearing are enclosed within the crank case. The inlet valves are located in housings affixed centrally to the heads of the cylinders; they are of the automatic type, and the lift is controlled in conjunction with the throttle of the carburetor. The method of varying the lift of the valves is claimed to obviate all noise and to prevent undue wear on the valves. It is clearly illustrated in the sectional elevation of the engine herewith.

The connecting rods are manganese bronze castings of I section, with a special babbitt bearing at the crank pin end and clamped to the wrist pin at the opposite end. The wrist pin is a hollow steel pin and has bronze bushed bearings in the piston bosses. This arrangement affords considerable bearing surface for the pin and permits of more effective oiling, as oil from the cylinder walls finds its way into the hollow pin and to the bearings. Another advantage claimed for this method of construction resides in the



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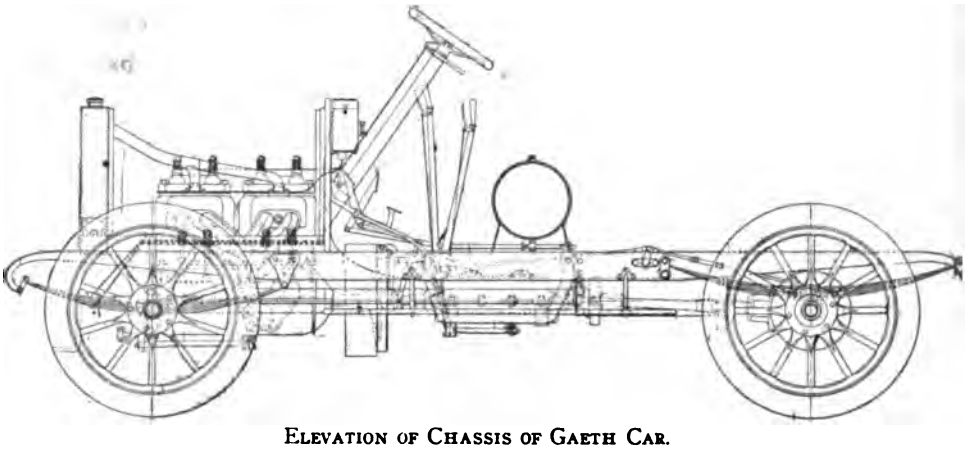
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The clutch is of the leather faced contracting band type, acting on a flange cast integral with the flywheel and slightly smaller in diameter than the latter. The band is hung from an arm keyed to the transmission shaft, and the clutch is engaged and disengaged by a sliding cone on this same shaft. The control of the clutch differs somewhat from usual practice, as no spring is used to hold the clutch in engagement. It is operated by means of a pedal which is constructed with two pads, on one of which rests the ball of the foot and on the other the heel. To engage the clutch the upper pad is pressed forward with the foot, and to release the clutch the lower pad is pressed downward with the heel. The clutch and brake are not interconnected, and the clutch is not necessarily released when the brakes are applied, which arrangement admits of the use of the motor for braking purposes, in addition to the regular brakes.

The change speed gear is of the sliding pinion type, and affords three forward speeds and a reverse, with direct drive on the high gear. All gears are made from high carbon steel blanks, are of wide face, and cut with six pitch teeth. The shafts are mounted in babbitt lined bearings supported by the aluminum case. The gear is operated by a hand lever at the right of the driver's seat, and an interlocking mechanism is provided to render it impossible to change the gear while the clutch is in engagement.

Ignition is by jump spark, a six volt storage battery being provided as the regular source of current and a dry battery as a reserve. Both are carried in a box on the running board. The spark is timed by means of a Herz commutator with hardened steel contacts, and a special sleeve fitting the cam shaft. The commutator is located beneath the radiator in a convenient and well protected position. A quadruple vibrator coil is carried on the dashboard, and the time of the spark is controlled by a lever on the steering column, underneath the wheel, by which same lever also the motor can easily be started on the spark, without cranking.

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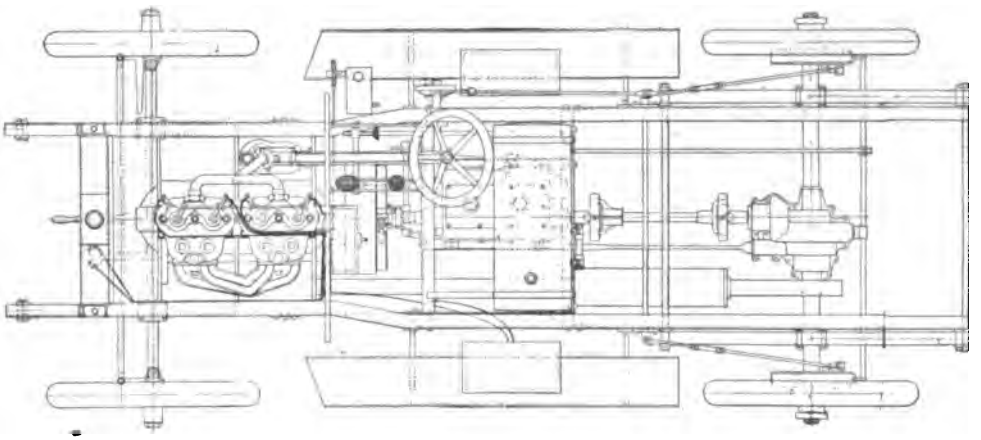
ELEVATION OF CHASSIS OF GAETH CAR.

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The cooling system is based on the thermo-siphon principle. A Kells radiator with an auxiliary water tank on top is placed at the front of the engine space, and a strong blast of air is drawn through this radiator by a belt driven fan directly behind it, and by the fan shaped spokes of the flywheel. The connections of the cooling system consist of aluminum pipes with flanged couplings. The muffler consists of a number of expansion chambers in series, and the exhaust from it is discharged through a pipe extending toward the rear of the car.

The frame of the car is constructed of angle section pressed steel, the side members tapering toward both ends and having spring horns fitted to it at the front and rear. The frame is narrowed in front and the offset in the side members is reinforced by a steel plate, extending from the extreme front end of the frame to the cross member at the middle of the length of the frame. The rear axle is of the clutch driven type and fitted with a spur differential gear. The weight of the car is carried on the axle tubes, which are fitted with adjustable bearings; the driving gears are cut from drop forged blanks. A torsion rod extends from the driving gear housing forward to a cross member of the frame, to which it is hung by a hanger with a ball and socket joint. The driving shaft comprises two universal joints, which are completely encased and packed with grease to act as lubricant. One of the universal joints has a sliding fit over a squared portion of the shaft, to allow for variations in the distance between the gear box and the rear axle, due to the play of the springs. The front axle consists of a seamless steel tube, 2 inches in outside diameter and with 5-16 inch wall, which is curved downward in the centre and is provided with forged steering heads and knuckles. The wheels are of the artillery type, 34 inches in diameter and fitted with 4 inch pneumatic tires and adjustable roller bearings. Each wheel has twelve spokes. The frame is supported upon the axles by semi-elliptic springs 2 inches wide, the front ones being 42 inches and the rear ones 48 inches in length. The car has a wheel base of 104 inches and the standard tread.

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ried on semi-elliptic springs at both ends, the rear springs being swung out from the frame. The engine and change gear box are carried upon a sub-frame. A sheet metal pan is secured to the under side of the sub-frame, to protect the engine, gear box and transmission brake against road mud and dust. The wheels of this car are 34 inches in diameter, of the artillery type, and fitted with 4 inch Diamond clincher tires. The car has a wheel base of 108 inches and a tread of 56 inches. Its weight complete is 2,400 pounds. Additional features of construction of this car may be seen from the photographs. The equipment includes two gas lamps, two side oil lamps, one tail light, tools, tire repair outfit, etc.

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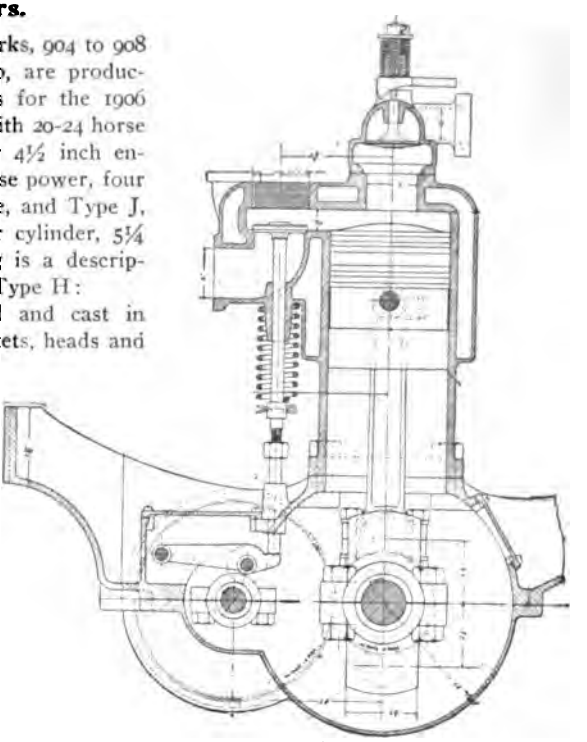
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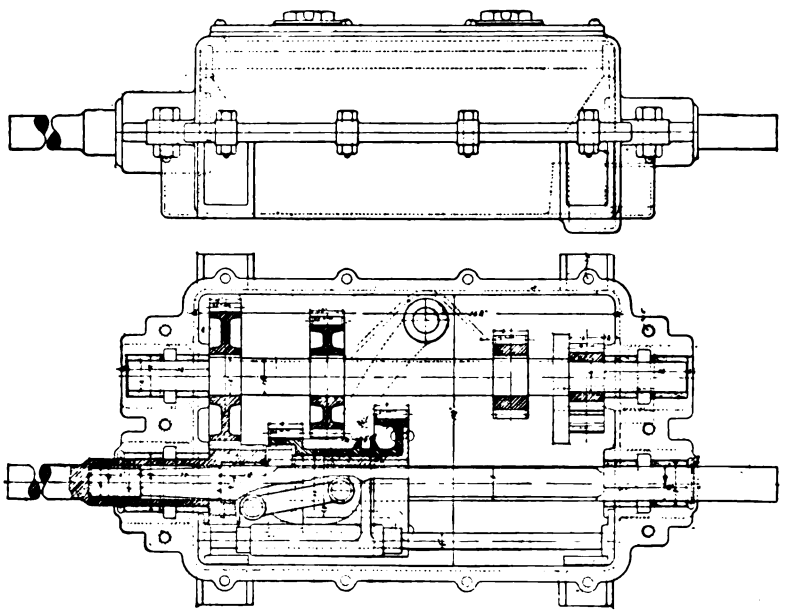
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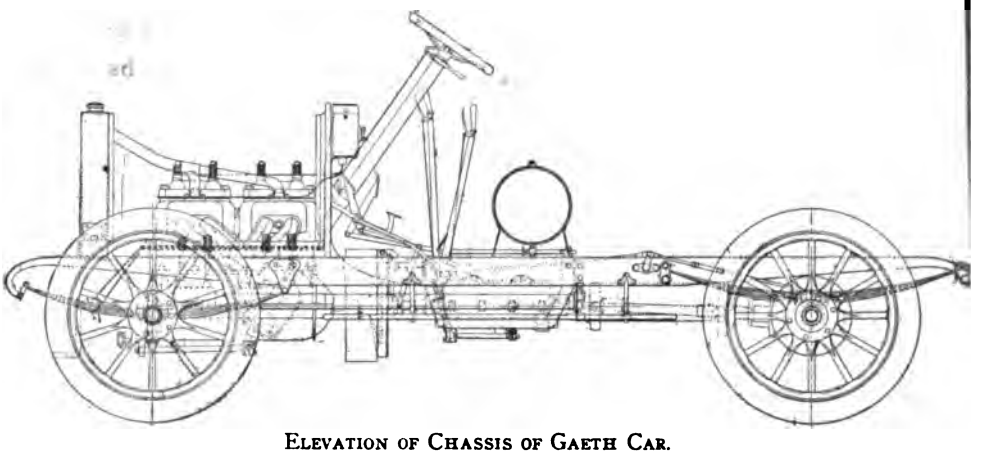
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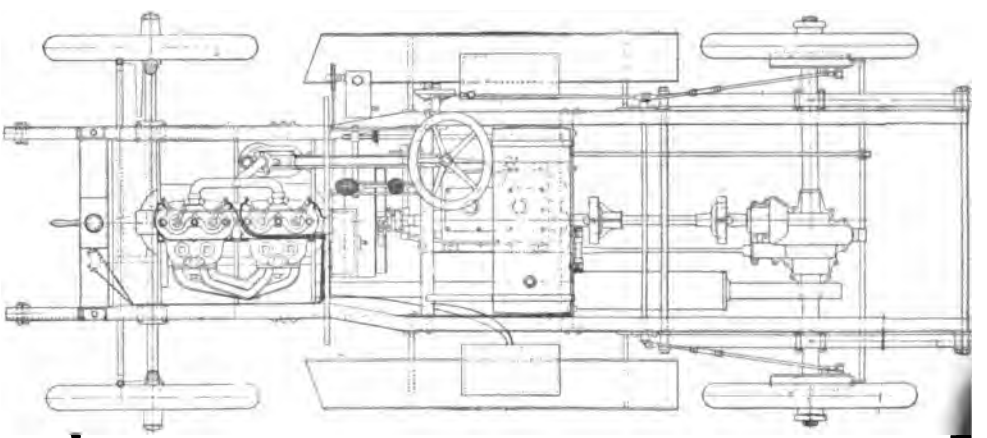
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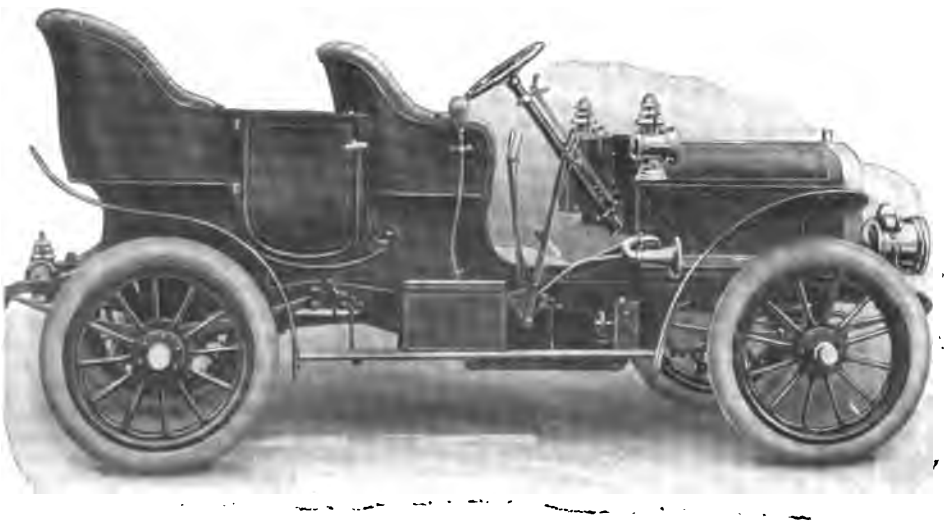


PLAN OF CHASSIS OF GAETH CAR.

enclosed in a case which is held in a pocket cast in the engine case. The connecting rod to the steering knuckle is provided with ball and socket joints. A stationary tube is pressed into the case of the gear and acts as a casing over the steering post and as a bearing for the aluminum spider of the steering wheel. The spark and throttle levers are mounted on this stationary tube underneath the wheel. In addition to the throttle lever a throttle pedal is provided, located on the footboard.

The car is fitted with two pair of rear hub brakes; one pair, consisting of steel bands lined with leather, act on the outside of the brake drums and are operated by a pedal; the other pair consists of bronze sectors within the drums, which can be expanded against the inner surface of the steel drums by means of a hand lever at the right side of the driver's seat. A sheet metal dust pan is secured to the rear end of the crank case and passes underneath the flywheel and back to the rear of the gear box. This pan prevents dust and mud from the road from reaching the mechanism of the car, and also retains any oil that drops from the bearings.

Purchasers are offered an option of two types of bodies—one a side entrance King of the Belgians tonneau and the other a surrey, both having seating capacity for five persons. The seats are upholstered with springs and leather, and ample luggage room is provided under the rear seat, which is reached by means of a door at the rear of the car. Pockets are provided in the upholstering of the side doors. Battery and tool boxes are carried on the running boards. Laminated wood mud guards of ample width are provided, those of the front wheels being of the flaring type. The gasoline tank, which is secured to the frame underneath the front seat, has a capacity of 15 gallons. An auxiliary oil tank of 2 gallons capacity is also provided; it is carried under the body and connected to the oil pump by a tube. The equipment furnished with this car includes five lamps, tube with horns and a box of tools.



GAETH FOUR CYLINDER TOURING CAR.

The Twombly Kerosene Carburetor and Pneumatic Shock Absorber.

A car has recently been completed and will be exhibited at the coming Automobile Club Show in New York city by the Twombly Power Company, of this city, which embodies quite a number of novel and interesting features, chief among which are a carburetor using ordinary kerosene and a pneumatic shock absorber which is claimed to allow of the use of solid rubber tires on regular touring cars. A photo and sectional view of the carburetor are shown herewith. The device is of the regular float feed, spraying type, and as gasoline is used for starting, two float chambers A A are provided, located on opposite sides of the mixing chamber, one in front and one behind, as the device is located on the car. One of these float chambers connects with the kerosene fuel tank and the other with a small gasoline tank, gasoline being used only in starting the motor. Both of the float chambers communicate through a horizontal passage and a two-way valve B with the spray nozzle C, the valve B allowing of putting either of the float chambers in communication with the spray nozzle. The valve B is operated by means of a small lever arm, which can be plainly seen at the side of the carburetor in the photograph.

The mixing chamber of the Twombly carburetor differs from that in most gasoline carburetors in that it contains four horizontal wire gauze screens D, D, D, D, at equal distances from each other, through which the mixture of air and fuel is drawn and which assist in thoroughly breaking up the liquid fuel and vaporizing it by imparting heat to it. At the top of the mixing chamber is located a throttle valve E of the cylindrical rotary type, which can be plainly seen also in the photograph. The mixing chamber is surrounded by a double jacket, each of which jackets is contracted in area at several points along its length and divided off into compartments by gauze screens at these points, these gauze screens being the same as those in the mixing chamber. The inner jacket is used for circulating a portion of the hot exhaust gases around the mixing chamber, the gases entering and leaving the jacket as indicated by arrows in the photograph. On their way through the gases heat both the inner and outer walls of the jacket, the heat passing into the inner wall being imparted to the mixture in the spray chamber, and that passing through the outer wall being imparted to the atmospheric air, which enters this jacket at F and passes through it downwardly. From the bottom of this outer jacket the considerably heated air is drawn through the poppet valve G into the mixing chamber. The head of this valve is provided with a number of small holes;



TWOMBLY KEROSENE CARBURETOR.



TWOMBLY PNEUMATIC CUSHION.

when the throttle valve is nearly closed all the air passes through these holes, and the valve G remains seated; but when the throttle is fully opened, the valve G is opened by the increased suction, thus regulating the suction around the spray nozzle and insuring a fairly constant mixture for all positions of the throttle, in the same manner as the supplementary air valve provided in most forms of carburetors. It is stated that the jacket is so efficient that the mixture attains a temperature of 200° Fahr. before entering the cylinder, and that consequently there is no trouble from misfiring, the kerosene being thoroughly vaporized.

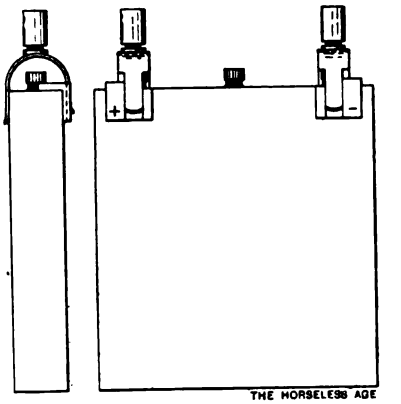
The Twombly pneumatic shock absorber consists of a circular cushion, 10 inches in diameter, which is provided with a gun metal base secured to the axle by the usual form of spring clips. Only the upper half of the cushion is flexible, this consisting of a compound fabric composed of a layer of rubber, a layer of fabric and a second layer of rubber and an outer layer of pigskin which protects the other layers. To the centre of the top half of the cushion is secured an ordinary vehicle spring, the fastening means consisting of a pair of circular bronze rings, one inside and one outside the cushion, and of four studs screwed into these rings. The cushion is inflated by means of a tire pump, being provided with an inflating tube with an ordinary tire valve, connected to the lower half of the cushion. The upper flexible section is secured to the lower section by means of a ring bolted in place. In order to prevent undue side lurching in turning corners, etc., an upwardly extending bracket is bolted securely to the lower section of the cushion, the upper end of which is joined by a link to the end of the spring horn. The car is fitted with 3½ inch solid rubber tires and is carried in semi-elliptic springs of moderate length, and it is claimed that with the shock absorbing device here described substantially the same cushioning effect is secured as with pneumatic tires.

The Bullard Wrench.

A novelty in pipe wrenches which ought to prove useful to the automobilist is marketed by the Bullard Automatic Wrench Company, of Providence, R. I. The principal advantage claimed for this wrench is that for a given turning moment applied to the handle of the wrench there is less radial pressure against the wall of the tube, so that the tendency to crush the tubes is greatly reduced, and the wrench can be used with impunity on comparatively light tubes. The wrench consists of three separate levers compounded. The whole thickness of the bearing part of the jaw is extended around the bend, and its width is increased at this point. The inner jaw is made of solid bar steel, machined to shape, and has the toothed section made of tool steel let into it. The spring is merely auxiliary, having no part in the actual operation of the wrench. It simply serves to keep the jaws together when the wrench is used with the jaw side up. Under ordinary conditions the weight of the jaws tends to keep them closed. To give the spring the desired resiliency and wear it is made extra long, extending clear through the jaw and bearing on the tooth piece. The Bullard wrench has no sliding parts, all parts being pivoted, which reduces wear and consequent lost motion. The wrench is also claimed to weigh less than other forms of wrenches of the same capacity. It is made in five sizes, the largest having a capacity up to 3 inches.



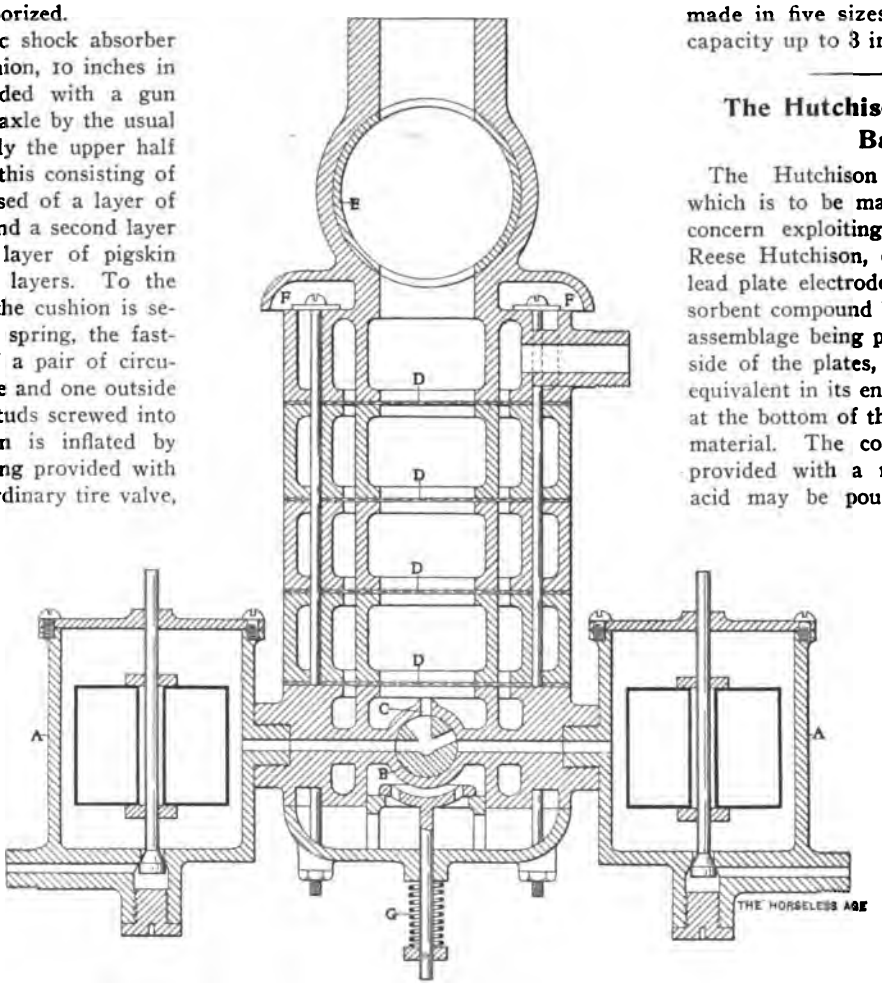
BULLARD AUTOMATIC WRENCH.



HUTCHISON STORAGE BATTERY.

The Hutchison Dry Storage Battery.

The Hutchison dry storage battery, which is to be marketed by a New York concern exploiting the patents of Miller Reese Hutchison, consists of the ordinary lead plate electrodes with sheets of an absorbent compound between them, the whole assemblage being placed in a jar. At each side of the plates, at the edges, is a space equivalent in its entirety to that usually left at the bottom of the jar to catch the active material. The cover of the reservoir is provided with a removable cork, so that acid may be poured in. The absorbent takes up as much of the acid as it will hold, thus bringing it in direct contact with the electrode and feeding it thereto by capillary action. Owing to the peculiar form of construction, grids are not depended upon to provide mechanical rigidity, and can be made light and provide a large surface for weight. The maximum ra



SECTIONAL VIEW OF TWOMBLY KEROSENE CARBURETOR.

is limited by the capillary action of the absorbent, and the limit can be varied to suit any particular work by compressing the absorbent sheets more or less in the process of manufacture. With a battery of this construction it is, of course, impossible for the plates to buckle. This battery is intended not only for ignition purposes, but also as a source of power for electric automobiles. The capacity obtainable is claimed to be as high as 1 horse power hour per 45 pounds of battery.

Manhattan Automobile School's Foot Warmer.

The Manhattan Automobile School, of 315 West Ninety-sixth street, New York city, are placing on the market a foot warmer for motor cars, which is shown in the photograph below. The device consists of a hollow aluminum casting through which the water of the cooling system circulates, pipe connections being fitted from the cylinders and to the radiator.

New Artz Folding Tonneau.

We are in receipt of particulars of the Artz folding tonneau made by the Dayton Folding Tonneau Company, of Dayton, Ohio, which has recently been improved in detail. When folded up the seat lies entirely within the curve of the back, and in order to make room for a seat of full thickness and at the same time to preserve the beauty of outline it was found necessary to make the upper half of the back a swell and the lower half of the back a dip, which proved a stumbling block at first. After two or three failures they found it was only a question of power, and they now make the backs of five layers of veneer with the grain in the alternate layer crossing, and so glued under a pressure of 162 tons that it has been found impossible to split them or to tear the layers apart.

It will be seen by the illustrations that the inner edge of the back is reinforced by



ARTZ FOLDING TONNEAU.

an ash strip three-quarters of an inch thick, 2 inches wide where the hinges are screwed to it and 1 inch wide where it forms the gimp ledge for the upholstery to be fastened to. This gimp strip, as it is called, is steamed and then bent on hot cast iron forms, rights and lefts, and as it cannot be strapped around the twist curves, is bent by means of V head clamps placed one beside the other and tightened down as the bending progresses; in fact the pressure of the clamps must do the bending, otherwise the wood would sliver off.

The sill of the back is a cast iron piece membered up outside of the back where it forms a moulding and inside of the back to the height of 1¼ inches, screws being put through this inside member into the back so that there are no screw hole plugs in the outside of the back. This makes the back when painted impervious to the weather. The locks and fittings are all hard bronze, except the hinges which are steel. All metal to wood joints are filled with white lead.

This tonneau weighs only 70 pounds, painted and upholstered, but it is claimed to be as rigid when open as a standing tonneau, and to have proven unbreakable in use. We understand that it has been used largely for Cadillac and Wayne runabouts, and that recently a well known manufacturer has made arrangements to furnish it as a regular equipment.

The "Three Minute" Tire Kit.

A set of tools for quickly removing and replacing clincher tires is manufactured by the U. S. Jack Company, 352 South Claremont avenue, Chicago, and sold under the above name. The set comprises four separate tools, one for each purpose for which a tool is needed in removing lugs and covers and in replacing them. The tools are made of forged steel, highly polished and heavily nickel plated, and are furnished in a case of heavy brown ducking of a size to go into the ordinary tool box. The cut herewith shows the separate tools.



MANHATTAN AUTOMOBILE SCHOOL'S FOOT WARMER.

The Westerfield Gasoline Motors.

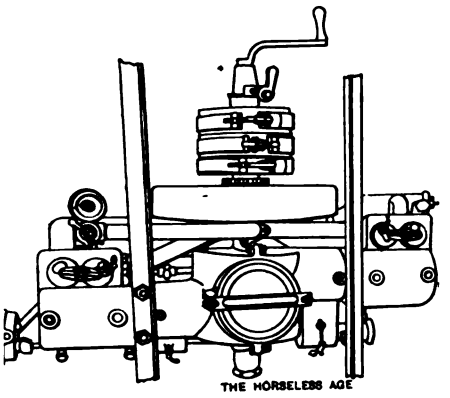
The Westerfield Motor Company, of Anderson, Ind., manufacture two sizes of double cylinder opposed horizontal gasoline motors for automobile use, one of 5 inches bore and stroke respectively, rated at 15-16 horse power, and the other of 5 inches bore and 6 inches stroke, rated at 20 horse power. The 20 horse power engine can be operated at from 200 to 750 r. p. m., the normal speed being 600 r. p. m. The cylinders are 3½ inches between centres, and are fitted with mechanically operated vertical inlet and exhaust valves. The water jackets surround both valves. The crank shaft is made from a steel forging, with pins 1⅞ inches in di-



THREE MINUTE TIRE TOOLS.

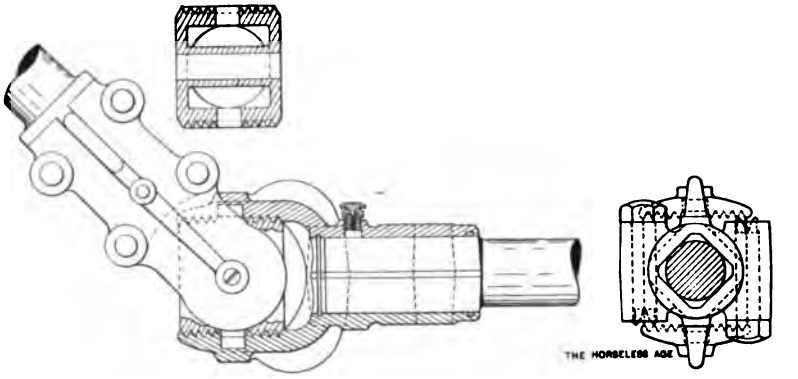
ameter by 2½ inches long, and main bearings 1⅞ inches in diameter by 4½ inches long. The flywheel fitted to this engine is of 21 inches diameter, with 3½ inches width of rim, and weighs 160 pounds. The weight of the engine complete, with flywheel, is 430 pounds. The engine is designed for jump spark ignition, a timer being carried at one end of a half time shaft and a gear pump at the other end of this same shaft. The crank shaft bearings are bushed with phosphor bronze and lined with nickel babbitt. Both of the valves can be taken out by removing one plug over each valve.

The Westerfield Motor Company also manufacture a change speed gear of the planetary type, with two forward speeds and one reverse. Only spur pinions are used in the gear, these being made of steel, with 1¼ inch face and cut with eight pitch teeth. The gear case is surrounded by three spring



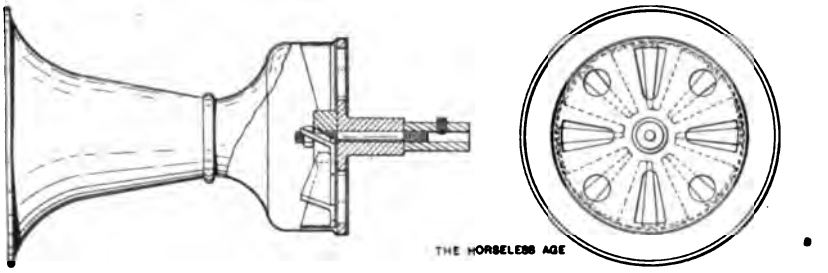
WESTERFIELD MOTOR AND TRANSMISSION.

eel brake bands, 1¾ inches wide—one for ıe low speed forward, one for the reverse nd one for stopping the car. The high peed forward is controlled by means of a iction clutch, with adjustment for wear. he gear housing is machined all over and oil tight.



ESTY UNIVERSAL JOINT.

the grooved walls thereof, which permits the grease to find its way to the bearing surfaces. The latter are very large, and with proper lubrication the joint should wear well. The joint here shown is suitable for cars up to 20 horse power. The yokes are drop forgings and the centre cube is a phosphor bronze casting. The device is to be placed upon the market by Mr. Esty soon. Mr. Esty informs us that one of these joints of a larger size has been run continually ten hours per day for nearly twelve years, or since 1894, on a large main shaft at an angle of about 10 degrees, and during all this time has not been adjusted or taken up for wear, and it is today in as good condition as it was the day it was installed. The only attention it has required has been oiling once or twice every two or three months.



LAVENE SIREN HORN.

The Lavene Siren.

In a recent issue we illustrated and described a new automobile signalling device f French origin, based on the principle of siren. Above is shown another horn of ıe same type, but of somewhat different onstruction, known as the Lavene, and andled by the Wayne Automobile Comany of New York. This device also conists of a horn proper and an aluminum fan riven from the flywheel of the engine hrough a flexible shaft, and which proıces a rapid succession of short blasts of ir through the horn, producing a continuus sound. The main difference in the deice here illustrated and the one we decribed recently is that the openings in the ousing of the fan through which the air is orced are in the end plate, and not in the ylindrical surface.

Esty Universal Joint.

A novel universal joint, the invention of Villiam Esty, of Laconia, N. H., is illusrated herewith. The centre piece consists f a hollow cubical casting four of the aces of which are cut with concentric cirular V grooves. The yokes are made in alves and clamped over the square ends of ıe shafts to be connected. Their branches re cut internally with V grooves to fit over ıe centre piece. The hollow centre piece is lled with grease and holes are drilled in

The Buckeye Dividing Automobile Top.

The Buckeye dividing automobile top, patented February 21, 1905, is the invention of William F. Kramer, a carriage and wagon manufacturer of Dayton, Ohio. The patent has recently been secured by the William F. Kramer Company, who are placing the top before the automobile trade. The invention relates to improvements in canopy tops for automobiles; and the improvements consist, first, in a front window which may be easily placed in and out of position to shield the occupants of the automobile; second, in a detachable tonneau with a separate canopy which joints the front canopy in a water tight joint, and which is used to convert the vehicle into a two seated vehicle with canopies above both seats. The objects of the invention are to provide a tonneau with a separate canopy which is a part thereof, and which is supported on said tonneau when the latter is removed from the vehicle. A further object of the invention is to provide a front window, which is of storm proof character and which prevents the entrance of rain or wind. It is claimed that owing to its lightness in construction, simplicity, general usefulness and reasonable price, this top is meeting with favor wherever it is being used. The owners of the patent are desirous of placing it with leading manufacturers upon a shop royalty basis.



BUCKEYE DIVIDING AUTO



LESSONS of THE ROAD

An Experience or Two and Some Lessons Learned.

By Dr. S. V. West.

THE EXPERIENCES.

Since I have owned a machine many varied happenings of interest have come about. I remember one afternoon just after a rain, when I was making a run in a runabout—a 9 mile trip up the river. Things were going splendidly, through water holes, across bridges and through slush, when suddenly the car stopped in the middle of a pond. I immediately cranked the engine over to see if the spark buzzed, and it did, but no puff. I tried it again with the same result. Next, I crawled over the machine, keeping my feet out of the water the while, took out the spark plugs, found them intact, turned the engine over, with a resulting healthy sound from the plugs. I knew my gasoline tank was full, and that the valves did not leak, so I turned my attention to the piece of hose that I had slipped over the air pipe entering the carburetor. That hose pipe couldn't have been plugged tighter with mud by hand. It had been put on and run out to the side of the machine especially to avoid sucking dust, water or mud into the carburetor.

Before I got back home a big rainstorm caught me, and the water that was scooped into the machine drenched my clothing. When I thought everything was going nice enough to pull me through to town, and as I was trying to get through the 6 inches of slush on a new levee, the engine stopped short again. The first thing I did, and always do, was to look at the coil. A drop of water had splashed through the hole admitting the wire cable to the coil terminal, and had struck on the vibrator, run down to the pin and short circuited the point. Blowing the water off allowed the engine to go again.

That same winter I was trying to make a quick run across the river with only the oil lamps burning. Things ran along smoothly until I came to a sharp turn, when something suddenly banged into the car with sufficient force to throw me quite out of my seat.

I hung to the tiller and kept the car on her course, slowed down and looked over the front of the car, to find only a small calf caught in the forks of the headlight bracket.

That reminds me of an incident which occurred at just about the same place last fall. A young banker driving a runabout with a folding front seat was sailing along that very road happy and contented. The front seat was let down, and holding two jolly companions. A few moments later the seats were both empty, the engine was tearing its trails out while on its side. The top of the machine was over the bushes, the seat was hanging to the car by a splinter or two, one front wheel was trailing along the road completely severed from its axle. The driver had just rolled over, and propped against a post was diligently trying to get back all the cigar stub that had been driven down his throat when his head hit the earth. His fat friend was trying to console the other friend, who had no wind available for about thirty seconds, although plenty of fresh air was streaming through his shredded apparel. Nothing in the world had caused all this commotion but a fat old gobbler, who would not forget his proud dignity to quicken his pace. The front wheel struck him, turned, and swerved the machine into a telegraph pole and turned it over. The old farmer who owned the bird stopped me on the street next day and gave me warning always to slow down when I went by his place, because he was "going to raise them birds just on purpose to destroy them devilish chuck wagons.'

THE LESSONS.

Sometimes the experience of one helps another. From mine I have gleaned the following points: If a single cylinder engine is used two or three years don't think of having the cylinder bored—go buy a new cylinder for $7 and a new piston for $25, and you have practically a new machine. One new feature of the 1905 cars is the automatic oil feeder. Put one on your old car and you gain speed, save oil and save your bearings. Always get a chain with separate links; carry extra links and you won't stop long for the want of a new chain. Never put graphite into the crank case of a single cylinder car; it fouls the spark plug for a week, although you may try to wash it out. When your high speed is slipping and your car is a bit worn you think, see if the clutch is working freely on its bearings, and not rubbing, thereby causing friction between its several parts. If your coil and the spark plugs seem all right, look at the battery connections, as, if the batteries are new, they may have worked loose. If these three things are in perfect condition you had better look to the wire cables leading from the coil and to the plugs. Oil on these cables caused trouble in the ignition circuit on my car for two weeks before I discovered it and ripped the bottom cover off the case carrying them.

When your car is losing power and the batteries and plugs are new, it may be that the valves are getting worn or that the cylinder is wearing. New rings after having the ring grooves trued up may remedy it if the latter is the cause. You cannot lengthen or shorten the valve stems easily. The remedy in this case is simply to lift out the main shaft sufficiently to clean the gears which run the cam shaft, turn the gear or cam shaft back three or four notches, causing the exhaust valve to close a little earlier and thereby preventing leakage after the explosion. This is done easily on some cars, but on others it is an awful job to take up any wear of the cams.

I am using an 8 horse power runabout. This car takes me anywhere at a speed that no car can beat on country roads It has cost me less than $50 during nearly two years for repairs and extras, because I take care of it and do all small repair jobs myself. Taking care of one's own car makes it possible to fix things on the road if necessary, thereby saving much expense for hauling back to town and hours of time waiting for assistance. Take your car to pieces and put it together while it's new and in good order, and then you know how the parts should fit.

Motors in Belgium.

Consul McNally, of Liege, furnishes a report on the value of Belgium's trade in automobiles, motor cycles and bicycles from 1901 to 1904. In 1901 the total value of these machines exported was $542,428, and in 1904 $1,316,035, an increase of nearly $800,000 in four years. The value of automobiles advanced from $192,000 to $437,000, and motor cycles from $70,465 to $660,538. It appears that the exports were twice as much as the imports. In 1901 the total value of imports was $369,000 and in 1904 $669,000. It appears from the tables furnished by the consul that in four years the exports of bicycles fell from 3,529 machines to 713, while the imports advanced from 2,967 to 5,417 in the same period. The exports of motor cycles advanced from 134 to 2,393, while the imports increased from 49 to 136. Germany is the principal competitor, as that country sends in a cheaper machine than the Belgian manufacturers produce. Of the 5,417 machines imported into Belgium in 1904, 3,784 came from Germany, which is about 70 per cent. of the total. The Belgian manufacturers complain also that the duties of the various countries are almost prohibitive, while the Belgian duty is but 12 per cent. ad valorem.

Three American manufacturers exhibited complete cars at the recent Paris Automobile Show, viz., the Olds Motor Works, the Cadillac Motor Car Company and the American Locomotive Company.

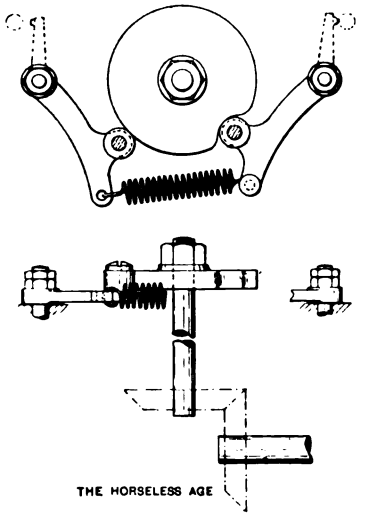
Calendar of Automobile Dates and Events.

January 13-20.—A. C. A. Show, Sixty-ninth Regiment Armory, New York.
January 13-20.—A. L. A. M., Madison Square Garden, New York.
January 22-27.—Ormond-Daytona Beach race meet.
February 3-10.—Chicago Show, Coliseum Building.
February 5-10.—Washington Automobile Show.
February 12-17.—Detroit Automobile and Sporting Goods Show.
February 17-25.—Cleveland Show.
March 3-10.—Philadelphia Show.
March 13-30.—Buffalo Show.
March 16-23.—Boston Show.

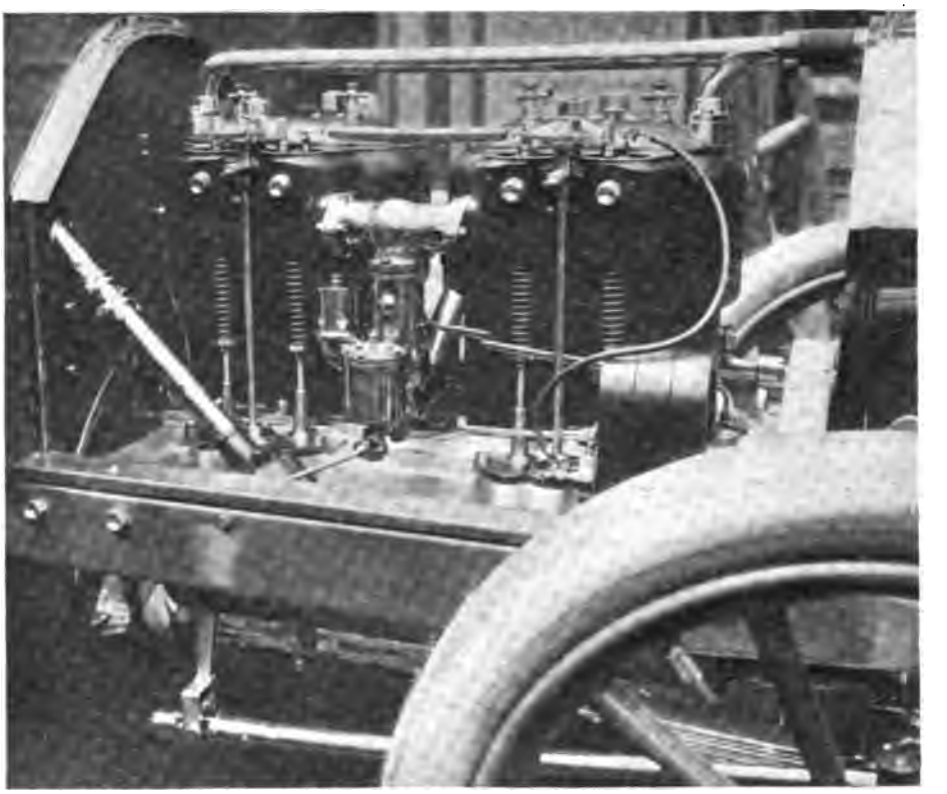
OUR FOREIGN EXCHANGES.

The Itala Car.

One of the most interesting of new cars ut out by Italian manufacturers is the tala, which is throughout of decidedly clean" design, as may be judged from the hotograph of the engine herewith, and also mbodies numerous novel features. It will e seen from the photograph that the car- uretor is connected to the inlet valve hambers of the two pairs of cylinders by a anged T fitting bolted to the inner ends of ıe two double valve boxes, whereby it is rought very close to the engine. The ig- ition is by low tension magneto, which is riven from the enclosed cam gearing at ıe front end of the engine. The make and reak mechanism is of novel and interest- ıg design. Two vertical shafts, one for ıch pair of cylinders, driven by mitre ears from the inlet cam shaft, extend up ıe side of the inlet valve boxes, and have ıeir upper ends carried in bearings secured) the wall of these boxes. As seen from ıe sketch herewith, these shafts are pro- ided at their upper ends with a cam disc aving a notch cut into its circumference. he igniter terminals are secured into the penings over the inlet valves, and the afts of the movable terminals are pro- ded with lever arms outside the valve ambers, the outer ends of which are awn against the circumference of the cam scs by a spiral spring between the ends each pair of arms. The arms are so ar- nged that their contacts with the cam disc e at an angular distance of 90 degrees ith each other, which corresponds with e time elapsing between explosions in the o adjacent cylinders. When the cam slot mes opposite the roller on one of the ms, the corresponding terminals are essed together by the coiled spring, and e current is allowed to flow, but the next stant, as the cam slot passes the roller, e circuit is broken again and a spark is produced. The entire mechanism is unusually substantial and accessible. There is only a single wire connection, viz., from the insulated magneto terminal to one of the insulated spark terminals, which latter is connected to the other insulated spark terminals by a coiled spring, thus avoiding screw connections and making the removal and replacement of the connection a very easy matter. Another point of interesting novelty in the car is the joint of the steering connecting rod, which is clearly seen in the photograph.



ITALA SPARK MECHANISM.



ENGINE OF ITALA CAR.

The Potting Prizes.

The Austrian Automobile Club announces a double prize competition for "the Pötting prize of 1905." Two cash prizes of 1,000 crowns each are to be competed for. The first prize will be awarded for inventions and improvements in the construction of automobiles and parts, as well as inventions and improvements relating to the use of automobiles, in so far as these inventions and improvements represent a notable advance in comparison with other arrangements serving the same purpose. The second prize will be awarded for the best scientific work calculated to promote the development of automobile construction or journalistic work on automobile matters in general. Contributions for the latter prize should be sent, enclosed in a double envelope, to the General Secretary of the Austrian Automobile Club, Vienna I, Kärntnerring. Entries for the competitions for the first prize close on May 5, 1906, and those for the competition for the second prize on May 1, 1906. The "ventions and improvements" competing must be on exhibition at the Sixth International Automobile Exhibition, Vienna, March 15-28. The inner one of the two envelopes referred to above must be marked "Bewerbung um den Pötting Preis aus dem Jahre 1905." Discussions on tests of automobiles will be given special attention, but there is no limitation as to the subjects that may be treated. All communications with respect to these two competitions should be addressed to the General Secretary, address as above.

British Automobile Volunteer Corps.

October 31 brought to a close the third volunteer year since the formation of the Motor Volunteer Corps, and it has, on the whole, been most successful. The whole of the staff tours carried out by the regular forces have been performed by the aid of the Motor Volunteer Corps, and the generals commanding in chief have testified in every way to the high state of efficiency and utility [illegible] opinion has been confirm[illegible]hness the Duke of Co[illegible]eneral of the Forces [illegible] the General Staff [illegible]g a strong [illegible]l review [illegible] of the Scottish [illegible] recent [illegible]nteers. [illegible]rmed, [illegible] days. [illegible] cars [illegible] Ex- [illegible] to the

public for the use of the motors has been approximately 10 cents per mile for cars and 3 cents per mile for cycles.

Efficiency of Worm Gearing.

Some experiments on the efficiency of worm gearing in connection with traction motors have been made by the Maschinen Fabrik Oerlikon, Switzerland, and the results are undoubtedly of some interest to automobile engineers, as it is not unlikely that the worm gearing will be used on heavy motor trucks and similar vehicles. Earlier experiments in this direction had proved unsatisfactory, principally because the worm gearing available at that time was not sufficiently well made to give a high efficiency, and also because, with the rigid connection between motor and gear which was employed, the shocks and consequent wear proved excessive. These difficulties have been largely overcome in the recent construction, and an experimental car containing two 20 horse power, 1,200 revolution, worm geared motors has given very satisfactory results.

The motors weighed only 675 pounds, in place of 1,460 pounds, each, which would have been the case if ordinary single reduction spur gear and 500 revolution motors had been used. The gear ratio was 12 : 1, the worm being of hard steel, with a triple thread, having a pitch diameter of 3 inches and a pitch of 45 inches, while the worm wheel had a cast iron hub with phosphor bronze toothed rim attached, a pitch diameter of 18.3 inches and thirty-six teeth. The motors were rigidly fixed to the car frame in accessible positions, and were connected to the worms through double flexible couplings, which allowed the necessary freedom of motion for the car springs. The worms and worm wheels were arranged on the outside of the car wheels, and run completely enclosed in oil baths. The end thrust was taken up on ball bearings. The gear was found to have an efficiency exceeding 90 per cent. for all loads between one-fifth load and full load. The wear and the cost of upkeep proved to be less than with the ordinary spur gear, and the running was practically noiseless and free from shocks.

Motorists May Shoot Dogs in France.

A curious automobile case was decided recently in France. Near the little town of Joigny, the precipitous streets of which are skirted by motorists who go down by car to the Riviera, lives a parish priest who is an enthusiastic motorist. The reverend gentleman rides an old fashioned motor tricycle, whereon he is peculiarly susceptible to canine attack. Not long ago, when passing through a village in the neighborhood of his home, a vicious looking cur rushed out, and prepared to do battle, whereupon the priest pulled out a revolver and fired. His reverence's aim was good. The bullet lodged in the body of the "friend of man," and the animal expired with a howl of anguish, which brought the irate owner on the scene. High words passed, and the reverend gentleman was mulcted in the sum of 75 francs in the civil court of Joigny. On appeal, however, the judgment was reversed, merely on the ground that "one may kill an animal when it threatens the life of a person or appears likely to subject him to wounds, even though they be slight ones."

The Renault Brothers firm is making attempts to collect royalties on the direct drive gear in combination with shaft drive, which was patented to them in France on February 9, 1899. The royalties demanded are 1, 2, 3 or 4 per cent. of the catalogue chassis price, depending upon the number of vehicles built annually, and it is stated that Darracq and Clement have agreed to the demands of the Renault firm.

The De Dietrich firm exhibited at the recent Paris Show a commercial motor vehicle carrying twelve people, which was fitted with six wheels—the middle set for driving and the end sets for steering. The car will turn round in nearly it own length, and can be manipulated in traffic as easily as a 6 horse power. The springs have been so devised as to allow the machine to pass over a large obstacle without the shock being felt by the passengers. The type will be employed in omnibus construction.

The international conference of motor cycle clubs was held in Paris on December 11. Owing to a misunderstanding between the president and secretary of the French club, France was only represented unofficially. England was represented by Mervyn O'Gorman and G. F. Sharp, Austria by MM. Lierche and Eustachio, and Germany by Herr Hein and Dr. Bruckmayer. The international cup race, which will take place in Austria, was fixed for June 29. No material changes were made in the conditions of the contest.

Basic Two Cycle Patent Claimed.

The Elmore Manufacturing Company, of Clyde, Ohio, have acquired from Joseph Day, of Rumford, England, United States patent No. 544,210, entitled "Gas Engine," and granted to Frederic William Caswell Cock, of Erith, England, on August 6, 1895. Cock assigned the patent to Day.

The two stroke cycle is generally regarded as the invention of Dugald Clerk, its invention dating back to 1880, and the two cycle engine is not completely covered by the Cock patent acquired by the Elmore Company. But the ordinary two cycle engine is a very slow speed engine, heavy and cumbersome, and absolutely unsuited to automobile work and in order to render the two cycle engine capable of high rotative speed and adapt it for automobile purposes, it is claimed to be necessary to have a piston-controlled inlet port to the base chamber. This feature is embodied in the Elmore and all other two cycle automobile motors now manufactured, and is covered by the Cock patent.

We learn that Mr. Day, the owner of the patent referred to, called on the Becker brothers, who are in control of the Elmore Company, about a month ago and informed them that he had a broad United States patent on two cycle motors. At first incredulous, Messrs. Becker soon convinced themselves that the claims were well founded, and that this engine developed by engineers employed by them and by themselves step by step had been protected by another inventor some ten years ago. They have once secured the rights to the invention and are willing, we understand, to grant licenses under it.

The Cock patent comprises two claims which are as follows:

"1. In a gas engine, the combination with a cylinder and a piston therein, the cylinder being divided by the piston into a combustion chamber and a compression chamber, and a passage connecting the two chambers, the said passage being opened and closed by the piston, with exhaust and gas inlet ports opening into the compression chamber, the said ports being covered and uncovered by the piston substantially as set forth.

"2. In a gas engine, the combination of a cylinder, a compression chamber at one end thereof, a piston adapted to reciprocate within the cylinder and to compress the explosive mixture in the compression chamber during its downward or outward stroke, a port or passage leading from the compression chamber into the cylinder, its lower end being adapted to remain constantly open and its opposite end adapted to be closed by the piston from near the beginning of the inward stroke until said piston has nearly reached the limit of its outward stroke and to be opened when the piston is completing its outward stroke, air and gas inlet ports leading into the cylinder and adapted to be closed by the piston from near the beginning of its inward stroke until near the completion of its return or outward stroke, and an exhaust port communicating with the cylinder and adapted to be closed by the piston from near the beginning of its inward stroke until near the end of its return or outward stroke, and to be opened while the piston is terminating its outward stroke and during a portion of its inward stroke all substantially as described, for the purpose specified."

COMMUNICATIONS

Stiff Clutches and a Word About Live Rear Axles.

Editor HORSELESS AGE:

I note in issue of December 27 an inquiry regarding disc clutches, and how to overcome their serious difficulty of dragging. Your answer suggesting reduction of friction surface and increase of spring pressure seems to have been anticipated by certain builders, at least in respect to strength of springs, for in the only two cars of 1906 model I have had a chance to examine the springs were so stiff and the pedal leverage so inadequate that the driving of either car would be an impossibility to anyone not possessing more physical strength than I have. Perhaps I might be able to run these cars on a long trip, where the high gear could be in constant use, without need to release clutch; but in city traffic, or hilly country, where gear changes are frequent, I should be utterly exhausted in an hour's run.

It seems to me strange that designers do not pay more attention to such matters as this, for it is not merely a question of comfort; such laborious leg work is absolutely prohibitive to such a purchaser as myself. A system of compound levers, such as illustrated in a recent issue of THE HORSELESS AGE in describing models of the Columbia cars, ought to make an easy pedal, and entirely overcome my objection, and it seems that builders ought to be sufficiently alive to their own interests to see this without being told it by an outsider. It is a fact that I am buying for next season's use a car much larger than I should prefer to use, simply because I can find no smaller one which satisfies me as to design and construction. The two disc clutch cars above referred to are each of a size I prefer, being medium weight and sufficiently high power to have excellent "life" and ability in hilly country; have comfortable, easy riding springs, and while lacking some refinements of the big cars, I consider these well compensated by light weight, and consequent saving on tires and brakes; but those pedals I simply could not push out. I should be invalided in a half day's run. Furthermore, in the car of these two I should otherwise prefer they have not gotten rid of the drag, and the discs, which run in oil, keep the clutch shaft spinning so that there is a horrible clash at each shift of gears.

While I am giving designers the benefit of a layman's wisdom I should like to call their attention to another point. Personally I do not like a chain drive, and should not willingly purchase a car so fitted. There are well designed "propeller shaft" drives on the American market which by personal use I know to be reliable and altogether satisfactory; but the majority to my notion are not so, for the reason that there is too great an angle at the forward universal joint. This makes constant friction, wear and loss of power at that point, and in many instances leads to serious trouble sooner or later. I have in my possession at this time a car weighing 2,500 pounds without passengers, which has run over 9,900 miles in a section of constant hills and poor roads, and the propeller shaft has not needed one moment's attention further than to pack the joints with grease each 800 to 1,000 miles. Anyone should get equal results by the use of good engineering and proper materials, if he will only see that his motor crank shaft, transmission gear and propeller shaft all stand in one straight line, when springs are loaded. Instead of that many place motor and gear in a horizontal line, which if produced to the rear would about cut the top of the differential casing, while the propeller shaft stands at a sharp angle from horizontal. What can they expect from a universal joint so placed except trouble?

B.

Queries.

Editor HORSELESS AGE:

I have a two cylinder car, vertical engine, which has done good service for three seasons. I would like to have this car put in good order; that is, make it as noiseless as possible as far as concerns the engine. The muffler is all right. What change has been made in engines which makes even a one cylinder car so free from engine noise? Should a vertical two cylinder engine run with practically no noise, exclusive of exhaust noise, if all the bearings are tight and the gears fit properly?

If a shaft runs somewhat loose in a brass bearing, how can you make it tight without putting in new brasses?

A few hints on fixing up old cars would be appreciated by men who cannot afford to buy a new car every year. It is the man who does his own repairs who reads a paper such as you publish; he wants to get information on repairs, replacements and improvements—not merely fixing wires or adjusting carburetors, but ideas on how to bring his car up to date—if such a thing can be accomplished. E. S. K.

[The subject of your inquiry is so broad that we could not well dispose of it in an answer to a communication. We can say, however, that in order that the engine may run noiselessly it is essential that all bearings be well adjusted. The most prolific source of noise is generally the valve mechanism. This cause of noise can be reduced by giving the cams such an outline that they lift and seat the valves very gradually. The tappet rods must be so adjusted that they have only just so much play as is necessary and it is advisable to provide them with strong springs, keeping them always up against the valve stems, so that the hammering at their lower end, within the crank chamber, where it is muffled. If all the bearings are tight, the flywheel is absolutely tight, the cams are properly shaped, the valve mechanism is properly adjusted and the peripheral speed of the gears is not too high, a two cylinder engine should be practically noiseless. Unless a brass bushing is in halves and means are provided for adjusting the bearings, it is impossible to make such adjustment, and a worn bushing must be renewed.—ED.]

Rotation of Explosions in Three Cylinder Motors—Ball Versus Roller Bearings.

Editor HORSELESS AGE:

Are you sure that the rotation of explosions in a three cylinder engine is as stated? Why not first in centre cylinder, then one end and then the other end, or, first one end, then the other end, and then in the centre cylinder? Joking aside, your explanation is rather misleading. If strictly followed out you would have three explosions in one revolution and none the next, while the proper method is to have the explosions follow each other 240 degrees apart.

I think if H. H. will look into the matter he will find that practically perfect roller bearings have been a commercial possibility for some time. Ball bearings certainly do not appeal to one as able to stand the strain of use on an automobile, and I have not seen a bearing yet that has not been scored, while the balls are liable to break under the strain any time. On the other hand, I have used roller bearings for over four years in the transmission without signs of any wear. Also during the same time conical bearings on the wheels, solid tires at that, without the slightest trouble. I do not see how the rollers in a correctly made bearing can possibly slew around or be in anything but correct two line contact. How some writers will, in an argument, suggest the absurd to prove their contentions! H. W. S.

Care of Storage Battery Not in Use.

Editor HORSELESS AGE:

Will you kindly advise me through the columns of your paper if a storage battery requires any special attention during the winter months while the car is in storage?

H. E. R.

[When storage batteries are not used for a long period it is advisable to fully charge them, then remove the plates from the cells, [illegible] and store them away in a dry

who was taking a cartload of ss to some works at Wolver- ntrived, by judicious manage- ve a trial of puncture pro- y half a mile long" in the le also [illegible] a sum of 15 he local [illegible] court.—*The*

LEGISLATIVE AND LEGAL.

The Legislative Situation in New York.

W. W. Niles, attorney for the Automobile Club of America, in an interview granted to a representative of THE HORSELESS AGE in reference to his views on the present city automobile ordinance and possible State legislation, said: "The automobile situation is a rather mixed one, owing to the fact that a great many automobilists feel that we ought to have a new law, the present one not being satisfactory to them, while others think that the ordinance now in force is satisfactory and that it is much more expedient to let it stand than to tinker with it, as this probably would bring the matter to the point where one would be compelled to have a license in order to run a car.

"My own impression is that as the use of automobiles increases there will come stronger demand each year for a more satisfactory law, especially on the part of non-users of automobiles, and that there will be a very strong demand for strict enforcement. Also for the infliction of penalties which would result in a great many automobilists being imprisoned, as the present law is a very arbitrary one. It establishes an arbitrary speed limit which makes the man a criminal who exceeds it in the slightest degree. The result will be that the users of automobiles will press for a more stringent enforcement of the law, while a great many more automobilists will be arrested than in the past. I feel that a new law should be adopted which would increase the speed limit or abolish it altogether. Penalties should be inflicted for the running of a machine at a speed unsafe to the life or property of users of the highways, and the law should provide that only the willful violators should be punished, as those who intimidate people by running at a reckless rate of speed or do some injury. I also feel that professional chauffeurs should be examined as to their qualifications, and they should have a license, to be received only when they showed that they were qualified to run a car. Other things to be looked after and effected are the use of the muffler, the tooting of horns, and dripping of oils in the streets.

"The revoking of certificates or licenses of owners or chauffeurs is another question which should be considered, and in my opinion the wisest way in which these matters could be handled would be by the appointment of a State mission to have entire charge. Such mission should be composed of high-class automobilists, who have the best interests of the sport and industry at heart. This would result in as nearly perfect regulation and control of the situation as possible. Further, amendments to the law will be suggested by the commission to the Legislature, which would be guided almost altogether by them, so that in the future we would be exempt from haphazard legislation inspired by cranks. Such a commission will hear complaints of the general public and have power to revoke or suspend licenses. The fact that their attention would be devoted exclusively to the regulation and use of automobiles, and that they would have the benefit of many valuable suggestions, is enough to assure me that such a body would not only be beneficial but is positively necessary."

CLEVELAND, Ohio.—The Prudential Trust Company filed its final report in the Court of Common Pleas on December 27 as receiver of the American Motor Carriage Company in closing up the affairs of that concern.

ALBANY, N. Y.—F. G. Robinson, manager of the Automobile Storage and Trading Company, has taken steps to have a bill introduced into the present Legislature making it a misdemeanor to take an automobile from any garage, or from wherever it may be, without the owner's consent.

PHILADELPHIA, Pa.—In relation to the automobile license troubles, Chief Justice Mitchell has decided that automobiles need only carry a State license tag until the suit now pending in the Supreme Court has been decided. This bars the local ordinance from going into effect for the time being.

LOUISVILLE, Ky.—John C. Durrett is suing A. C. Montenegro and A. C. Montenegro, Jr., for damages to the amount of $1,170 for the smashing of Durrett's buggy, destruction of his harness and injuries to his horse, which ran away, having become frightened, it is alleged, at Montenegro's automobile. A lien on the automobile is asked for.

HARTFORD, Conn.—A suit for damages has been begun in the Superior Court in which W. D. Johnson, a chauffeur, claims $5,000 damages from the Electric Vehicle Company. He alleges that he was riding in one of the cars of the company and was thrown out, sustaining serious injuries. The company replied that Johnson was on a test car at his own risk, and had not been invited to ride.

LANSING, Mich.—The case of Edmund L. Carrar against the city of Detroit for damages for injuries alleged to have been sustained by himself and his automobile when he drove the machine into an excavation on Madison avenue was reversed by the Supreme Court. The plaintiff had recovered a judgment, and the city appealed and a new trial will now be given.

DETROIT, Mich.—The Detroit Auto Vehicle Company, in their answer to the litigation instituted against them by Alfred O. Dunk, Robert C. Yates and others, deny the allegation of not paying the debts of the absorbed Detroit Novelty Machine Company, claiming that they have paid more than $7,000. The company state that their damage amounts to about $20,000.

NEWBURY, Mass.—In deciding several appeal cases of persons charged with exceeding the speed limit, Judge Gaskill, in the Middlesex Superior Criminal Court, decided that an owner of an automobile who is registered and has a license is not criminally liable for overspeeding when he is not in the machine at the time of the speeding, and the chauffeur is controlling the auto. He further rules that in order to convict the owner of a machine for overspeeding a police officer must identify him as being in the machine, and that it is enough for the prosecution to prove that it is his machine that was overspeeding without knowing that he was controlling the machine.

New Incorporations.

Brown-Lipe Gear Company, Syracuse, N. Y.—Capital $150,000. Directors, A. T. Brown, W. C. Lipe and H. W. Chapin.

Westchester Motor Car Company, New Rochelle, N. Y.—Capital, $25,000. Directors, K. S. W. Glasser, J. A. Manstedt and F. W. Bender.

The Miller Garage Company, Bridgeport, Conn. — Capital, $35,000. Incorporators, Wilmet R. Miller, Elmer Miller and Charles H. Peck.

The Huntington Automobile Company, Huntington, N. Y.—Capital, $3,500. Directors, August Heckscher, Frank H. Berthold and George C. Fraser.

E. T. Kimball Company, New York.—To manufacture motors, engines, etc. Capital, $10,000. Incorporators, William R. Hayes, Carlisle G. Gleason, Henry T. Randall.

The Auto Construction Company, Minneapolis, Minn.—To manufacture automobiles. Capital, $50,000. Incorporators, P. S. Adams, George A. Hughes and W. T. Hartson.

The Gray Motor Company, Detroit, Mich. —To manufacture and sell engines, machinery, etc. Capital, $12,000. Incorporators, David Gray, Paul R. Gray and Lyman W. Goodenough.

The Standard Cushion Hub Company, Augusta, Me.—To manufacture cushion hubs for use on automobiles and vehicles. Capital, $500,000. President and treasurer, I. L. Fairbanks.

The Sharman-Ottinger Automobile Company, Salt Lake City, Utah.—Capital, $25,000. Officers, Samuel H. Sharman, president and treasurer; Adolph Ottinger, vice president, and A. Schneider, secretary.

Watertown Automobile and Supply Company, Watertown, N. Y.—To deal in automobiles and accessories. Capital, $5,000. Directors, Lincoln G. De Cant, Perley A. Pitcher and Joseph A. McConnell.

Reports on Springfield's Municipal Automobiles.

The use of automobiles in place of horses during the past year by the street lighting and police departments of Springfield, Mass., has been satisfactory, according to the reports of the Street Lighting Committee and the Police Commission to the city government. The Street Lighting Committee states in its report, which is for the year ending December 10, 1905: "There has been added to the equipment of this department one Knox double cylinder Model F surrey, with special body arranged to carry six persons, which can be quickly and compactly closed into a runabout for two persons. This machine has displaced one horse, and materially increased the efficiency of the department as a time saver in emergency cases and has afforded a substantially wider range of nightly inspection of street lights. It has also been used by other departments and committees of the city government for city business, having covered a total distance of 3,518 miles since its purchase: Street lighting department, 2,892½ miles; city treasury department, 320½ miles; city government committees, 148 miles; water department, 157 miles."

In the report of the Police Commission, which is for the year ending November 30, 1905, the following appears: "During the month of January a new departure was made by substituting a motor wagon in place of the horse van, which has done service for many years. This was in a way an experiment, but the experience during the year seems to have more than justified the outlay, the expense of running and maintaining having been reasonable, and the quickness with which the department is able to do its work, and above all its use as an ambulance (which in at least two cases has saved the lives of injured persons by the speed with which they were taken to the hospital), would counterbalance any increased cost over horses, if, indeed, there were any. This suggests the idea that it would be wise ultimately to convert the present horse ambulance into a motor vehicle, and provide the department with a motor car to carry from two to three officers to points where their services may be required expeditiously, and also to be used by the officers of the department for general work in place of the present Concord buggy."

Commercial Vehicle Notes.

A company is being organized to operate motor cars between Galion and Sanbury, Ohio.

Bailey, Banks & Biddle, jewelers, of Chestnut street, Philadelphia, have placed two Cadillac delivery wagons in service.

The Mexico Consolidated Mining and Smelting Company are reported to have just placed an order with the Autocar Equipment Company, of Buffalo, for a freight automobile to transport ore from Guanacevi to Tepehuanes, Mexico.

The installation of automobiles to supplant horse drawn vehicles for carrying mail between stations in Cleveland, Ohio, is being considered.

The motor line from Marinette and Menominee to Peshtigo, Wis., will be operated by a company with a capital of about $12,000. It is stated that operations will be started this month.

Club Notes.

CHICAGO A. C.

The directors have unanimously decided to build a new clubhouse. No site has yet been selected.

NEW YORK M. C.

The club will hold a smoker on the night of January 4 at the clubrooms in the Hotel Cumberland.

A. C. OF AMERICA.

Circulars are again being sent out by S. M. Butler, the secretary, to members of the club stating that the Club Garage of America has again assumed operations, and cautioning the members that the club has absolutely no connection with the scheme.

MINNEAPOLIS A. C.

At the meeting held on January 2 the matter of establishing a policy by which the club will take up and defend civil actions brought against any member for injury to some person or property caused by the operation of their cars was discussed.

Trade Literature Received.

S. N. Brown & Co., Dayton, Ohio.—1906 catalogue of automobile bows.

Buick Motor Company, Jackson, Mich.—Pamphlet, advance information 1906 models.

Davis Manufacturing Company, Milwaukee, Wis.—Folder illustrating their opposed motors.

Dayton Folding Tonneau Company, Dayton, Ohio.—Card showing the Artz folding tonneau.

Elmore Manufacturing Company, Clyde, Ohio.—Booklet, "The Heart of the Man and the Machine."

New York Sporting Goods Company, 17 Warren street, New York.—Catalogue of automobile specialties.

Gabriel Horn Manufacturing Company, Cleveland, Ohio.—Folder telling about the Foster shock absorber.

The Lunkenheimer Company, Cincinnati, Ohio.—Pamphlet showing and describing various kinds of grease cups.

The Sheddan Manufacturing Company, 138 West Fayette street, Baltimore, Md.—Leaflet regarding "Perfection" air cushions.

Atlantic Automobile Company and Machine Works, 12 South North Carolina avenue, Atlantic City, N. J.—A map, "Improved New Jersey Roads."

Société Anonyme d'Electricité et d'Automobiles Mors, 84 Rue du Théâtre, Paris.—Descriptive catalogue of the Mors cars, showing the various models.

The Horseless Age at the Shows.

THE HORSELESS AGE has taken space at the leading automobile shows to be held during the coming months. At the Association of Licensed Automobile Manufacturers' Show, Madison Square Garden, New York, we will occupy Space No. 132 in the gallery; at the Automobile Club of America Show, Sixty-ninth Regiment Armory building, New York, we will occupy Space No. 67 in the gallery; and at the National Association of Automobile Manufacturers' Show, Chicago, Space No. A68 (Armory).

November Exports.

The United States exports of automobiles and parts during the month of November, 1905, were valued at $129,389, as compared with $106,117. The value of the exports for eleven months ending with November was $2,499,010 in 1905, $1,682,994 in 1904, and $1,419,481 in 1903. The following table shows the distribution of exports among the different countries buying American cars:

Automobiles and Parts of.	November, 1905.	Ten Months Ending Nov., 1905.
Exported to—		
United Kingdom...	$27,065	$631,787
France	8,028	262,058
Germany	1,808	103,806
Italy	5,580	159,905
Other Europe.....	15,085	237,902
British North America	11,996	513,761
Mexico	12,738	162,780
Other West Indies and Bermuda	6,809	131,361
South America.....	6,974	55,912
British East Indies	2,495	31,097
British Australasia.	25,571	111,119
Other Asia and Oceania	287	60,878
Africa	4,791	33,528
Other countries....	222	3,116
Total	$129,389	$2,499,010

Agency and Garage Notes.

Nolan & Smith will erect a garage on Main street near Kent, Los Angeles, Cal.

P. C. Rutan, of 46 Front street, Port Jervis, N. Y., has been appointed agent for Wayne cars.

The Sharman-Ottinger Automobile Company, Salt Lake City, Utah, are erecting a garage on South Temple street.

Price Brothers, agents for the Baker electric vehicles in Cleveland, have moved into their new building on Huron street.

The Welch-Estberg Company, Milwaukee, Wis., are building a garage at the northwest corner of Grand avenue and Seventh street.

P. F. Rockett, formerly general sales manager for the Maxwell-Briscoe Motor Company, Tarrytown, N. Y., is now the vice president and general manager of the Zim-Rock Motor Car Company, 1853 Broadway,

New York, agents for the Stoddard-Dayton cars.

B. G. Burrington, Holyoke, Mass., is now the agent for Maxwell cars.

The North Philadelphia Auto Station has acquired the 1906 agency for the Crawford car.

The Cleveland car will be represented in Newark, N. J., for the coming season by Burtt & Co.

The Atwood Auto Company, Toledo, Ohio, are erecting a new garage on Monroe street. They are recently appointed Northern agents.

The Haynes car will be handled in St. Paul, Minn., during the coming year by A. H. Eckbergh.

The Moulton-Jordan Company, St. Paul, Minn., have secured the agency for Cadillac cars for 1906.

The Kelley-Hunter Company, 1449 Michigan avenue, Chicago, are to represent the Northern car.

The Franklin car will be represented in Indianapolis in 1906 by the Indiana Automobile Company.

The 1906 Oldsmobile agency for St. Paul, Minn., has been secured by the Barclay Automobile Company.

The Diamond Motor Car Company, Philadelphia, have become the new agents for the Jackson automobile.

Walter Benz, St. Paul, Minn., will handle the Moline car during 1906, having acquired the agency for that city.

The Saginaw, Mich., agency of the Northern car for this year will be held by the Huron Auto Electric Company.

J. P. Schneider has become the Detroit agent for the coming season for the Oldsmobile and Columbia electric trucks.

John J. Short & Brothers are erecting a three story garage and repair shop at 2028 and 2030 Sansom street, Philadelphia.

The Frayer-Miller Automobile Company, of New York, have taken new quarters at the corner of Sixty-fifth street and Broadway.

The Ford Motor Car Company have made the Northwestern Motor Vehicle Company of St. Paul their agents for the coming season.

Charles B. Hawver has taken the old theatre building on Dietz street, Oneonta, N. Y., which he will use as an automobile garage.

The Foss-Hughes Motor Car Company, recently incorporated, have opened their garage at Broad and Race streets, Philadelphia, Pa.

The Pope Manufacturing Company's branch at Washington have acquired the 1906 agency for the Hartford-Truffault suspension.

The new garage of the Riding and Driving Club of Brooklyn, New York, at Prospect Park plaza, was formally opened on December 28.

New Pope-Waverley representatives for 1906 are: The Elmira Arms Company, Elmira, N. Y.; Ruhl & Johnston, Decatur, Ill.; Atwood Automobile Company, Toledo, Ohio, and H. T. Hearsey Vehicle Company, Indianapolis, Ind.

The Relay Motor Car Company, of Reading, Pa., have appointed the North Philadelphia Auto Station, at Philadelphia, their 1906 agents.

E. V. Hartford, president of the Hartford Suspension Company, has secured the American agency for the Gobron-Brillie car. L. C. Burnett is to be sales manager of the new agency.

Grove B. Warner and R. M. Cornwall will occupy a new building on South Clinton street, Syracuse, N. Y., acting as the Pierce agents. Mr. Cornwall will also manufacture gasoline engines.

Minor Mention.

The Massnick Manufacturing Company, of Detroit, are placing a new type of non-float carburetor on the market.

Gustave Reno has retired from the firm of Herz & Co., New York, having disposed of his interest in the firm to Gustave L. Herz.

N. D. Goff has retired from the Lowell, Mass., Automobile Corporation as a partner, and has been succeeded by H. H. J. Read.

L. D. Sheppard, 52 South Morgan street, Chicago, is to put a four cylinder touring car on the market for 1906, to be known as the "Ariston."

The Auto Construction Company, Minneapolis, Minn., have just equipped a factory at Hennepin avenue and Tenth street, where they will engage in the manufacture of automobiles.

The New York, New Haven & Hartford Railroad Company, the Boston & Maine and the Boston & Albany roads will put automobile freight cars, having end as well as side doors, in service during the coming season.

Eight hundred applications have so far been received at the State Highway Department of Harrisburg, Pa., for automobile licenses.

The National Body Company, Mt. Pleasant, Mich., have proposed to the board of trade of Pontiac that they remove their plant to that city.

The Davenport (Ia.) automobile dealers have arranged a schedule of prices to be charged for supplies and for renting and storing machines.

The Northern Manufacturing Company, Detroit, are erecting an extension to their plant which will add about 3,000 square feet of floor space.

The Hyatt Roller Bearing Company, of Harrison, N. J., will hold their fourth annual collation and entertainment on the 17th of January at the Waldorf-Astoria, New York.

The Julius King Optical Company have bought the good will and stock of automobile goods of the Meyrowitz Manufacturing Company, 104 East Twenty-third street, New York.

The Brown-Lipe Gear Company, Syracuse, N. Y., have been incorporated and have taken over the stock of the partnership of the Brown-Lipe Gear Company. No change will be made in the management.

The York Automobile Company, York, Pa., has been reorganized under the name of the York Motor Car Company. The following officers have been elected: S. E. Bailey, president; A. P. Broomell, secretary and treasurer, and James A. Kline, general manager. The new company will manufacture for 1906 three models—two



A Large Cash Register Company's Electric Truck.

touring cars with four cylinder engines, sliding gears and bevel drive, and one runabout.

The Abendroth & Root Manufacturing Company, Newburgh, N. Y., are to engage in the manufacture of a four cylinder pleasure vehicle, and also a commercial vehicle.

The Deere car for 1906, made by the Deere-Clark Motor Car Company, will be equipped with a four cylinder, vertical motor of 24 horse power, and shaft drive.

A stock company is being organized in Austin, Tex., to sell and repair automobiles. The major portion of the stock of the company will be held by automobile owners.

S. N. Brown & Co., of Dayton, Ohio, manufacturers of bows for automobile tops, are placing on the market a new bow which is curved in at the bottom, having an offset of 4½ inches or less on a side.

The Fisk Rubber Company, of Chicopee Falls, Mass., have filed a complaint with the Interstate Commerce Commission, charging the railways operating west of Chicago with enforcing unreasonable rates on rubber tires for vehicles.

E. B. Jackson, formerly in charge of the automobile department of John Wanamaker, New York city, has become the sales manager for the Chadwick car, made by the Fairmount Engineering Company, of Philadelphia.

The Kelley-Hunter Motor Car Company, 1449 Michigan avenue, Chicago, have changed their name to the Northern Motor Car Company, Mr. Hunter retiring from the firm, and W. G. Tennant has been made president and general manager.

The Monarch Manufacturing Company, Columbus, Ohio, manufacturers of motor pumps, have located on Vine street. The following officers have been elected: E. J. Smith, president; J. E. Matthews, vice president, and E. K. Jones, secretary and treasurer.

The advent of automobiles into the piano delivery business in Chicago is said to have aided the drivers in securing higher wages. The special classification for helpers on piano auto wagons was a special feature of the wage agreement which went into effect on January 1.

At a recent meeting of the Pontiac Motor Car Company, Pontiac, Mich., the organization was formally effected and the following officers elected: President, D. V. H. Wells; vice president, George E. Fisher; secretary, A. H. Burton; treasurer, Frank L. Perry; general manager, Martin Halfpenny. The board of directors comprises Pierre Buckley, M. D. Heitsch and Dr. V. H. Wells. The company has leased the Van Kleek cider mill building on East Huron street, where they expect to be located some time this month. A two cylinder opposed commercial car and a combined commercial and pleasure car will be manufactured.

MOTOR VEHICLE PATENTS.

Patents of December 19.

807,457. Driving Attachment for Automobiles.—Benjamin A. Grâmm, Chillicothe, Ohio. Filed July 28, 1905.

807,479. Carburetor.—Julius H. Mason, Duncan Falls, Ohio. Filed March 10, 1905.

807,536. Vehicle Wheel.—Stanislaus Berens, Lagrange, Ill. Filed April 14, 1905.

807,537. Pneumatic Tire.—Edgar M. Birdsall, Buffalo, N. Y. Filed January 26, 1904. Renewed May 22, 1905.

807,581. Valve Gear for Regulating Descending Automobiles.—Hippolyt Saurer, Arbon, Switzerland. Filed November 22, 1904.

807,611. Non-Skidding Cover for Tires.—Edward Fairburn, Brighouse, England. Filed July 24, 1905.

807,612. Vehicle Spring.—Samuel Furmidge, St. Louis, Mo. Filed November 16, 1904.

807,623. Motor Vehicle.—John W. Lambert, Anderson, Ind. Filed April 3, 1905.

807,627. Power Transmission Device.—George W. Marble, Chicago, Ill. Filed December 7, 1904.

807,633. Tire.—John F. McCanna, Chicago, Ill. Filed August 15, 1904.

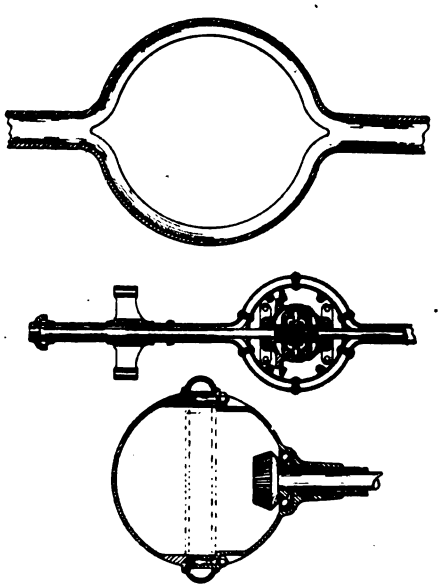
807,731. Lubricator for Sprocket Wheels.—James M. Dodge, Philadelphia, Pa. Filed May 17, 1904.

807,744. Vehicle Tire.—Charles A. Immler, Akron, Ohio. Filed January 26, 1905.

807,748. Elastic Vehicle Tire.—Godfred Knadler, Akron, Ohio. Filed July 31, 1905.

807,771. Speed Changing and Transmission Gearing.—Irvin H. Pleukharp, Columbus, Ohio. Filed May 10, 1905.

807,789. Guiding Device for Motor Vehicles.—Zachary T. Sweeney, Columbus, Ind. Filed June 22, 1905.



No. 803,121.

807,922. Adjustable Vehicle Wheel.—Bert D. Gilson, Indianapolis, Ind. Filed March 18, 1905.

807,958. Motor Vehicle Running Gear.—Ransom E. Olds, Lansing, Mich. Filed October 29, 1904.

807,961. Metallic Tire.—Walter J. Paton, Galva, Kan. Filed June 14, 1905.

808,047. Differential Gearing.—Frank M. Haldeman and Bluford W. Brockett, Cleveland, Ohio. Filed September 29, 1905.

Patents of December 26.

808,210. Internal Combustion Engine.—Edward S. Palmbla, Waukegan, Ill. Filed December 14, 1904.

808,221. Speed Changing Gear.—Charles G. Simonds, Schenectady, N. Y. Filed August 27, 1904.

808,234. Emergency Brake.—Walter M. Gooch, Dayton, Ky. Filed March 27, 1905.

808,306. Transmission Gear.—Bennard H. Pomeroy, St. Louis, Mo. Filed August 22, 1904.

808,307. Clamping Device for Pneumatic Tires.—Harry K. Raymond, Akron, Ohio; Maximilian C. Schweinert, West Hoboken, N. J., and Henry P. Kraft, New York, N. Y. Filed March 18, 1905.

808,336. Internal Combustion Heat Engine.—John L. Bogert, New York, N. Y. Filed October 26, 1904.

808,423. Vertical Explosive Engine.—Alexander Winton, Cleveland, Ohio. Filed November 12, 1904.

808,426. Cushioned Tire.—Charles W. Adsit, Owatonna, Minn. Filed March 3, 1905.

808,479. Art of and Apparatus for Heating and Vulcanizing, Etc.—Howard S. Riddle, Akron, Ohio. Filed June 22, 1904.

808,490. Air Cooling Construction for Engine Cylinders, Radiators, Etc.—William B. Swan, Seymour, Conn. Filed February 16, 1904.

808,551. Ignition Device.—Leon J. Le Pontois, New Rochelle, N. Y. Filed November 7, 1903.

808,560. Power Transmitting Mechanism.—William R. May, Newton, Mass. Filed March 1, 1905.

37,763 (Design patent). Automobile Tonneau.—Ralph A. Leslie, Cleveland, Ohio. Filed October 23, 1905.

Review of Specifications.

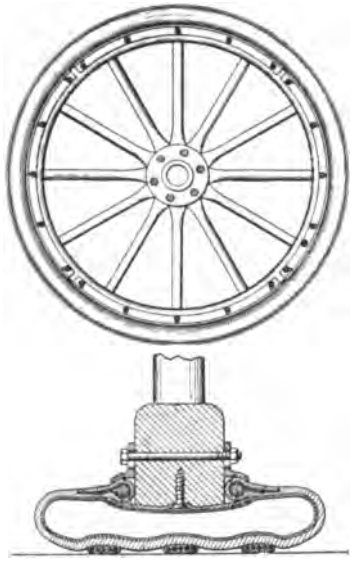
803,121. Rear Axle for Automobiles.—Frederick C. Miller, Cincinnati, Ohio. October 31, 1905. Filed April 13, 1905.

The principal object of this invention is to produce a one piece rear axle for automobiles where it is desired to drive the wheels without the intervention of a countershaft and side chains, either by bevel gearing or chain and sprocket, and to secure all the strength in the axle secured by the side chains and countershaft construction. The essential feature of the invention is a one piece tube, preferably of steel, the intermediate portion of which has walls swaged away from the centre of the tube, the wheel shafts being inserte

through the ends of the tube and projected between the separated walls, whereby the transmission mechanism may be mounted within the housing formed by said swaged walls. The transmission mechanism is supported within a suitable casing secured within the housing formed by the divided tube. This one piece axle construction and arrangement obviate the use of any brazed or bolted connections in the load carrying part of the axle.

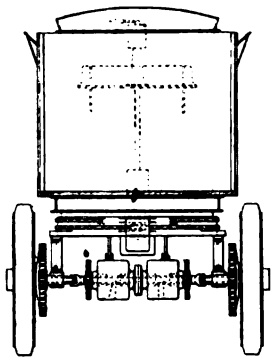
803,345. Pneumatic Tired Wheel.—Thomas B. Jeffery, Kenosha, Wis. October 31, 1905. Filed November 21, 1904.

To do away with "rim cutting" is the object of this invention. A rim entirely encompassing the wheel overhangs the lateral margins of the felly for the purpose of co-operating at the two sides of the felly with an annular tire retaining device, which is made in separate segments. These annular devices at opposite sides of the felly are bound thereto



No. 808,345.

by bolts taking through the felly and binding both the opposite devices. The rim has its overhanging portion at each side curved back toward the axis of the wheel, and the annular retaining devices have their flanges projecting off from the plane of the wheel and deflected away from the axis and hollowed or concaved on the outer side facing the inwardly curved overhanging margins of the rim. There is thus formed at each side of the felly between the overhanging margins of the rim and the off-jutting flange of the retainers a laterally opening recess extending all around the wheel, which widens back from its mouth to the side of the felly, and is thereby adapted to seat and hold the enlarged or reinforced marginal portion of the flexible tire casing. It is one purpose of this invention to afford a pneumatic tire which shall not be circular in cross section when distended to maximum. For this purpose the ire casing has encompassing its tread



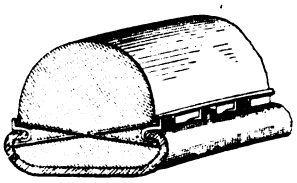
No. 803,008.

portion one or more substantially non-extensible bands. These are preferably made of rubber embedded braids or cords of such firm material as to practically be non-extensible under the maximum tension of tire inflation and weight of load.

803,008. Motor Vehicle.—Herman P. Moorees, New York, N. Y. October 31, 1905. Filed October 6, 1904.

This invention relates generally to the driving and steering mechanism of electrically propelled motor vehicles, and especially to those vehicles in which both the driving arrangements and the steering arrangements are applied to the same truck, usually the forward truck, and in which the steering is effected by the swiveling of the steering truck or its axle about a central vertical axis rather than by independent steering wheels mounted at the ends of a fixed axle.

In the drawings the improvements are shown as applied to a heavy vehicle upon the frame of which is mounted a gasoline motor and a dynamo as the source of supply of the current employed in the driving and the steering of the vehicle. The body of the vehicle rests upon a movable fifth wheel, constituting part of the truck frame, to which the axle is connected. The driving and steering wheels are mounted upon the ends of the axle, and are provided with driving gears, engaged by driving pinions on the outer ends of corresponding two part countershafts. The two parts of each countershaft are connected by a suitable universal joint, and the outer part of the shaft is mounted in a bearing, which is carried by an arm, mounted upon the axle. The other part of the shaft has a long bearing in a sleeve, which is carried in short arms or bosses projecting from the casing of the motor. The latter is suspended from a fixed portion of the frame, such as the fifth wheel. The two sleeves are provid-



No. 803,011.

ed with flanges and bolted together to further stiffen the structure. A gear meshes with a pinion on the shaft of a corresponding motor. The provision of a two part transmission shaft between the motor and the driving wheel, with a universal joint interposed between the two parts, and with the outer part supported in a bearing carried by the axle in close proximity to the driving wheel, permits relative movement between the driving wheel and the motor to be taken up by the universal joint without any tendency to cause binding between the pinion of the transmission shaft and the driving gear on the driving wheel. The motor and one part of the countershaft are supported from the truck frame, and opportunity is given for the necessary reduction of speed between the motor and the driving wheels, while the arrangement of gearing is such as not to be disturbed by the relative movement between the axle and the motor, and is adapted to withstand the strains to which it is subjected in use.

803,011. Tire for Vehicle Wheels.—Charles Motz, Akron, Ohio. October 31, 1905. Filed January 3. 1905.

A means of securing solid tires to clincher rims is the subject of this patent. The rim is secured to the felly in any preferred manner and has upwardly extending marginal flanges, with inwardly extending portions, thereby forming an undercut channel for the tire. The tire has in each side, at a distance from the base, longitudinally extending side grooves. Within the base of the tire are embedded cross wires, alternately arranged, one end of said wires extending under the inturned flanges of the rim and the other ends of said wires extending over or above the inturned flanges of the rim on opposite sides thereof.

In order to more effectually secure the tire to the channel rim, circumferential metal wires are placed on the outside of the tire and over the ends of the transverse wires. In order to prevent outward lateral displacement of the circumferential wires, metal hooks with upwardly extending portions are hooked on the inturned flanges of the rim, and there held in position by pressure of the tire.

In lieu of the circumferential wires on the outside of the elastic tire over the cross wires used as a retaining means, metallic hooks, preferably S-shaped in form, may be employed with good effect as a retaining means for the tire. One end of said hooks is hooked on the inturned flanges of the rim and the other ends thereof engage the ends of the transverse wires in the rubber tire.

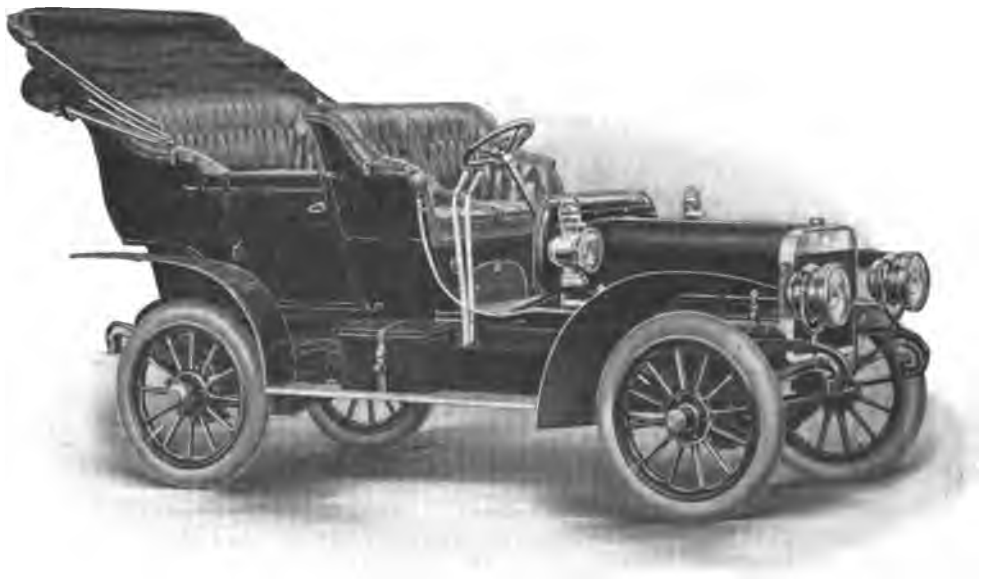
The arrangement of the cross wires or stays within the tire forms a double clencher or fastener for the tire at their points of location, and by the peculiar arrangement of the cross wires within the tire under a load the tire will be free to move between the spaced wires, thereby retaining to a considerable extent its natural resilient qualities.

...THE...

Horseless Age

VOLUME 17 JANUARY 10, 1906 NUMBER 2

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That's how you can know the value of the new Winton Model K.

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Don't accept anybody's praise stated in general terms, but get the details and the reasons why.

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We tell you its materials are TESTED before we use them, because we aim to make Model K the strongest and safest car on the market.

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THE TWO-CYCLE ELMORE

When you understand that the two cycle Elmore engine does away with 18 to 20 parts on each of the fo cylinders, and absolutely eliminates all inlet and exhaust valves, with their attendant mechanism, you'll agree wi us, won't you, that this is the simplest engine in the world?

Do we need to point out that this also reduces the cost of operation and up-keep to the minimum, and mal the Elmore the most economical as well as the simplest engine in the world?

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Again, it is the most successful self-starting engine in the world. Again, you can cut out one, two or three cyl ders at will with both spark and gasoline. With one cylinder cut out the difference is imperceptible except speed; with two cut out—barely noticeable. Do you see the economy of this?

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JONES SPEEDOMETER, 130 West 32d St., New Yor

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By Albert L. Clough.

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INCREASED USE OF STORAGE BATTERY.

One of the most noticeable changes from st years is the increased use of the storːe battery for ignition purposes. Its growth in popularity is very marked. Of the seventy-nine models, forty-five employ the accumulator wholly or in conjunction with dry cells or mechanical generators. Accumulators are employed exclusively in eighteen cases. Two and four cell storage batteries, of four and eight volts respectively, are somewhat used, but the three cell or six volt battery is very much the most generally employed. In a few instances a single accumulator is the sole current source supplied with the car, but in a great majority of cases two six volt batteries are furnished. A favorite equipment seems to be one six volt accumulator and one battery of five dry cells. This makes a most excellent arrangement. In ordinary service the storage battery is relied upon, but in case of lack of charging facilities or any other accident, the dry cells constitute a reserve which will give good service for a time and is readily replaced. This combination is adopted upon twenty-two of the seventy-nine cars concerning which data were obtained.

The uniformity of performance and general reliability of the accumulator have caused it to deserve its present popularity, and if charging facilities were a little more generally accessible it would be nearly ideal despite its occasional short circuits, broken plate hangers and spillings of acid. The favorite place to carry ignition accumulators is in a box upon the car step. This arrangement disposes of the objection sometimes made to its acid fumes and occasional spillings of the electrolyte.

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Mechanical spark generators, both of the magneto and dynamo types, have made very little progress in popularity during the past year, much less so than might have been anticipated. Magnetos are supplied as the regular equipment of but four 1906 models out of the seventy-nine tabulated. They will be furnished as extra equipment upon three others, at the option of the purchaser. In all cases but one the type furnished is the synchronously driven, low tension magneto, with interrupter and distributer integral, and a single plain coil for stepping up the voltage. One high priced car is furnished with a high tension magneto as part of the regular equipment. In five of the above cases the generator is gear driven, and in two chain and sprocket connection is employed. A battery is always supplied as an auxiliary current source. Dynamos are offered in only three models, the friction drive being the method provided. A storage battery is the direct source of the ignition current, the dynamo being run continuously for charging it. In two of these instances the dynamo is of the dashboard type for convenience in regulation of the voltage.

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to dirt and oil, have finally condemned it in the judgment of most American manufacturers. Forty-eight of the seventy-nine cars make use of the segment and brush type of timer; by which term is meant a timer in which the circuit is made and broken by the frictional contact of a moving metallic portion, upon metallic segments set into the inside periphery of an insulating shell. The general use in timers of this type of hardened steel frictional surfaces, and the possibility of their free lubrication, reduce wear to a minimum. These devices are self adjusting and very rugged. The frictional or wiping nature of the contact insures clean electrical connection at all times. Twenty-four of the cars studied are equipped with roller contact timers, and the use of this form seems to be rapidly increasing. The moving roller contact upon fixed hardened segments reduces the wear to a very slight amount and secures a good electrical connection, although lubricant be freely used.

BALL BEARINGS ON TIMERS.

Another improvement in timers is the use of a ball bearing between the shaft bearing, the moving contact and the shell carrying the segments. The wear and consequent wobble, which leads to imperfect electrical action, are largely reduced by the use of these anti-friction bearings. Ball contact timers, with the electrical connection made between a ball capable of rolling in the end of the moving portion and the segments, are used upon three of the models in the list.

ACCESSIBLE POSITION OF TIMERS.

One notable advance is in the increased accessibility of timers. The end of the half speed or cam shaft is generally in a decidedly unhandy position, and the timer, if located thereon, is far from convenient of access for adjustment or inspection. In thirty-six of the seventy-nine cars the timer is carried upon a shaft driven by bevel or spiral gears, and is thus located in a more convenient position than would otherwise be possible. A vertical or inclined shaft, with the timer at its upper extremity, is a common arrangement. In three cases the timer is chain driven and is mounted upon the dash, and a number of the gear driven timers are placed there also.

SECONDARY DISTRIBUTER LITTLE USED.

Only five of the cars listed make use of the secondary distributer, and a single coil with battery current supply. Several others use a distributer as part of the magneto equipment.

This hesitancy upon the part of the manufacturers in using the distributer seems rather remarkable, especially as its use would materially reduce the cost of a four or six cylinder ignition outfit. Where distributers are used they are, as a rule, mounted upon the dash.

One of the petty but annoying defects of ignition apparatus has been the frequent breakage of the primary wires leading to the portion of the timer which is shifted to vary the spark position. This defect has at last received some attention from the manufacturers, as is evinced by the claims of several of them that their timer wires are not moved in varying the spark advance. In one form of combined dashboard timer and distributer bending of the primary wires is obviated by the use of sliding contacts, and in another type by a spiral cam arrangement which allows the rotating portion which carries the wipe contact to be rotated relatively to its shaft by a fork and collar arrangement, thus advancing or retarding the time of contact.

LOCATION OF SPARK PLUGS.

Spark plugs in the majority of cases are placed vertically over the inlet valve, but in not a few of the engines they are inserted in the centre of the head. In some of the air cooled motors and in certain others they are inserted horizontally into the combustion space. To facilitate the removal of plugs for cleaning or inspection a breech block carrier is used in one or two cases, into which the plug is screwed, and which is locked into position in the combustion chamber by a fraction of a turn with a wrench.

NEAT WIRING.

A great deal of care seems to be taken with the wiring of the new cars to make it neat and "shipshape," and as short as possible. The use of hard fibre or metal tubing to enclose the highly insulated secondary cable is quite common, and fibre brackets or standards are used in some instances to support these high tension wires upon the engine structure. The primary wires are carried in copper tubes in some cases to protect them from oil and abrasion.

SPARK LEVER ARRANGEMENT.

The time of the spark is varied by means of a hand lever on the wheel or steering post in all the cars studied. In only one instance is automatic spark control, by means of a governor, made use of, and in this case manual control is also provided. One of the large manufacturers, who has hitherto used a spark governor, has discarded it in this year's models. However, in quite a number of these models a safety device is employed which returns the spark to its retarded position before the starting crank can be attached.

The battery selecting and disconnecting switch is generally mounted upon the coil case, and the details of these switches have been greatly perfected recently in point of reliability. A few cars employ a finger operated ignition cut-off, located upon the steering wheel, which enables the operator to open and close the primary circuit of the coil at will, thus interrupting and resuming ignition as desired. The practice of sparking both cylinders of an opposed cylinder motor from a single coil seems less in evidence than it was last season. It has several serious disadvantages. In this year's two cylinder cars double coils are usually provided.

TYPICAL IGNITION SYSTEM.

Perhaps the typical ignition system of 1906, considering high and low priced cars together, may be described by the following specifications: Two sets of five dry cells, feeding a vibrator coil for each cylinder, mounted upon the dash, through a segment and brush timer accessibly carried on a geared shaft, with plugs located over the inlet valves. In order to properly cover the higher class of cars the specifications should read: Two sets each of three cells of accumulator instead of the dry batteries.

SPECIAL SYSTEMS.

Among the ignition systems of 1906 cars which decidedly depart from general practice the following may be alluded to: One four cylinder car employs a gear driven, synchronous, low tension magneto, carrying its own make and break and secondary distributer in conjunction with a single, plain coil. A single set of dry cells, so connected as to employ the same interrupter, distributer and coil, is supplied for starting and emergency use.

Another four cylinder car is equipped with a frictional driven dynamo, so placed that its speed regulator is accessible on the dashboard. The dynamo charges a three cell accumulator (a dashboard voltmeter being provided), which supplies the quadruple vibrator coil through a timer of the segment and brush variety with automatic timing. An automatic cut-out is provided to protect the storage battery and disconnect it when it is fully charged. In addition to this equipment a battery of dry cells is provided as a reserve, using the same coils and timer. One ought "to be able to get there and back" with such an arrangement.

Another four cylinder car is equipped with a high tension geared magneto with distributer integral, which furnishes the high tension current direct, without separate coil, to plugs over the inlet valves. Accumulators are also carried, which supply four vibrator coils through a segment and brush timer, furnishing high tension current to plugs over the exhaust valves. The two ignition systems of this car are absolutely independent. The magneto is the one ordinarily used, the other being held in reserve.

THE LOW TENSION SYSTEM.

Such cars as employ the make and break spark usually employ a gear driven synchronized, alternating current, low tension magneto. In some cases a battery of dry cells or an accumulator is carried for starting purposes or as a reserve. Ordinarily the magneto is capable of furnishing the starting spark. The voltage wave of a magneto is of such duration as to give a sufficient current through the desired range of spark advance. The make and break igniters are generally operated by push rods actuated by spiral cams cut on the valve cam shaft, and the time of ignition is determined by varying the point of contact of the spiral cam surfaces with the igniter push rods. Igniters are made so as to be readily removed from the combustion spaces and the points are now made of iridium-platinum.

STARTING ON LOW TENSION SPARK.

One car employing the contact spark is arranged to start from the seat. Means are

provided for manually tripping any one of the igniters without leaving the car. An indicator shows which cylinder is in the firing position, and a touch of a lever causes the make and break, upon which the car should start if not too cold. The wiring of the contact spark system is extremely simple, one side of the magneto being grounded and the other connected to a single bus bar tapped to each igniter through a cylinder cut-out switch.

Carburation—Its Controlling Factors and Its Defects.

By David Landau.

The historical development of the modern carburetor would alone furnish matter for an interesting article, but I feel that descriptions of the now obsolete devices would occupy more room than is necessary for a thorough treatment of the subject, especially as the reader is probably familiar with the devices on the market some five or six years ago. The almost universal adoption of the constant level or float feed carburetor, originally introduced by Maybach, demands that we deal solely with this device, pointing out its shortcomings and advantages.

There are so few constants that enter into the construction, and particularly the operation, of the device that it may be as well to state the variables first, and analyze the means of compensating their actions, and how the results sought for are obtained in practice.

We expect the carburetor to supply our motor with a constant explosive mixture of fuel and air. I say fuel and air advisedly, for while the carburetor supplies only charges of fuel, yet it is nevertheless important—and this is really a fundamental point—that it must be designed to also permit certain and definite supplies of air to mingle with the fuel to obtain the proper mixture.

It is a fairly easy matter to design a carburetor to operate on an engine of a given size, running at a given constant speed, such, for example, as an engine for a motor boat or launch, or a motor driving machinery in a factory where the output is practically constant. In a motor car, however, the demand on the engine is so variable that the problem becomes more complex, owing to the variations in speed, torque, gear change, etc., and we must take account of the varying conditions which affect the actions of the carburetor. These variable factors are:

(a) Compression.
(b) Engine speed.
(c) Ignition and lubrication.
(d) Temperature of the atmosphere.
(e) Temperature of the motor (almost constant).
(f) Barometric pressure.
(g) Atmospheric humidity.
(h) Road vibration.

A few more factors may be added, such as varying fuel compositon and density, the manner of the fuel supply to the float chamber (gravity or pressure feed), automatic and mechanical inlets, etc.; but I believe that justice will have been done to the subject if we can clearly state the modus operandi of the variations mentioned and suggest means for remedying their effects.

To Robert Street we are indebted for the invention of practically generating gas from petroleum by vaporizing the liquid fuel on hot surfaces and then mixing the gas produced with air. This was in 1794, and in 1799 to 1801 Philip Lebon, a French engineer, patented a gas engine in which compression of the mixture was suggested. Lebon was assassinated in 1804, and for over half a century inventors worked on these lines, till the ideas promulgated by him were embodied in the present day four cycle engine. From Street and Lebon in 1800 to 1905 many changes have been wrought and several refinements have been introduced which have made our motors more flexible, faster running, lighter in weight per horse power and improved in general design. Practically all the improvement in gasoline motors is due to higher compression, more certain ignition and more certain carburation.

COMPRESSION.

The manner in which a variation in the compression affects the carburation is a much mooted point to many. With a given motor having a given compression space, the compression varies with the throttling, temperature of the cylinder and temperature of the atmosphere, and depends also upon constricted ports, insufficient valve area and lift, improper timing of valves, too much tension or too little tension on inlet valve springs (in the case of automatic inlets), wire drawing by sharp bends in inlet pipe, etc.

Let us consider the first mentioned cause—throttling. With a motor designed to work with a compression of, say, 60 pounds per square inch, when the throttle is closed so that the motor just turns over, only enough gas is admitted to allow the motor to overcome its own internal friction. Such a motor running on "very fine throttle" is known to run spasmodically, slowing down at times by cutting out several explosions, and is only brought into action again by the vis viva of the flywheel, a heavier or larger flywheel invariably assisting "fine throttle" running.

Assume an explosion to have occurred in one of the cylinders, then on the return stroke part of the gases is swept out of the cylinder by the piston, only the compression space remaining filled by the inert products. This amounts to about 29 cubic inches in the case of a 5x6 inch motor, and this volume of burnt gases remains practically constant, whether the engine is running on closed or "full open" throttle. But now comes the question, How does this affect the incoming charge, which we suppose is throttled?

Let the throttle admit sufficient gas to just turn over the motor, so that at the end of the intake stroke the internal pressure in the cylinder is, say, 5 pounds per square inch absolute, or one-third of an atmosphere. The volume swept by the piston is evidently $D^2 \times .7854 \times S$, which with the cylinder dimensions as above gives $5^2 \times .7854 \times 6 = 118$ cubic inches. The compression space is 29 cubic inches, hence the total cylinder volume is $118 + 29 = 147$ cubic inches. To give an absolute pressure of 5 pounds per cubic inch, or one-third atmosphere, the number of cubic inches of gas introduced into this volume must be proportionately reduced, i. e., we must introduce a total quantity equal to $147 \div 3 = 49$ cubic inches. But it will be seen that the cylinder already contains 29 cubic inches of burnt gas from the preceding explosion, so that the amount of fresh charge to be introduced can only be the difference of 49 and 29, viz., 20 cubic inches. The ratio of the burnt gas to the total is therefore $29 \div 49 = 59$ per cent.

Grover has shown that "when the volume of the products of combustion does not exceed 58 per cent. of the total mixture, the mixture is explosive." This statement applies to mixtures of coal gas and air, and possibly also to mixtures of gasoline and air, so here we have a mixture just at the limit of the range of inflammability.

If now the throttle be fully opened, and supposing that there is no wire drawing, the incoming charge will be 118 cubic inches, while the 29 cubic inches of mixture in the compression space still obtain, so that the ratio of the burnt gas to the total will now be $29 \div 147 = 19.7$ per cent. From this it will be seen that the full throttle opening must give rise to a more perfect and perhaps quicker burning mixture, as compared with "fine throttle" running, owing to the greater purity of the mixture. It is also clear that between the two extremes we have a large range in the conditions of operation.

We may now also explain another often observed fact, namely, that a cold motor cannot be throttled quite so low as one that has attained a little higher temperature—say after running fifteen minutes. The cold cylinder head abstracts the heat from the residue left in the compression space, chilling it, and this mingling with the incoming throttled charge, which is also cold, adds thereto its cooling effect, and the charge being but slightly compressed is not readily ignited.

Let us now see what will occur when the throttle is opened fully. In that case a large volume of gas is drawn in and highly compressed, and as gases on compression are always subjected to a rise in temperature, the vaporization of the fuel is assisted by the heating effect during compression, so that the charge at the end of the compression stroke is more inflammable. Again, it will be noticed that the ratio of the burnt gases in the charge to the whole is considerably smaller, only about 20 per cent., which condition also favors ignition and rapid combustion. Another factor tending to facilitate

ignition and perfect combustion during full throttle operation is the higher engine speed, which gives less time for "wall action" and increases the amount of heat in the charge at the end of the compression stroke. For these various reasons, and also because at full throttle the gaseous molecules are brought into closer proximity, charges weak in gasoline are more readily ignited when the engine is operated at full throttle. Higher compression, therefore, demands slightly weaker mixtures, in order to secure a higher fuel efficiency; it assists in vaporizing the fuel that may be carried over into the cylinders in the liquid form; improves the conditions for ignition, owing to the fact that the charge is purer and that the gas molecules are brought closer together, and it reduces the time for "wall action."

ENGINE SPEED.

The speed of the motor varies generally with the compression, but it is still a distinct factor, and its effect on carburation may be considered separately. Let us take the case of a motor designed for high compression and high speed. It is admitted, and can be shown mathematically, that a high compression means a high heat efficiency. But high compression means also high speed, and in order that the motor may be run at high speed, the carburetor must be designed to allow of rapid mixing of the fuel with the air, which necessitates a mixing chamber, mixing pipes and a baffle or baffle plates. The well known stop jet on the Mercedes carburetor and the ridged cone over the jet of the Phœnix Daimler carburetor are examples of arrangements for rapid mixing of fuel and air. Where a compensating air valve, such as the Krebs, is introduced, it should be placed in front of the spraying jet (so that the air admitted by it passes the jet) instead of behind it. The writer has in mind one maker who placed it on the inlet pipe, and who discovered his mistake only after he had gone to considerable expense.

Wire drawing due to sharp bends in the inlet manifold must be avoided. It has often been observed by the writer that manufacturers place their carburetor in such a position that a large number of bends in the piping are necessary. Every bend in the inlet pipe adds greatly to the friction of the inlet passage, as may be seen from the appended curve. The friction in bends is here represented as equal to the friction of a length of straight pipe of the same diameter. The curve shows the radii of bends as ordinates and the equivalent pipe lengths as abscissas. It is drawn from a table in Haswell's Mechanical Engineering Pocket Book. (See Fig. 2.)

IGNITION AND LUBRICATION.

The effect of ignition—that is to say, of the source of ignition current and the manner of producing the spark—upon the composition of the mixture is a very delicate matter, beset with many difficulties. Experiments are here necessary, and the problem of obtaining the best results is still in the first stages of its development. Two forms of ignition require particular attention, viz., (1) low tension, make and break and (2) high tension magneto or coil and battery. We assume that the reader is thoroughly familiar with both forms of ignition, and begin at once to investigate their effects upon carburation. It may be advisable to first consider the precise conditions under which a charge will ignite.

Charges extremely poor in gasoline fail to ignite when cold or not highly compressed, regardless of what form of ignition is used, and it is well to remember that in case of a weak battery or with a magneto it is advisable, in starting the motor by cranking, to give it a somewhat stronger charge; the same applies when, with magneto ignition, the engine is running on a nearly closed throttle, for at slow speeds the magneto does not generate sufficient potential to give a very hot spark. Higher engine speed increases the temperature of the spark; for, as is well known, the heat of an electric spark is proportional to the square of the current, and the current generated by a magneto increases (within certain limits) in proportion to the speed. The increase in the heat of the spark alone gives lead to the ignition, and is the only means for advancing the ignition provided on the cars of one prominent foreign maker.

As there is as yet so little definite data from direct experiments on the maximum explosion pressures of gasoline and air mixtures and their rates of combustion and cooling, the statements in the following paragraph must be taken with some reserve. Lubrication appears to be rather closely related to ignition; quantitative data on this subject do not seem to have yet been published by any investigators, but we find an account of some provisory experiments made in England by Capt. C. C. Longridge, in a paper on "Oil Motor Cars of 1902," wherein he says:

"He recently took a 3¾x4½ inch tin case, with tightly fitting cover, and successively introduced two, four and six drops of gasoline, then placing the can over a Bunsen burner, at each attempt the solder was melted. In no case did ignition take place. He then took a jointless stamped tin case, 3½x1 inch, and tried, unsuccessfully, with four and six drops of gasoline, to obtain explosion at partial red heat. Repeating the tests, using instead of gasoline a cylinder lubricating oil of 410° to 430° Fahr. flash test, 440° to 460° Fahr. fire test, .910 to .915 density, ignition readily took place."

These remarks suggest the question, Does a mixture of pure gasoline and perfectly dry air of the proper proportions for explosion explode readily? It was shown by Dixon in 1884 that a completely dry mixture of carbon monoxide and oxygen cannot be exploded by an electric spark, or at least only with great difficulty, but the introduction of the slightest trace of watery vapor renders the mixture readily inflammable. Experiments were also made with mixtures of carbon monoxide and oxygen, mixed in the proportions to yield carbon dioxide ($2CO - O_2$) upon explosion. These gases were properly dried by means of concentrated sulphuric acid, and were then saturated with water at 10°, 35° and 60° C. respectively, when, upon ignition, the velocity of flame propagation was found to be 36, 119 and 175 metres per second, respectively. It was also observed that water was not essential, as the same effect could be secured by the addition of sulphuretted hydrogen (H_2S), marsh gas (C_2H_4), ammonia (NH_3), or even hydrochloric acid (HCl). No explosion occurred when traces of sulphur dioxide (SO_2), carbon bisulphide (CS_2), carbon dioxide (CO_2), or carbon tetrachloride (CCl_4) were added, none of these gases containing any hydrogen.

According to Dixon and Lothar Meyer the action of the water vapor is as follows: The water vapor is dissociated into hydrogen and oxygen, and the mixture of hydrogen and oxygen then burns with a velocity sufficient to produce an explosion, but at a much lower temperature than that of the combustion of carbon monoxide. Hence, the water vapor only acts "catalytically," or in this case as a carrier of oxygen, according to the following chemical equations:

(a) $CO + H_2O = CO_2 + H_2$

(b) $2H_2 + O_2 = H_2O$

These together lead to

(d) $2CO + O_2 = 2CO_2$

The reaction (d) requires a much higher temperature than the other two, which is readily obtained after combustion is once started. It will be seen from this that the presence of a foreign substance, such as water vapor, has a very important effect upon the ignition of a fuel mixture, and may insure ignition where it might otherwise fail. It would seem that the introduction of oil into an otherwise perfect mixture increases its rapidity of inflammation, owing, no doubt, to its liberation of nascent hydrogen, which acts in the same manner as in the above described experiments. Weak mixtures, which naturally burn slowly, require an extra early ignition, particularly if the gasoline is free from water, the atmospheric humidity is low, and only a moderate amount of lubricant is used in the motor.

TEMPERATURE OF THE ATMOSPHERE.

Most automobile drivers have observed that the motor "pulls" better in cold weather. The simple explanation usually given, that a greater weight of air is drawn into the cylinder in cold weather, is certainly well founded, but it is not the only reason. In general, as the temperature of the atmosphere decreases, the humidity also decreases, so that at low temperatures there is a greater amount of oxygen in a certain volume of air, which must of necessity give sharper explosions. The proportion of gasoline vapor that air can take up varies with the volatility of the fuel, and directly as the temperature of the air, but inversely as its percentage of humidity. Thus, at 50° Fahr., 5.7 volumes of air are saturated with one volume of vapor, while

at 60° Fahr. 3.7 volumes of air will absorb one volume of vapor, which renders obvious the necessity of slightly warming the air before it enters the carburetor, to increase its absorbing power. But increasing the temperature of the incoming air expands it, and thus results in a smaller charge being drawn in and less power developed, for which reason a happy mean must be adopted with respect to heating of the air. Increasing the temperature of the incoming air 1° C. increases its volume in the proportion of 1.003665, and the weight of the charge drawn into the cylinder is reduced in the same proportion. To cite an example, suppose that the volume swept by the piston is 100 cubic inches and the temperature of the incoming air 60° Fahr. A cubic foot of dry air at 32° Fahr. weighs .0807 pounds, and expands $\frac{1}{491}$ of its volume for each 1° Fahr. The air drawn into the above cylinder at 32° Fahr. then weighs $\frac{.0807 \times 100}{1728} = .00466$ pounds, and at 60° Fahr. it will weigh less in the proportion of $\frac{60-28}{491} = .06$ nearly. In other words, at the temperature of 60° 6 per cent., or $.00466 \times .94 - .00438$ pounds less of charge, is drawn into the cylinder, and if we assume that the power is proportional to the charge taken into the cylinder (which is practically the case), a variation of 6 per cent. in the power of the motor due to variations in atmospheric temperature may be experienced in the course of a day's journey.

TEMPERATURE OF MOTOR.

The effect of the heat of the motor is analogous to that of heat applied to the air before it is drawn into the carburetor. This is proven by the fact that air cooled motors invariably deliver less power for a given cylinder volume than water cooled motors, owing largely to a reduction in the density of the mixture admitted to the cylinders.

BAROMETRIC PRESSURE.

The effects of varying atmospheric pressure are practically restricted to the light metal float and the vaporization of the gasoline. It is well known that the boiling point of a liquid varies with the external pressure, and that the evaporation of a liquid is retarded by an increase in atmospheric pressure. It will thus be seen that the evaporation of gasoline depends to a certain extent upon the pressure of the atmosphere. For a further discussion of this subject the reader is referred to a paper by Mervyn O'Gorman which appeared in THE HORSELESS AGE of May 10 and 17, 1905.

HUMIDITY.

The effect of the humidity of the atmosphere upon the process of carburation is at present a matter of dispute, and we must here content ourselves with pointing out a few facts. Some years ago, when a motor failed to work on a rainy day, the humidity in the air was frequently held responsible for the trouble, while in reality some defect in the ignition system was usually the cause. That no objectionable effects are produced by large percentages of moisture has been conclusively proven by several experimenters, who found that there is no apparent falling off in the horse power developed if a jet of steam is injected into the inlet pipe. In the use of alcohol in motors, it has been found that while the theoretical consumption of alcohol should be 1.8 times the consumption of gasoline for the same power, the ratio between the fuel consumptions in practice is only 1.25. This discrepancy between theory and practice has been proven to be due to the water with which the alcohol is diluted. That water actually increases the power output has also been demonstrated in connection with the Banki motor, into the cylinder of which water is injected.

From experiments conducted under the direction of Capt. C. C. Longridge, the following results are summarized: (1) Maintaining a constant gasoline supply, increase of water gave an actual increase of power and resulted in cooler running; (2) the effect was maintained until the proportion of the water was equal to that of the petrol; (3) larger quantities of water interfered with the ignition, which failed altogether after a short time. From this it is evident that atmospheric humidity is of very little importance in the problem of carburation.

ROAD VIBRATION.

The effect of this factor with the ordinary construction of carburetor is very important, as it causes a tilting of the liquid in the float chamber whereby the height of the fuel in the spray nozzle is varied, which results in irregular action of the motor. This action is particularly noticeable when running on the high gear with the motor throttled down. Rounding corners at high speed produces similar effects, which are also easily noticeable. To prevent these effects, some manufacturers provide the float with baffle plates to dampen out the vibrations, while others, including De Dion, employ an annular float, concentric with the nozzle.

The automobile motor of today is expected to work under widely varying conditions of speed and torque, which renders the problem of carburetor design a difficult one. In the early history of the gasoline motor car the engines were designed to run at practically constant speed, and were mostly governed (like a Phœnix motor) on the hit and miss principle. The carburetor employed with these motors was simple indeed, having no moving parts with the exception of the float and its needle or ball valve, and only a single spraying jet. The engine speed being constant, it was a comparatively easy matter to determine the proper size of the jet to deliver the fuel and of corresponding air orifices.

In the last few years, however, the motors have been radically changed in design, improvements having been made in all of the details, whereby it has been rendered much more flexible—in other words, the speed-torque characteristic has been improved. This result is largely due (in the writer's opinion) to advances in the construction of carburetors.

"AUTOMATICITY."

The carburetor of today must supply a constant mixture for various motor speeds, and other varying conditions as outlined above, and it is of interest to note that the first practical suggestion of the up to date "automatic carburetor" was made by Messrs. Bradley and Pidgeon in 1902. Since the spraying carburetor draws its supply of fuel from a small nozzle placed in the path of an incoming charge, it is evident that the force tending to draw fuel into the cylinders of the motor varies as to the velocity of the air past the jet. This suction depends on the form and size of the inlet pipe and the form of the nozzle; but since these are constant in a given design, the suction will depend entirely on the motor speed and the position of the throttle.

Assume the throttle to be "full open," the motor running at normal speed and not governed, and the mixture to be correct, then, if for any reason (such as ascending a gradient) the speed of the motor drops, the suction decreases, owing to the decrease in the velocity of the air past the jet. The result is that the fuel charge decreases, although the same volume of mixture enters the cylinders (which have not been throttled). This results in too weak a mixture, which may ultimately even fail to explode.

Supposing now we have changed to a lower—very much lower—gear; the motor then rapidly accelerates till it may exceed its rated speed, with the result that the draught past the jet increases over and above the normal, till the amount of fuel may become excessive, resulting eventually in too rich a mixture, which will "choke" the motor, causing it to slow down, but not till much fuel is wasted, the ignition plugs are fouled and the engine is overheated perhaps.

From these considerations it will be evident that such a motor must be governed on the "hit and miss" principle, and this virtually gives us a motor of constant speed and almost constant torque.

To overcome these difficulties and obtain a mixture of gasoline and air of constant proportions, designers have proceeded in two ways. One set varied (or attempted to vary) the fuel by acting on the spraying jet, and another and perhaps more successful class of designers kept the fuel supply constant and altered the air velocity past the jet so as to keep it nearly constant.

When it is remembered that the jet in a spray carburetor for a four cylinder, 45 horse power motor measures but .060 inch in diameter, and that of a 15 horse power four cylinder motor only about .04 inch in diameter, it will be clear why failure has attended the first mentioned class of designers. Fig. 1 illustrates the suggested scheme of Messrs. Bradley and Pidgeon, and shows how this device overcomes the difficulties encount-

ered. Assume that the jet shown in the figure is just large enough to supply the proper quantity of fuel when the engine speed is 200 r. p. m.; then as this speed is increased to 800 r. p. m. the mixture becomes too rich. By inserting a small automatic inlet valve in the pipe, as shown in Fig. 1, it is evident that the increased draught due to the increased motor speed, resulting from farther opening of the throttle, will cause

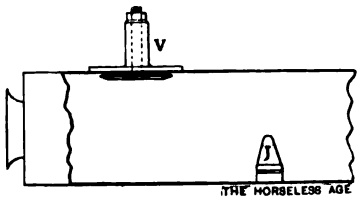


FIG. 1.

the little valve V to open, admitting more air, thereby "compensating" for the extra suction and virtually maintaining a fixed or nearly fixed draught past the nozzle, producing a uniform mixture.

It may occur to some that, since the varying motor speed is the cause of the altering effects on the carburetor, the motor might be used to correct the defects caused by its own variations, and so maintain a uniform mixture. The reason is very clearly stated by J. S. V. Bickford as follows: "Suppose we have an engine with a cylinder of four units capacity, and suppose this engine to run at 100 r. p. m. with throttle fully open; it will require for the maximum output of power for the speed a supply of mixture equal to 400 units per minute. Now suppose the load (torque) to be reduced to one-quarter and the speed to be increased to 400 r. p. m. In order that this speed may be maintained without a governor, it will be necessary to throttle the mixture until the cylinders receive only one-quarter charge (assuming that the torque varies as the quantity of mixture per cycle). The quantity of mixture will therefore be one unit per revolution, or 400 units per minute; in other words the engine is running at four times the speed, and is still taking the same quantity of mixture per minute.

"Obviously therefore any arrangement which controlled the gasoline supply by the speed of the engine would be bound to fail."

The difference in the nature of the inertia of the liquid and the inertia of the air in the induction pipe is rendered clearer when we consider that the momentum of the fuel set in motion by the suction caused by the motor is greater than that of the air, and after the closing of the inlet valve the fuel continues to flow for an appreciable interval, while the air comes to rest more suddenly, owing to its smaller momentum. The use of the "auxiliary air valve" suggested seems after all to offer a simple solution of the problem, and it has been adopted on many foreign and domestic cars.

But in spite of its simplicity and cheapness, this apparatus has some drawbacks. In fact, it does not compensate accurately at all motor speeds, and the mixture oscillates between certain points, but maintains a fair average. The mixture varies owing to variations in spring adjustment, sticking of the valve to its seat, dithering action of the valve when opening and lag of the valve (due to its inertia and spring constant). These objections are largely overcome in the carburetor designed by Major Krebs.

KREBS CARBURETOR.

The air valve of Bradley and Pidgeon is replaced by an automatic compensating device. The action of this device is almost the same as that of the valve, except that the rubber diaphragm and the piston valve connected thereto are opened to the atmosphere through a small vent, which dampens the motion of the piston which uncovers the air ports, thereby preventing the dithering action common to the inlet valve. The air ports are formed to give extra air in quantity not directly proportional to the distance traveled over by the piston valve, but in a proportion which has been found best in practice.

The writer has no data on hand regarding the speed-torque curve of the motors to which these carburetors are fitted, but thinks that the area of ports uncovered by the piston movement bears some close relation to the motor characteristics. From observations made by the writer the increase as well as the decrease of motor speed conforms exactly to the movements of the piston valve in this device, showing that the piston valve is "in phase" with the motor speed. It is my experience that this "harmony" is highly important, for it is found that after long use in a dusty atmosphere, if oil gets onto this compensatory cover

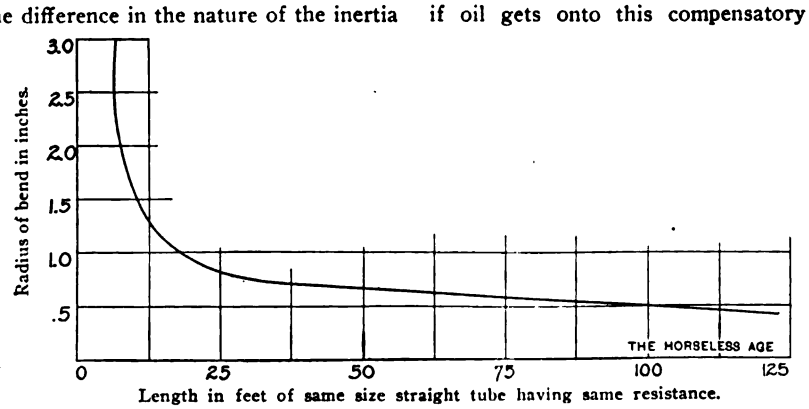


FIG. 2.

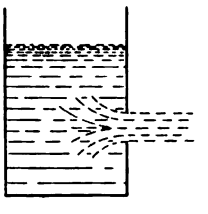


FIG. 3.

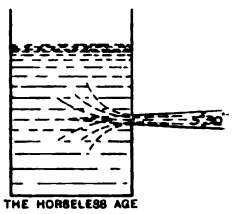


FIG. 4.

closing the vent X and causing the piston to stick, or at least to act more sluggish, the motor fails to "pick up" or to accelerate rapidly.

This sluggish action of the diaphragm has been termed—and I think appropriately—"laziness," and the remedy is apparent.

GROUVELLE & ARQUEMBOURG CARBURETOR.

We must now describe an interesting carburetor, the result of a search for a simpler and more dependable device. The French engineering firm of Grouvelle & Arquembourg have produced a carburetor which is simple in the extreme, and which —in the writer's opinion—operates as reliably as any device yet produced. It was

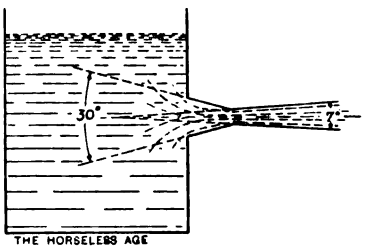


FIG. 5.

shown by experiments of Dr. Venturi, on the flow of liquids through the orifices in the walls of a vessel, that the flow through a plain circular opening could be increased two and one-half times by the mere attachment of a conical mouthpiece to the aperture, the angle of the cone being 5 degrees 30 minutes (Figs. 3 and 4). An investigation was made as to whether the above law holds also for a gas, and by references to the researches of Ser it was found that in the case of air the discharge was a maximum when a mouthpiece with an angle of 30 degrees was placed on the entering side (in Fig. 5), and a similar horn with an angle of 7 degrees on the discharge side.

Thus far all the information was ready made, and experiments were then conducted by means of the simple apparatus shown in Fig. 6.

Into the pipe N was fitted a fan, to produce a suction which was maintained constant; pieces of wood, W, were turned to fit into the pipe, and bored in a conical form, the openings being tapered at different angles, and two of these were inserted, giving any desired angle of ingoing and outgoing mixture of air and gas. The tube M, bent as shown, and immersed in a vessel of water, acted as a pressure gauge and

showed the draught at the end of the pipe or nozzle.

These experiments led them to formulate two very important principles, viz., that with various gases the pressure at the constricted point was proportional to the volume of gas aspirated, and that the point of least pressure (greatest suction) did not vary its position materially with a change in the speed of the flow. The correct form of double cone was then found for the mixing chamber and the position of the jet. The position of the jet may be varied somewhat—a fraction of an inch from the theoretical point. It is stated that the makers supply three jets with each carburetor, stating that one of them will give the best results.

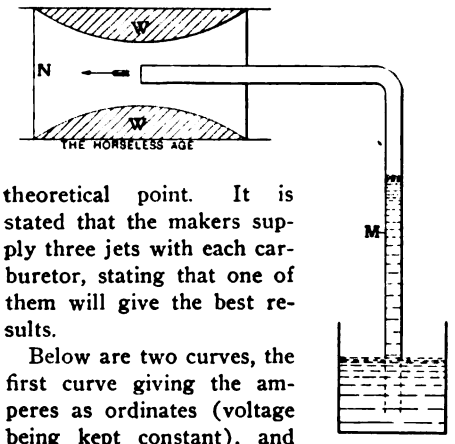


FIG. 6.

Below are two curves, the first curve giving the amperes as ordinates (voltage being kept constant), and the bore of nozzles (from .7 to 1.3 mm.) as abscissas. [We presume that the carburetor was used on a motor driving a dynamo, and that by varying the size of the nozzle varying maximum current outputs could be obtained, as shown by the curve.—ED.] Fig. 8 is a curve showing the variation with motor speed, and is self explanatory.

This device seems to possess all the elements desirable in a carburetor, but nothing of its practical value is known to the writer, so he must withhold his comment for the present.

MERCEDES CARBURETOR.

Another carburetor, extremely simple in design, that has been in use for several years both here and abroad, and been copied on the best cars built in this country, deserves description. I have reference to the Mercedes carburetor. The action of this carburetor is not quite automatic, as that of the types already mentioned, but its regulation is so close that, considering its simplicity, it bears comparison.

The mixing chamber E has an outlet pipe to the cylinders at I, a warm air supply pipe H (usually attached to exhaust pipes of the motor), a spraying jet J, connected to float chamber F, and a piston form of throttle valve T, containing air ports *a*, *b* and *c*. The ports *a*, *b* and *c* are made to register with similar ports in the sleeve X.

Now as to the operation of this carburetor: When the throttle is completely closed, a small notch D still allows gas to enter the inlet pipe I—sufficient to allow the motor to turn slowly—and the air for vaporization is derived from around the exhaust pipe. As the throttle is opened the motor speed increases, and to supply the extra air the ports *a* and *b* register with similar openings in the sleeve C, giving the additional air, the same as in the Krebs carburetor. Still farther opening of the throttle further increases the motor speed and opens the air ports wider; but a point is soon reached where even more air is derived, and one of the upper ports closes and the bottom port opens, together with the remaining port *a*. Upon still farther opening the throttle, port *a* is closed, while port *c* continues to open to the end, when *a* is closed and *c* wide open. This gives the compensating features of the automatic carburetor.

It will be seen that should the motor speed drop, as in ascending a grade, the suction past the nozzle would decrease, giving too weak a mixture; but this may be compensated to a degree by partly closing the throttle to shut off the extra air, entailing a little wire drawing, it is true, but not enough to be noticeable as the motor speed is dropping anyway.

This device is simple, requiring no adjustments after it has been set once, and practically no attention except for slight wear of the throttle valve.

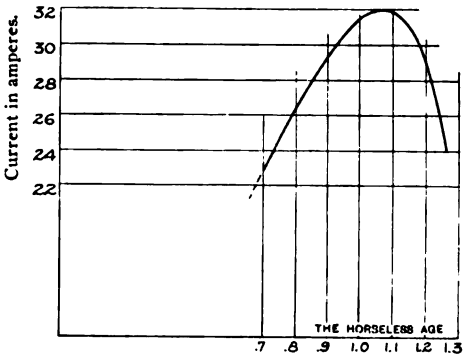


FIG. 7.

MULTIJET CARBURETORS.

During the past year there has been such a large demand for high powered cars of 40 horse power and over, with a corresponding call for perfected carburetors to enable these large motors to be throttled low and yet "pull" on the high gear through the city and the parks, that carburetors are now built on the multijet principle, i. e., a single jet supplies gasoline at low motor speeds and a multiple jet and induction air pipe for high speed work. This form of carburetor has been used for the past season by Leon Bollee, and in its most developed state is being introduced on the 1906 70 horse power Mercedes model. This new Mercedes has four jets, one for slow speed running of the motor and the other jets for increments of the motor speed.

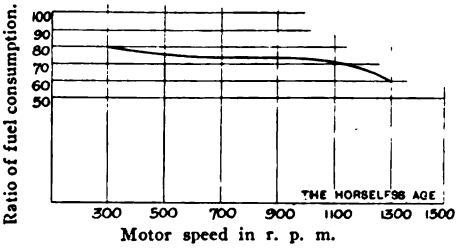


FIG. 8.

ERRATIC ACTION.

Under this caption may be enumerated some carburetor phenomena and explanations offered in accordance with recently discovered facts.

Of all the ills of a gas engine, missing due to a just slightly overrich mixture is the most aggravating annoyance when the true cause is not definitely known. To cite a particular case, which occurred with a four cylinder car equipped with a float feed carburetor, gasoline fed by pressure from tank to carburetor, twin cylinders, each pair fed by branch pipe from the main pipe: Calling the cylinder adjacent to the radiator No. 1 and those following in their order 2, 3, 4, it was observed that No. 3 cylinder skipped badly, but none of the others. To suspect the mixture (which was unalterable) would have been considered the

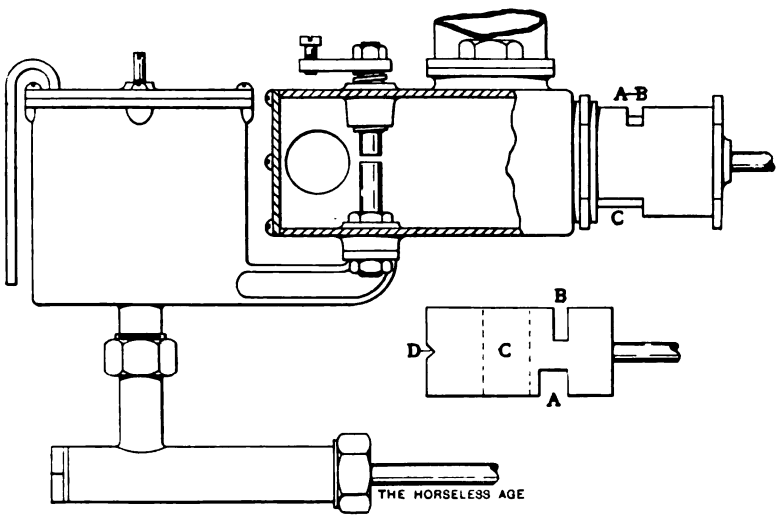


FIG. 9.—OLD MERCEDES CARBURETOR.

thought of one who was not versed in the vims of a gas motor, so the ignition was examined, valves were inspected, and finally (once the trouble was localized), in one cylinder it was thought advisable to remove the cylinder and see if the jacket had not sprung a leak. Much to our regret the jacket was found to be in good condition, and now it was suggested to shut off the gas by plugging the spraying jet, and drilling a smaller hole, which was tried with perfect success.

It appears that the jet in this carburetor had been enlarged by the grinding action caused by the stop jet screw which is screwed down over the spraying valve every time the motor is shut off. It is still a puzzle to some why a motor which misses, owing to a mixture that is too rich in fuel, will continue to run. The reason will readily be understood, I believe, from the following:

Assume that the motor—say after cranking—gets a charge just weak enough to explode. The explosion having taken place, the motor is thereby accelerated in speed, and by virtue of the greater suction a still richer charge is drawn in which now refuses to explode. The momentum of the flywheel, however, carries the crank over, but much slower, and this decrease in the motor speed causes the suction past the jet to drop, so that a smaller quantity of fuel is now carried along by the inrushing current of air, giving a weaker mixture, which is explosive, but the speed upon the explosion of this charge again increases, with the repetition of the results mentioned.

These characteristic actions are so closely related to the symptoms of other defects, namely, weak battery, cracked plugs and water leak in cylinder, that it is no easy matter to localize the fault. After one has ascertained that the ignition is correct he should invariably look to his mixture before suspecting the other possible troubles.

POOR MIXTURE.

This fault is more easily determined, its general effects being more marked. The motor is not readily started without priming, and when speeded up it gives positive indications of a slow burning mixture by firing in the carburetor, and shortness of power on grades. A motor seldom skips on account of too weak a charge, unless it is highly speeded up, which causes the popping already noted.

This back firing into the carburetor is largely due, we are told, to the extremely slow burning of these weak charges, which continue to burn after the exhaust stroke is completed, and when the inlet valve is opened to admit a fuel charge, the charge is ignited on its entrance, causing the back firing. Something similar may occur when the charge is throttled very low and fails to ignite, owing to its not being sufficiently compressed. The result then is that the charge is ejected into the muffler, causing "muffler explosions."

Owing to the slowness of combustion of weak mixtures, it is evident that the spark may be given more lead without producing knocking.

In conclusion I desire to again state that compression, ignition advance, throttle position and motor speed are so closely related to carburetor operation that to consider the problem without any attention to these factors is not studying it in its entirety.

Jet Carburetors.

By J. S. V. Bickford.

In designing and reasoning about carburetors—or for that matter any other instrument—it is well to obtain as accurate a conception as possible of the functions and action of the ideally perfect instrument.

In the case of a carburetor it is not quite certain as yet what the operation of the ideal instrument is. It may eventually be decided that the carburetor which gives an absolutely uniform mixture at all speeds and rates of flow is ideal, and whatever the eventual form should be, I take it that there is little doubt that progress has to move through this position to any more perfect form further on. For if we can once get a carburetor which will give a constant richness of gas at all rates of flow it is quite easy afterward to introduce modifications to allow for variations of the mixture under certain conditions of running. We will therefore begin by considering the possibilities of designing a carburetor which shall give a constant mixture at all rates of feed within its capacity.

THEORETICAL CONSIDERATIONS.

Firstly, I should like to say that I am not much of a believer in instruments supposed to be designed on a careful examination of the rate of flow of gases into a vacuum; that is to say, of course, if the designer assumes any simple law and designs his apparatus on the supposition that it will be followed in all cases. The passages which the air has to traverse, not only in the carburetor itself but in the supply pipes of the engine, are so tortuous, as a rule, and have so many sharp turns, that it would seem very improbable that any simple law of flow would hold good. Were I about to design a carburetor I think I should be inclined, as a preliminary experiment, to couple up an engine to be driven off the shop line shaft and fit my experimental rigs on its induction pipe. I should then have a calibrated gasoline measure to supply my carburetor, and either assume that the quantity of air flowing through the machine would be the full capacity of the cylinders multiplied by the speed or else apply a gas meter to actually measure the quantity, or, perhaps better still, let the exhaust pipe deliver into a measuring tank. In these preliminary experiments I should be measuring the relative rate of flow of gasoline and air, only the perfect mixing of the ingredients being a matter for later examination. There is nothing more fatal to experimental progress than varying more than one condition of an experiment at a time, and there is nothing to tell you whether an increase of power in an actual engine following on an alteration to the carburetor is due to a change in the relative quantities of gasoline and air in the mixture, or a change in the intimacy of that mixture, two entirely different things.

After this digression we will return to the ideal carburetor, which is to give a uniform mixture at all rates of flow. The ordinary jet carburetor will not do this—how is it to be done?

LAW OF AUTOMATICISM.

Now a general law of mechanical apparatus is that where one part is to vary with changes in another there must be some connection from one to the other, or, to express it differently, one part must "know" what the other is doing.

Now what is it that the carburetor "knows"? (I am restricting the term here to just that part of the apparatus round the jet.) I think that we must answer "the degree of vacuum" and "the velocity of the air." If the instrument is a perfectly plain jet carburetor, the first of these factors determines the whole of its action, for the amount of gasoline and air both depend on the degree of vacuum, and nominally at least follow the same law of flow at the pressures we are dealing with. The vacuum in a carburetor is probably very slight in most cases. If the air passage to a single cylinder (or, for that matter, any number of cylinders up to four) motor having cylinders 4½x5 inches running at 1,000 revolutions per minute is 1 square inch, the velocity of the air is probably about 200 feet per second, which is a velocity due to only a difference of pressure of about 5½ ounces per square inch, and the pressure varies as the square root of the speed, so that it will only be 1⅜ ounces at 500 revolutions. The actual size of the passage in a carburetor for this size engine is slightly less than this, and the velocity is higher, but these facts show us the difficulty of constructing a single jet carburetor for any wide range of speeds, for if it has a practicable working vacuum at 200 revolutions it will create a vaccum at high speed which will act as a serious throttle. There is another point to consider. The velocity of efflux of the gasoline will probably follow a fairly constant law, but it is anything but certain that the air will, for it would seem likely that at higher vacua the velocity through the passages leading up to the carburetor will be lower than it should be. This may account for the known fact that the mixture given by a plain jet carburetor is richer at high speeds than at low. Be the cause however what it may, this is the factor we have to deal with, and many and various are the means which have been proposed for dealing with it.

ENGINE SPEED NOT THE ONLY FACTOR.

Stated as above, the obvious remedy is to interconnect the governor with the carburetor to give more air at high speeds, [illegible] were the engine always run on a full, [illegible] throttle, this would do quite well; but [illegible] pose, in one case, the engine is

with the throttle closed down, so that only one-half full charge is taken at 500 revolutions, and the next minute a hill is encountered and the throttle being opened the speed remains constant. As far as the governor "knows" the conditions are unaltered, and it consequently keeps the carburetor adjustment constant, whereas twice the gas is now being made. Obviously, therefore, from this point of view the speed of the engine is no good for our purpose, the only variable being the quantity of air going through the carburetor and that in consequence of the increased vacuum. The same remark applies to Napier's hydraulic governor, though it seems to work well. In this case it is probably modified by special air ports in the throttle valve.

The only other item which changes with the quantity of mixture passing through the carburetor is the back pressure in the silencer, which has been proposed by the Wolseley Company and tried, but (I believe) abandoned.

We are therefore left with only the vacuum in the carburetor to deal with.

As we have seen that the proportion of air and gasoline do not remain uniform at different velocities, it is at least likely that the change of proportion follows no simple law, and it was in recognition of this apparently that the Krebs carburetor was designed. In this instrument the pressure acts on a diaphragm which opens additional air ports. It is obvious that by noting the deflation of the diaphragm at different speeds and simultaneously noting the opening of the auxiliary regulator (set by hand for this time), it is perfectly possible to so combine these two sets of facts that the change of one shall produce the corresponding change in the other. It seems, however, that in practice this carburetor is rather complicated to work, and that a cruder instrument would do the work quite as well. At any rate it has not come into use to any large extent, though modifications of it are used by Crossley and on the Germain car.

SUPPLEMENTARY AIR VALVES.

The most common method in use today for rendering the mixture of vapor and air supplied by a jet carburetor more constant is the insertion of a small inlet valve in the mixture pipe, and this is now becoming almost universal. It is cheap to make and very little liable to derangement, some patterns of this valve being on the market at as low a figure as $3. Such a carburetor is quite satisfactory for engines of moderate power, but it seems to me that they leave something to be desired for large engines, which are wanted, on occasion, to run at very low speeds with next to no load. It will be an interesting inquiry what are the conditions to be satisfied by such an instrument.

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the velocity, and on the other by the fall of the velocity of the air to a point too low to vaporize the gasoline. In the present case we shall have to assume these data and argue on them, as I have no data in my possession to go on. This course has not as many objections as at first sight appears to be the case, as the error, if there be one, will only be one of degree and not of kind.

Let us then assume that the maximum back pressure, or, to be more correct, vacuum, permissible is 2 pounds per square inch, and the minimum velocity to properly vaporize and spray the gasoline that due to a pressure of 4 ounces per square inch.

I do not think that it is really safe to go much below the latter figure, though there are certainly engines working with a lower velocity, but my experience with heavy oil burners teaches me that the spraying effect of pressures below this amount is inconsiderable. The velocities given by the two pressures are 480 and 170 feet per second, respectively—let us say approximately as three is to one.

VARIATION IN DEMAND OF CHARGE.

Further, let us assume that the engine is required to run from full load at 1,200 r. p. m. to no load (except the friction, which would probably amount to one-seventh the maximum power at the given speed) at 200 revolutions; or, in other words, the carburetor has to supply a perfect mixture in quantities, varying between one and forty-two (six times the speed and seven times the load); that is to say at 200 revolutions the engine is using 1 cubic foot of gas per second, while it will be using 42 cubic feet at 1,200 revolutions and full power. Immediately the problem is placed like this, the difficulties are apparent. We see above that it is doubtful whether we can obtain a variation of more than one to three in one mixing nozzle, and even if we run the vacuum up to a dangerous limit, even 7 pounds per square inch, we should only get a velocity about double that given, i. e., about 900 feet per second, and we are not much nearer, as we should require our carburetor to work at a lower limit of 22 feet per second, or that due to a pressure of something like one-sixteenth inch water gauge. Our calculations will be in some measure modified by the fact that a richer mixture is produced at the higher pressure, and an additional supply of air becoming necessary, a greater total supply of mixture is produced at this pressure, so that we may possibly obtain, within the limits of pressure selected, a variation of one to four, but this is not great help to us, as to obtain the variation demanded by our engine we should have to use ten mixing nozzles and jets. Is it possible then to vary our conditions? Would it be possible to work with a lower velocity than that selected? In my own experience I have found that a heavy oil burner can be worked down as low as 1 inch water pressure, but the connection between the two is not very complete, as this was a burner in which the oil was blown on to a broken brick floor, and the flame so produced blowpiped by further air supply, so that spraying was not necessary. If, however, it were found to be possible to work with a velocity due to a pressure of 1 ounce per square inch, or about 85 feet per second (60 miles per hour), we should then have a variation in one nozzle between 480 and 85, or as one is to five, which would still require eight nozzles to work the engine, but if we make the same allowance as before for the air introduced by the additional air valve, our variation might be brought up to one to seven, and the number of nozzles reduced to six. I hardly think that this would be a practicable carburetor, though it might be possible to allow to use four nozzles.

MULTIPLE NOZZLES.

With four nozzles each nozzle would have to be capable of a variation in supply in the ratio of one to ten, and allowing for the additional air valve, this might be reduced to a ratio of air velocity of one to eight, or with a higher limit as before, 480 feet per second (the velocity rises so slowly with increased pressure that nothing is to be gained by trying to increase the higher velocity), our lower limit would fall to 60 feet per second, or that due to one-half ounce per square inch. Whether a carburetor will work efficiently at this pressure remains to be proved.

If the engine had four cylinders with a total capacity of 500 cubic inches (approximately 40 horse power) at 1,200 r. p. m., it would require 10,000 cubic inches per second of mixture, and at 480 feet per second one square inch orifice will pass 480×12 cubic inches per second, so that we should require a total cross sectional area of our four nozzles of $\frac{10{,}000}{480 \times 12} = 1.6$ square inch or .4 square inch each. Allowing for the additional air valves this would be still further reduced to possibly .35, giving a minimum diameter of five-eighth inch for the four jet nozzles of a 40 horse power engine.

We have now to consider how these four jets are to be controlled so that each will come into operation in its turn. Suppose, in the first instance, that we fit each nozzle with an ordinary mushroom valve controlled by a spring. Obviously, when the pressure rises to such a point that this valve on the second jet (say) begins to lift, air will only leak through it, and there will not be sufficient force of air or vacuum to produce a flow of gasoline, so that this jet for a time will act only as an auxiliary air inlet, which is not what is wanted. The arrangement would be improved by using a very long spring on this control valve, which would require approximately the same force to move it at any point of its compression within the limits necessary, but this would only be a mitigation of the evil. I believe, however, that the trouble could be overcome with a flap door controlled by a spring on a short arm, as shown in Fig. 1. If this door valve be supposed to be oper-

ated not so much by the suction pressure as the pressure due to the air velocity the pressure on it will remain sensibly constant (per square inch exposed) as it opens, but the virtual area exposed will diminish as the sine of the angle of opening, but it will be seen that the arm through which the spring acts also diminishes according to the same law, and if the spring be long enough to retain a sensibly constant tension through the amount of extension necessary the pressure and resistance would remain constant, and the door would open wide for the slightest increase of pressure or velocity. We are, however, making a rather wide assumption in supposing that the pressure on the door when closed will be no more than when it is partly open, and if this should be found not to hold good the whole apparatus would fail. There is yet another method available, however.

First it must be noted that when the throttle is wide open the only variation in the quantity of mixture passing the carburetor is that due to the change of velocity due to load, and we have already seen that a variation in a given jet in the ratio of one to eight is permissible, which would permit the engine speed to fall from 1,200 to 150 under the influence of the load, without seriously affecting the mixture, provided the throttle is at the open, and we only require a reduced number of jets when the throttle comes into action. Here, then, is our solution of the difficulty. The throttle must so operate as to bring jet after jet into action. I am not now engaged in describing the construction or design of any given carburetor, so it will not be necessary to show how this can be done; but many ways will occur to any designer, as for instance a long, cylindrical valve, with a slot opposite each jet nozzle, these slots differing in length, but beginning on one axial line. The jet opposite the longest slot would first be uncovered, and all the rest in succession.

CONTINUITY OF VARIATION.

We have then got a four jet carburetor, with the throttle opening jet after jet as required, and we now have to examine the arrangement of the auxiliary air inlet valves. Obviously one valve will not do, for if it be proportioned to the whole four jets in operation at once, it will either not act at all when only one is in use or will flood the engines with free air, according to the point it is connected at, besides which there are difficulties in the way of so connecting up a single valve that it will not act as a short circuit from one jet to the next and so forth, and as far as I can see if we are to use an auxiliary air supply a valve must be applied to each nozzle. It already follows as a necessity from our throttle design that each jet must deliver into a separate mixing chamber, otherwise we could not cut off one only, and it is on this mixing chamber that the auxiliary air valve must go. We have therefore added the automatic auxiliary air mechanism, and

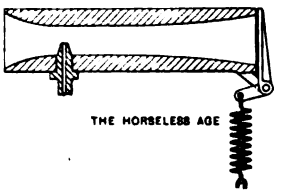


FIG. 1.

if our assumed data are correct we have an instrument which will give a sensibly constant mixture at all rates of delivery within its capacity and having a range in the ratio of 1 to 40. But it is not certain that this is quite desirable; it may be advisable to slightly weaken the mixture as the throttle comes into action.

WEAKENING THE MIXTURE WITH INCREASE IN LOAD.

Consider first one jet chamber alone (Fig. 2). If we add air to the mixing chamber A, the only effect will be that the auxiliary air valve will close, and we shall just change the auxiliary for the manual valve, which will do us no good. If, on the other hand, we introduce the air beyond the throttle valve, we shall have trouble with a four jet carburetor, for when it is throttled down to one jet the auxiliary air valve will be at its widest open or as it ought to be for all four jets in action. I am assuming that the weakening of the mixture must not proceed beyond a certain point, and that only a certain proportion of additional air must be added. If this is not fulfilled we shall reach a point where the mixture is not explosive, and waste gasoline.

What then are the conditions which have to be fulfilled? In any one jet chamber there must be no change of vacuum by opening the manual air valve, hence the only thing which can be done is to weaken the mixture entering the mixing chamber. How is this to be done? It is not practicable to open the throat of the nozzle wider, though it might possibly be feasible to have a cone in the nozzle and withdraw it, thus virtually increasing the size of the throat (B, Fig. 2), but I believe that there is a still better way than this. If the neck of the nozzle be parallel for a short distance, and the jet placed at the outer end of the parallel portion (C, Fig. 2), and if we drill a series of holes D inside the jet in the nozzle and introduce air here, it seems to me that we shall not have increased the net size of the throat or neck, but we shall, so to speak, short circuit some of the air past the jet, so as to reduce the vacuum at the jet and thus reduce the gasoline supply without altering the vacuum in the mixing chamber A.

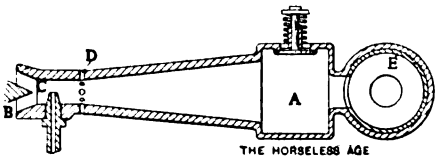


FIG. 2.

INTERCONNECTION OF THROTTLE AND EXTRA AIR VALVE.

The last thing we have to consider is the arrangement of the throttle valve to operate both the four nozzles and the auxiliary manual air supply. We have already seen how the nozzles are controlled by the cylindrical valve E, and to control the manual air supply I would suggest (many simpler ways could no doubt be found) a second parallel cylindrical valve coupled up with a coupling rod (like a locomotive side rod) to the throttle. This second valve would be provided with slots uncovering the auxiliary air supply when the slot in the other valve covering the nozzle had closed a predetermined amount; further, the opening might be quite sudden, for the suction on the auxiliary air would be the same as that on the nozzle itself, and if the auxiliary air holes in the throat were proportioned by experiment to give a definitive weakened mixture, then as soon as the auxiliary air was turned on this weakened mixture would be supplied. That is to say, each nozzle would supply two grades of mixture, and two only, a rich and a weak.

Another difficulty crops up here—that the total mixture to the engine will be richer under the influence of the throttle when four jets are just in use than with any lesser number, because auxiliary air will only be supplied to number four, the other three supplying rich gas, so that where four nozzles were just in use we should have one nozzle supplying weak gas and three rich, and the average be much richer than where only the one nozzle was in use, and that throttled. This problem, if it is worth solving, I will leave to my readers.

CONCLUSION.

To sum up, we see that under certain postulated conditions we have been led to presume that the best practicable carburetor for a four cylinder engine will have four gasoline jets and four air inlets to correspond; each nozzle will deliver into a separate small chamber from which the outlet to the gas pipe will be controlled by the throttle so arranged as to open them in turn. Each mixing chamber will have a small automatic auxiliary air valve, and in addition to this the mixture will be weakened by additional air supplied by a valve interconnected with the throttle valve, and delivering air to the throat of the vena contracta nozzle between the mixing chamber and the jet. That our argument is fairly sound is perhaps proved by the fact that the latest Mercedes engines are fitted by a four jet carburetor controlled by the throttle.

It is worthy of note that the latest Mercedes carburetor, of the multiple jet type, is based upon the invention of an American automobile engineer, vi kin connected with the Da Company. The num American patent is 7

Compression.

By L. E. French.

In designing a gasoline motor, one of the first things to be considered is the compression pressure, since this must be decided upon before the engine proportions can be definitely determined.

VARIABLE CONDITIONS.

There are naturally many variable conditions which affect the compression during the operation of an engine. The initial pressure changes with the speed, and the heat interchange per stroke between the metal walls and the gas also changes with the speed. Moreover, the proportion of gasoline vapor which is mixed with the air changes the compression pressure, as will be shown later.

THEORY.

Before determining the pressure in terms of the percentage clearance, it will be necessary to understand a few of the fundamental thermo-dynamic principles underlying the subject. There seems to be a tendency on the part of some of the so called "practical men" to scoff at anything called theoretical. A gentleman of this class recently designed an unusually large steam engine, in which the crank shaft twisted off the first time the machine started Five minutes' calculation would have saved hundreds of dollars. Several cases have recently come to my attention in which designers of gasoline engines have been calculating their compression by erroneous methods, coming out with values containing errors of from 50 to 25 per cent. It is therefore advisable to learn something of the theoretical before attempting the practical.

A perfect gas follows the law:

$$P V = w R T \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (1)$$

where P is the absolute pressure in pounds per square foot, V the volume in cubic feet, w the weight in pounds, T the absolute temperature in degrees Fahrenheit and R is a constant depending upon the nature of the gas.

Gas may be compressed in a cylinder in an infinite number of ways, but there are four special cases worth considering separately. If the volumes are plotted as abscissas, and pressures as ordinates, the conditions may be represented graphically as in Fig. 1. The line 1—2 represents compression at constant pressure. Referring to equation (1), we see that under these conditions the volume varies directly as the temperature. The curve 2—4 represents compression at constant volume, and the pressure then varies directly as the temperature. If the temperature is kept constant throughout the stroke, equation (1) shows us that the product of the pressure and the volume is a constant, $P V = C$. If P_1 and V_1 = the pressure and the volume at the point 1 and P_3 and V_3 = the pressure and volume at the point 3, then $P_1 V_1 = C = V_1 = P_3 V_3$, which is true for any curve. This constant temperature which is known at 1—3, is, with equal weights, also a constant heat curve, and is known as the isothermal.

If there is no interchange of heat between the gas and the confining walls during the compression the curve is called adiabatic. Such a curve is shown at 1—4, Fig. 1. Although there is no transfer of heat, as such, during the compression, the pressure, volume and temperature are all changing, and the quantity of heat in the gas is also changing throughout the stroke. This is because the work which is being done upon the gas appears in the form of heat in the gas itself, and as no heat is lost to the walls, the quantity of heat in the gas during the compression constantly increases. By a simple mathematical derivation from the first law of thermodynamics, it may be shown that the curve has the form $P V^y =$ constant or $P_1 V_1^y = P_4 V_4^y$, where y is the ratio of the specific heat at constant pressure to the specific heat at constant volume.

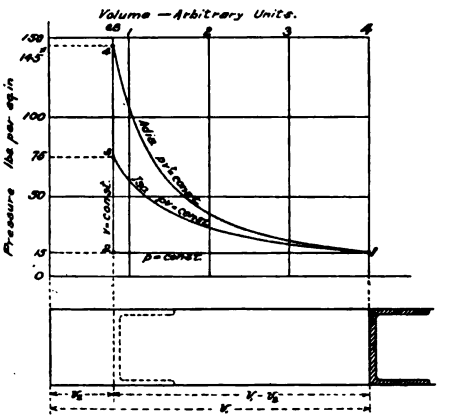


FIG. 1.

For air y is equal to $\frac{C_p}{C_v} = \frac{.238}{.169} = 1.41$.

Many other curves are of the form $P V^n =$ constant. In the isothermal $n = 1$.

PERCENTAGE CLEARANCE.

The clearance is shown in Fig. 1. If 1 and 2 are the positions of the piston at dead centres, V_2 is the clearance volume and V_1 the total volume. Then $V_1 - V_2$ is the displacement.

$$\frac{V_2 \times 100}{V_1 - V_2} = \text{the percentage clearance.}$$

DETERMINING THE COMPRESSION.

The final compression pressure may be easily and quickly determined by means of the curve, Fig. 2, which was kindly drawn for the purpose by W. M. Davis. Suppose that an air compressor has 30 per cent. clearance, and that the pressure at the beginning of the stroke is 10 pounds per square inch absolute. Running from 30 per cent. to the upper curve and then over to the scale at the left it is seen that the pressure at the end of the stroke is 80 pounds absolute or 65 pounds gauge. The initial pressure P_1 varies, however, in different machines and at different speeds, and it is necessary to allow for this. Nine or ten scales for P_1 might be provided at the left, but in order to simplify matters we have used one scale at the top. The nine lines across the curve correspond to nine initial pressures, ranging from 7 pounds abs. up to atmospheric. Taking the same case as before, we run from 30 per cent. up to the curve, then horizontally to the 10 pound line, and then vertically to the upper scale, where the pressure is found to be 80 pounds abs. If P_1 had been 15 pounds abs. P_2 would have been 120 abs. It is thus quite simple to obtain P_2 when the percentage clearance is known, or to obtain the percentage clearance necessary to produce a given compression P_2.

The calculation of P_2 by formula is also quite simple. Starting with the expression

$$P_1 V_1^n = P_2 V_2^n \text{ or } P_2 = P_1 \left[\frac{V_1}{V_2}\right]^n, \quad (a),$$

let C = the percentage clearance and $V_1 - V_2$ the displacement, then $V_2 = C(V_1 - V_2) = CV_1 - CV_2$; $V_2 (1 + C) = CV_1$ $V_2 = \frac{CV_1}{1+C}$. Substituting this value of V_2 in equation (a), we have

$$P_2 = P_1 \left[\frac{V_1}{\frac{CV_1}{1+C}}\right]^n = P_1 \left[\frac{1+C}{C}\right]^n \quad (2)$$

Let $\frac{1+C}{C} = K$, then $P_2 = P_1 K^n$ where P_2 is the abs. pressure after compression in terms of the initial pressure (abs.) and the per cent. clearance. It will be noted in Fig. 2 that K is plotted to the right. P_2 in each case is equal to the proper value of K^n multiplied by P_1. Running from the per cent. clearance to the curve and then to the scale at the right, the value of K^n is obtained.

MODIFYING CONDITIONS.

In working out the curve, Fig. 2, it was desired to obtain results which were not only unchanging but absolutely accurate. The upper curve is therefore drawn for pure air, compressed adiabatically. Two other conditions affect the results, as explained above, when the engine is in operation, so that a correction is necessary when it is desired to find the compression under running conditions. A value for n has been worked out from actual indicator cards and should give quite close results, for although it represents a special case, the variation in different engines will not be sufficient to impair the results for practical purposes.

The following citation is taken from Wood's "Thermodynamics, Heat Motors and Refrigerating Machines."

EXPANSION AND COMPRESSION CURVES.

"Since there is a flow of heat from the working substance to the water jacket and the reverse, the curves will not be strictly adiabatic, neither will they be isothermal. Their character may be more accurately determined from a study of the actual diagram. Assuming that they follow the law $P V^n =$ const., Messrs. Brooks and Stewart found for the expansion curve that

$n = 1.363$, and for the compression curve $n = 1.335$. Professors Ayrton and Perry, by a less accurate experiment, found for the expansion curve $n = 1.479$, and for the compression curve $n = 1.304$. These results show that it is much more nearly adiabatic than isothermal. The value of y used in our analysis should be less than 1.41 (the value for air), because the presence of the hydrocarbon of the mixture will reduce the ratio of the specific heats; but since the quantity of air predominates, we may in the absence of actual measurements use 1.41. Air behaves so nearly like a perfect gas that this value would be practically constant, even for the highest temperatures, if the expansion were adiabatic."

With the value of n as determined by experiment, the formula $P_2 = P_1\left[\frac{1+C}{C}\right]^{1.335}$ will give results as accurate as necessary for the purposes of designing. The lower curve is for an engine mixture, and is the one to be used to determine the compression under operating conditions.

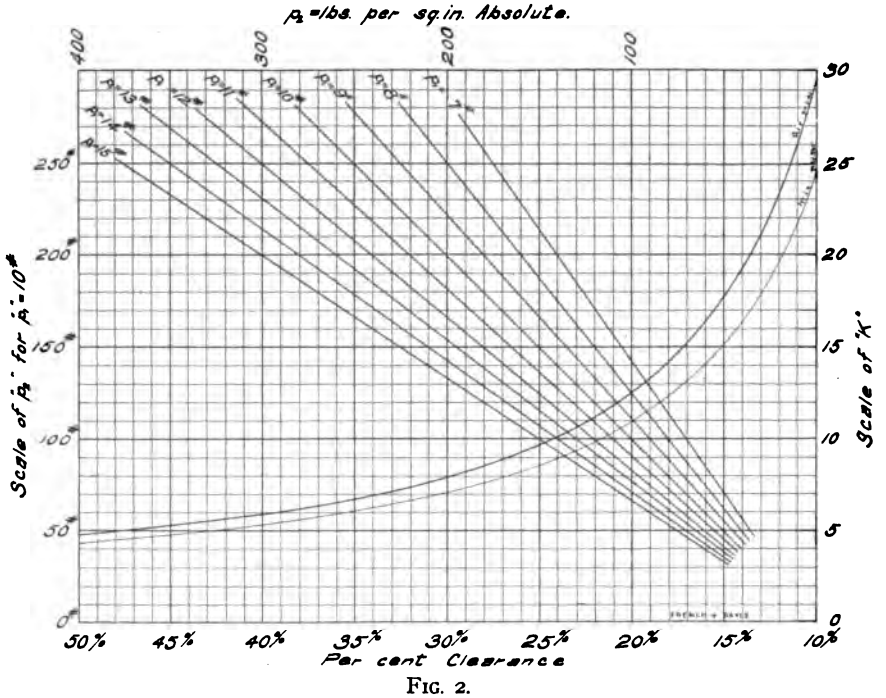


FIG. 2.

EFFICIENCY.

The actual efficiency of a gasoline engine, according to Reeve, though less than the theoretic, is very closely proportional to it. The latter is given by the expression

$$E = \frac{T_2 - T_1}{T_2} = 1 - \left[\frac{V_2}{V_1}\right]^{.402} \therefore E = 1 - \left[\frac{C\,V_1}{V_1(1+C)}\right]^{.402} = 1 - \left[\frac{C}{1+C}\right]^{.402}$$

But $\frac{C}{1+C} = \frac{1}{K} \therefore E = 1 - \left(\frac{1}{K}\right)^{.402} = 1 - \left(\frac{P_1}{P_2}\right)^{.304}$

where P_1 is the initial pressure and P_2 the pressure at the end of compression. Let $P_1^{.304}$ be constant and call it M. Then $E = 1 - \frac{M}{P_2^{.304}}$. It may be seen at a glance from this, that as P_2 is increased the efficiency is increased, hence the higher the compression the higher the efficiency of the engine.

Spark and Throttle Control.

By A. L. B.

A glance at some of the new models shows some interesting tendencies as regards the devices for controlling the throttle and the time of ignition. The tendency is distinctly to employ separate levers, usually mounted upon the steering wheel, to perform these two functions. A small number of makers, however, employ only one lever to control both the throttle and the spark. The principal objection against this arrangement is that it is impossible to open the throttle without simultaneously advancing the spark. The difficulty arises in ascending a hill, or in going through a very sandy stretch, when it is desirable to open the throttle to obtain the full power of the engine, but when the time of ignition should not be advanced, owing to the slow speed of the motor. But as it is impossible to sufficiently open the throttle without at the same time advancing the spark, a pronounced knocking is the result, as is always the case when the spark is too far advanced.

A very excellent way of doing away with one of these control levers, which is a comparatively new idea, is employed on a few cars. This latter method consists in having the time of ignition controlled by a governor. Some claim that it is practically impossible to adjust such a governor so that the time of ignition will be correct. In point of fact it is extremely difficult, but it is doubtful if many drivers are able to control the spark by hand with anywhere near the same accuracy that it can be regulated by a mechanical governor. The only other objection against this method is that it requires some additional lever, or other arrangement, if the motor is to be started from the seat without cranking, but it is but a comparatively simple matter to fit such an arrangement to a car using a mechanically governed spark. There is no doubt that this system has a great deal of merit, and it is not unlikely that a more general adoption of it will be seen by another year.

LOCATION OF CONTROL LEVERS.

But, as stated before, by far the most common form is that in which two levers mounted upon the steering apparatus are employed. In a few cases these levers are located on the steering column below the wheel, but the general practice seems to be to place them on top of the wheel where they are more easily accessible. The levers are sometimes placed on a sector which revolves with the steering wheel and therefore turn with it, and sometimes they move over a stationary sector, and are hence always in the same relative position to the driver, no matter in what position the steering wheel may be. This difference is more a matter of taste than anything else, as every driver is usually in favor of the arrangement with which he is the most familiar. The stationary sector is, if anything, the simpler and easier method, and has been adopted by a few concerns who have previously been using the revolving sector.

A very novel arrangement of the spark lever is seen on two of the new models. Usually both spark and throttle levers revolve, one just outside the other, on the same axis as the wheel, but in these two cases the spark is controlled by a small vertical lever moving in a vertical plane and perpendicular to the wheel. It is claimed by those who have used it to be a very convenient arrangement, but this, too, is merely a matter of taste and is not likely to be very generally adopted.

THE ACCELERATOR PEDAL.

It is gratifying to see the large number of cars which are now using a foot throttle or accelerator in addition to the regular hand throttle. A few are still opposed to this additional foot lever, but they are for the most part those who have never driven cars so equipped. In changing gears, by using the foot throttle to obtain the necessary momentum before shifting, it is possible, by simply releasing the pressure of the foot, to bring the engine speed much nearer to the point which the speed of the car and the new gearing require, than when a hand throttle has to be used. And in running a car through a crowded street, or over an exceptionally rough road, when it is essential to have both hands firmly on the rim of the wheel, a foot throttle is certainly a great convenience, if not almost a necessity. A great many of the new cars, especially the more powerful ones, are fitted with an accelerator, and it is hoped that others will not be slow in following their example.

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Catalogue of Vehicles at the Shows.

In the present issue will be found our annual catalogue of vehicles exhibited at the New York shows, arranged in order of price. The two shows will open shortly after the appearance of this issue, and we hope that the catalogue may prove of practical value to visitors who attend the two exhibitions. The information given covers all the important features of the cars, and the experienced reader who knows what he wants will be able to tell from this condensed information whether a car is likely to appeal to him or not. This information could of course also be arranged in tabular form, whereby considerable space might be saved, but we have purposely avoided the use of tables, as they are never very convenient to use.

In order that the prospective purchaser may employ a visit of a few days at the automobile shows to the best advantage, it is necessary for him to select beforehand a list of the cars that are likely to come nearest to his requirements, and then confine his attention at the shows to these; for if he makes an attempt to study everything exhibited, the effect on his mind is most likely to be one of confusion, and while he may enjoy a glance at all the new things shown, he will learn little or nothing of practical value. Fortunately, this year descriptions of nearly all the new models have been published before the shows, so that the visitor who has followed the more important trade publications is already familiar with what will be shown by the majority of the exhibitors. The shows will serve to supplement the information contained in the technical descriptions, enabling the visitor to judge
elf the execution of the designs.
publish in this issue a list of
s at the various stands of both shows. Our object in publishing this rather long list is not to cater to that personal vanity which is pleased by a mention in a paper, but to facilitate meetings for business or social purposes between acquaintances of the trade to whom the New York shows offer the only opportunity for a personal meeting. The list contains the names of practically all the trade people attending the shows and tells also where they may be found.

The Direct Drive Patent.

As mentioned in our last issue, the firm of Renault Frères, of Billancourt, France, are claiming royalties from French manufacturers who employ the "direct-drive-on-high" change speed gear in connection with the shaft drive to the rear axle, on which system a French patent was granted to Louis Renault in February, 1899. It appears that the Renault firm instituted an infringement suit under this patent, and the validity of the patent was sustained by the court of last resort. The defendant firm is not mentioned in any of the reports of the case that have reached us, but undoubtedly it was some little known concern, as otherwise something would probably have been heard of the case while it was pending. Now that the patent has been sustained by the court of last resort, nothing seems to remain for French manufacturers employing this type of transmission but to accede to the demand of the Renaults or return to the old Panhard system. If they had recognized the danger a little earlier they might possibly have prevented the present, to them, unpleasant situation. The Court of Appeals in acting on the case was not guided by expert testimony, which would appear essential in such a

case. The only priority reference was to an invention of Whitney, comprising a two speed planetary gear and propeller shaft, with which the drive is also direct for the high speed gear. This, however, was declared to be no anticipation of the Renault invention, as the planetary gear has no stationary case. The Renault gear, as is well known, closely resembles a back gear as used on machine tools. The back gears are meshed with the gears on the main shaft by a sideways movement, and for the direct drive the two parts of the main shaft are clutched or locked together.

The Renault change speed gear has also been patented in this country (as well as in England, Germany, Belgium, etc.), and although the favorable decision of a French court does not establish the validity of the American patent, it will undoubtedly add to the value of its possession, and it would not be surprising if the United States Renault direct drive patent should be acquired in the near future by some firm either in or out of the Association of Licensed Automobile Manufacturers.

Compression.

There has been a good deal of discussion on this important subject in our columns recently, but unfortunately we have not been much enlightened by it. The chief point under discussion has been, "What is the most advantageous compression pressure for automobile engines?" but in the discussion other questions were introduced, such as the relation between the ratio of compression volumes and the compression pressure, and the relation between compression pressure and mean effective pressure of explosion. The discussion has been rather devoid of argument backed up by experimental data, and it indicates what we believe to be a fact, namely, that the investigation of the high speed internal combustion engine by means of the indicator is as yet a practically unexplored field. The formulæ found in some of the text books on gas engines are not applicable to modern automobile motors, because they are, without exception, based upon data obtained in experiments with low speed, stationary gas engines. Now the effects of wire drawing in the inlet passages and cooling of the cylinder walls are certainly much more pronounced in high speed engines, and the difference in the fuel certainly also makes a difference in the mean effective pressure. It can be readily seen that since the decrease in the power of motors at very high speeds, down to zero, is directly due to the reduction in the quantity of the charge taken in by the cylinders, the variation in the quantity of charge, and hence in the compression, with speed, must be very considerable. Consequently the ratio of compression volumes no more fixes the compression than does the piston displacement fix the horse power of a cylinder. It is, of course, possible to calculate from the compression ratio the maximum theoretical compression pressure, under the assumptions that the cylinder at the beginning of the compression stroke be filled to atmospheric pressure, that there be absolutely no leakage, that the compression be adiabatic, and that the gaseous mixture have the same specific heats as pure air. None of these assumptions is absolutely correct in practice, and the actual compression must always be lower than that shown by the calculation.

Famous Engineering Firms Entering the Automobile Industry.

An interesting feature of the recent development of the automobile industry has been the entrance into it of firms prominently connected with other branches of mechanical engineering. Most of these firms have either taken up the manufacture of automobile parts similar in character to the products in their regular line of business, or have engaged in contract work for automobile manufacturers of a kind for which they are specially fitted by reason of their special equipment and experience. Of course, of the firms now regularly engaged in the manufacture of complete automobiles, many started in business as manufacturers of other articles, and regard the manufacture of automobiles as only a branch of their business. These latter concerns, or at least those of them that entered the automobile line at a comparatively early date, encountered all the mechanical difficulties that were met by the individual experimenter. The mechanical problems of the automobile had yet to be solved, their solution necessarily required time, and no amount of experience in related lines sufficed to produce a highly developed machine on first attempt. The only point in which the already established manufacturers may have had the advantage at times was that they usually had at hand a staff of skilled mechanics, so that no failure was likely to result from poor execution of the designer's ideas. But the greater number of defects in the early machines was due to improper design. Now, however, that the principles of good automobile design have largely become public property, and that standardization of types is being approached, the entrance into the automobile field of firms prominent in other branches of mechanical manufacture, to devote themselves to the manufacture of specialties falling within their adapted lines, or to classes of work for which they are specially equipped, ought to mean a great deal for the advancement of automobile construction. A number of firms of international reputation have thus become associated with the auto industry in recent years. Their experience and facilities enable them to produce the very best work possible at the present stage of machine construction, and as these firms extend their activity in the automobile line complaints about poor construction ought to become less frequent.

Offsetting the Cylinders.

The practice of slightly offsetting the centre of gasoline engine cylinders with respect to the centre of the crank shaft has recently been adopted by one more French manufacturer and is now followed by three of the foremost French makers (Mors, Hotchkiss and Richard-Brasier). This practice, as applied to reciprocating engines generally, was originated by the Westinghouse Machine Company in 1886, when they placed upon the market a high speed single acting steam engine. It has been followed by one American manufacturer (Duryea) for years, and is now being adopted also by others. It would not be surprising if, now that it has received the stamp of foreign approval, the practice should soon become general here. The result of offsetting the cylinder is that the side pressure of the piston on the cylinder wall is decreased during the power stroke and increased during the compression stroke, but as the compression pressure is much lower than the explosion pressure the increase of the side pressure during the compression stroke is less important than the decrease of the side pressure during the expansion stroke.

The Three Port, Two Cycle Motor.

By E. W. Roberts, M. E.

The following remarks being based upon the writer's experience in two cycle practice, it is necessary to refer frequently to experiments he has made. He sincerely hopes that it will open up further discussion of this much abused motor from an unbiased engineering standpoint.

The two cycle engine may be said to be the pet aversion of those who have built four cycles only, or have simply dabbled in two cycles. Why? The answer is that almost anyone with a little skill in proportioning and a knowledge of steam engine design can design a four cycle, but it requires experience, often dearly bought by expensive experimenting to design a two cycle, especially for high speed work.

TWO TYPES OF TWO CYCLE MOTORS.

It was high speed work that brought into prominence the three port, two cycle in preference to the two port type. The difference in the two engines is this: In the two port motor the mixture is first drawn into the airtight crank case through a check valve, afterwards flowing to the cylinder through a bypass or transfer port because of being compressed in the down stroke of the piston. In the three port type the check valve is omitted, and instead there is an opening or port in the cylinder wall which communicates to the vaporizer. This port is uncovered by the piston when the latter is nearly at the top of its stroke, and closed by the piston when returning upon its down stroke.

This opening and closing is exactly like the action of the piston valve of a steam engine. Upon the up stroke of the piston a vacuum is formed in the crank case. When the crank case port is uncovered the mixture rushes in, is trapped by the return of the piston, and is slightly compressed (to from 4 to 8 pounds) to supply the cylinder above the piston. The difference between the two types is much the same as between the four cycle with a suction inlet and that with a mechanical inlet.

A FALSE THEORY.

The resistance of the check valve in the two port type "wire draws" the air and limits the piston speed. Joseph Day, it seems, built his first engines of the three port type and afterwards changed to the two port, because of a fancied loss of efficiency due to the vacuum produced during the up stroke. As it happens, the three port engine, on account of the free passage it gives to the intake during the opening of th[illegible]ort and the quick draft of [illegible]ening, is exceedingly w[illegible]obile service and [illegible]ry common thin[illegible] designed for torque to 1,1[illegible]

DESIGN OF TWO CYCLE MOTORS.

The design of a two cycle in the average shop is accomplished by a cut and try method, engine after engine being built and discarded until the proper proportions are arrived at. A manufacturer designing engines in this way will finally get fair proportions for one bore and stroke, and perhaps a slight enlargement of the bore will not get him into serious difficulties. Let him, however, increase the stroke, say from 5 inches to 6 inches, and he has to begin all over again, and cut and try until he perhaps gets the same results as with the shorter stroke. This is not because there is no definite relation between the proportions of the two engines, but simply because the cut and try method is the only one he knows, An example in fact is that several builders of this type have never been able to get away from a 4 inch stroke. Nevertheless, it is the writer's experience that with a knowledge of the principles involved, a three port, two cycle may be laid out on the drawing board with as much certainty of the results as if the engine were already on the testing stand, and, further, the necessary calculations for the ports take scarcely fifteen minutes. But it is not on design alone that the actual results depend. The best possible design can be made and the engine ruined by indifferent mechanical work.

Now as to design. While I shall not publish my private formulas, I would say that a careful consideration of what takes place during the cycle, and the behavior of gases, should give any designer a basis upon which to work. These considerations are principally the speed of the engine when running its slowest and developing full torque as a basis for the time of the port openings, and the highest speed developing full torque as a basis for the width of the ports across the cylinder.

LOCATION OF THE THROTTLE.

One little secret of success is the location of the throttle. If the throttle is placed between the vaporizer and the crank case port, the effect of throttling is to lower the pressure in the crank case. It is well known to experienced gas engine designers that the lower the compression or the weaker the mixture the slower the charge will burn. Hence when throttling there is a higher pressure and more heat at the end of the stroke than when running with a full charge. When throttling outside the crank case the crank case pressure is lower and the cylinder pressure higher at the time the cylinder inlet is opened. Hence there is a tendency for the flame to rush through the by-pass and into the crank case, causing a crank case explosion.

Suppose, however, the throttle is in the bypass or transfer port, then the pressure is never lowered in the crank case and at the same time the throttle chokes the pas[illegible] crank case. Hence, the combined resistances of the crank case pressure and the contracted area prevent the passage of the flame to the crank case. With a throttle outside the crank case a screen must be used in the bypass. With the throttle in the bypass no screen is required, provided, of course, that other proportions are good.

SCREEN A NUISANCE.

A screen is more or less of a nuisance because it both chokes up and blows out. When badly choked the easiest way to clean it is to put in a new one, otherwise it must be gone over, one aperture at a time, with a fine sewing needle. With a well designed compensating vaporizer and the throttle in the bypass, few crank case explosions should occur, and then only when the spark is retarded too much. Usually, advancing the spark will stop them. If this will not answer it is a sign of too little gasoline in the mixture.

As to carburetors, I have used a number of the better class, and with the exception of the type in which the compensating must be done in connection with the throttle, I find that a type giving first class results on a four cycle will give good results on a two cycle. The price is no criterion, as I have obtained good results with some very expensive ones, and results equally as good with a carburetor costing exactly one-quarter as much.

A SINGLE CARBURETOR ENOUGH.

As to the number of carburetors, I have found a single carburetor gives good satisfaction on a four cylinder engine, with the cranks at 90 degrees. In fact, one seems to work as well as two, and possibly better than two. This is particularly true at low speeds.

The ignition of a four cylinder engine is no simple proposition. Electrically, the single coil distributer system leaves nothing to be desired, but mechanically the distributer must be substantially made to stand the service. The very best dry cells obtainable are down and out in short order. A good storage battery stands up fairly well, but one is soon exhausted. The dynamo or magneto appears to be the only satisfactory solution of the problem.

As to mufflers, there are some excellent ones, but this phase of the problem I have not tested out to the limit. However, I have run across at least one muffler which, through a certain range of speed, not only does not choke the engine but adds to its power. As the muffler was an experimental one I am not at liberty to describe it, but the results of a careful test showed an increase of 3½ per cent. in the brake pull, with the muffler attached, over the result obtained when no muffler was used. But little more heat appears to be carried off by the jacket water than with a four cycle of the same bore and stroke.

ADAPTABILITY FOR AUTOMOBILE WORK.

The adaptability of the two cycle for automobile use may be best appreciated by the following: Owing to the frequency of the impulses, which are double that of the four

cycle, cylinder for cylinder, the torque is more nearly constant than the older type. Hence the motor will hold its rotative effort at low speeds with less flywheel. It will answer the throttle more promptly under load. Hence for hill climbing and flexibility a four cylinder, two cycle is practically equal to a two cylinder double acting steam engine. On this account the writer believes it perfectly practicable to omit the transmission altogether except possibly for reversing, and to place the weight, which would be in the transmission, in the engine. As to reversing, there are any number of reversing marine two cycles, but the process of reversing is comparatively slow, though scarcely slower than the usual reversing process of the sliding gear transmission. This reversing is accompliished by means of the ignition, and, by the use of a governor attachment, can be made practically certain. The absence of valves, gears or cams makes the two cycle, three port engine less likely to get out of repair than the four cycle, and hence it is practically fool proof. The objection often made that the crank case is difficult to keep tight is easily overcome by careful workmanship and the use of a hard bronze for the main bearings, which reduces the wear to a minimum. The use of long bearings, with cup grease as a lubricant, is of great assistance. With high crank case compression, 7 to 8 pounds, a simple form of packing will prevent any chance of a leak at this point.

CRANK CASE COMPRESSION.

As to crank case compression, no less than 4 pounds should be used for speeds above 600 r. p. m., and anything above 8 pounds is scarcely necessary. The latter pressure can be obtained only by the closest work in the crank case, with extremely small clearances, the use of filling blocks on the crank webs and filling the pistons. Except for speeds over 1,000 r. p. m. I do not believe over 4½ to 5 pound crank case pressure worth while.

POWER AND WEIGHT.

It is easily realized that the two cycle can be built much lighter for the power developed per revolution than the four cycle. This is due not only to the greater number of impulses, but also to the absence of valves and their accompaniments. It is not difficult, by taking a little pains with the details, to make a four cylinder engine delivering 40 b. h. p. at 1,000 r. p. m., weighing 400 pounds or less, and this can be done without working below the usual factors of safety. By careful choice of high strength steels for the rods and shaft and thin cylinder walls, such as are employed for racing engines, such an engine could easily be built weighing 250 pounds or less.

The power derived for the same bore, stroke and speed is usually about one-third greater than the four cycle, and the writer has data of tests, for the reliability of which he cannot vouch personally, which showed double the power of the four cycle.

ENGINE SPEED.

The speed at which the engine will hold its full torque can easily be made as high as 1,500 to 1,600 r. p. m., the best results at high speed, so far as I know, being with an opposed cylinder engine.

No absolutely reliable tests of fuel consumption on the testing stand under brake load have been published, so far as I know. But in automobile use the mileage per gallon compares most favorably with the four cycle.

By placing the oil inlet so that the centre of the opening registers with the lower edge of the piston while the latter is at the top of its stroke, the lubrication rarely gives any trouble. Two or three pieces of ordinary flat lamp wicking in the bottom of the rod suffices to oil the crank pin, and the piston pin will oil effectively with the splash. The heavier gas engine oils give the best results, as they are not so easily carried out with the exhaust nor easily cut with the gasoline.

Lately the automobile makers have shown an increasing interest in the two cycle, and one prominent concern, the Olds, has announced a two cycle car for 1906. Then there is the Simplex of Mishawaka, lately announced, and a number of others, including many of the best known makers, experimenting along these lines. I venture to prophesy that in 1907 many more makers will be in line with two cycle cars.

THE TWO CYCLE PATENT SITUATION.

In conclusion, the patent situation with reference to the two cycle engine is peculiar. Two United States patents (now expired) were issued to Joseph Day, of England, in 1891, and another, No. 544,210, on August 6, 1895, to F. W. C. Cock and assigned to Day, this patent having been pending since 1892. Owing to the United States patent law under which this application was filed, it expires on October 15, 1906, with the English patent to which it corresponds. This patent covers engines of the three port type, and in spite of its short life it has made quite a stir in the ranks of two cycle manufacturers, several of whom have taken license under it. This is to be wondered at, since the United States patent records themselves would seem to show that this invention was anticipated in this country.

The Mors self starter comprises a pump by the driver's side from which a charge of gas is forced into the cylinders. The electric current from a trembler coil then ignites the gas and the motor is off. Between the pump and the motor, it should be said, is a "dynamogène" on the dashboard in which the combustible mixture is produced, and whence it is driven to the cylinders by the action of the pump.

Air Cooling.

By Albert L. Clough.

The opening of the 1906 season finds the air cooling of gasoline vehicle engines more popular than ever before, and as a practice enjoying more fully than hitherto the confidence of the automobile buying public. It cannot be said that there is any tendency manifest upon the part of users of the water cooled system to discard it in favor of air cooling, but it is very noticeable that the established manufacturers of air cooled engines are, almost without exception, adhering to that system and showing no signs of going over to water cooled methods. Their ranks are being recruited by quite a number of new concerns, who advertise air cooled apparatus. The established manufacturers who use this system of cooling, so far from showing any diminution of confidence in the use of air as a cooling medium, are nearly all of them applying the principle to engines of larger horse power, so that cars driven by air cooled engines may now be obtained, which, in point of effective engine power, are very little inferior to those driven by water cooled motors. It is safe to say that an air cooled car having all the power that a reasonable user ought to require may readily be purchased.

The manufacturers who use air cooling have not been slow to follow the general trend toward vertical multicylinder motors, and their engines are now in the majority of cases of the four cylinder type, arranged tandem, while several instances of six cylinder motors may be cited. Some horizontal, opposed cylinder, air cooled motors are still produced, their employment being, however, chiefly in commercial service. Air cooling is one of those simplifications which, like valveless two cycle motors and frictional transmissions, hold out a promise to the prospective user of the practical motor vehicle of a reduced repair bill, diminished annoyance and ultimately of lessened first cost. On this account the air cooled engine, with its freedom from water piping, radiator and pump, its invulnerability to cold and its capability of operation during the winter without requiring special precautions, is a part of the ideal which has been formed by very many intending motor car users of the practical turn of mind.

IMPROVEMENTS IN AIR COOLING METHODS.

The manufacturers of air cooled motors have performed a vast amount of intelligent experimental and development work during the last few years, and excellent results have flowed therefrom. In a general way it may be said that improvement in air cooli
been along two genera
reduction of the rate a
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which heat is abstracted from the outside surface of the cylinder and its attachments.

Under the first head may be mentioned attempts to reduce the surface in the combustion chamber which is exposed to the burning charge. With this object in view the use of ported valves has been practically done away with. Especially is this the case with the exhaust passage, which is no longer found in air cooled motors.

VALVES IN THE HEAD.

The elimination of gas passages communicating with valve pockets, with their very considerable heat absorptive area as compared with their cubic contents, has necessitated the employment of valves opening directly into the cylinder head. Such valves, set directly in the top of the cylinder, in cages, which are usually quite readily removable, are now almost universal. The valve housings, being generally of an elbow form, allow the exhaust gases to pass directly up and out of the combustion space and to the exhaust pipe, through the horizontal portion of the housing, which is out of contact with the cylinder head itself, freely exposed to the air, and may be provided with cooling ribs. Much less heat is thus imparted to the cylinder structure than if the exhaust was expelled through a port or passage, cored in the body of the head.

With the intention of further reducing the exposed heat absorptive, internal surfaces of the combustion chamber, resort is had to machining its surface to a smooth finish. A rough casting possesses quite a large excess of actual surface over and above its projected area, since the lateral surfaces of its small protuberances and irregularities must be counted in as a part of its actual superficies. Such accidental surfaces are more or less active in a heat absorptive sense, and are regarded as detrimentally active in increasing the passage of heat to the walls, which heat must be gotten rid of by the external cooling ribs. As the heads of air cooled cylinders are generally separate from the cylinders proper, this machining can be done without undue expense being incurred.

The hemispherical form of combustion chamber obviously offers the least internal surface, proportionally to its cubic contents, and its employment would seem to tend in the direction of reducing the rate at which heat passes into its walls. Some air cooled motors are to be found which possess clearance spaces approximating to the hemispherical form.

FACILITATING THE EXHAUST.

Facilitating in every possible manner the free exit of the exhaust gases is another expedient which acts to reduce the trans- [illegible] heat from the charge to the cylinder [illegible]he more rapidly the spent charge [illegible] into the open air the more [illegible]pera[illegible]re is reduced, and the [illegible] [illegible]nfining walls. [illegible] are being employed in the later engines and very capacious exhaust valve housings. The exhaust pipes are as free from curves as possible, and of large size, and a separate pipe from each cylinder seems to be preferred over a branch pipe leading to a manifold. In some instances two mufflers are used for a four cylinder engine.

That very much discussed arrangement, the

AUXILIARY, SIDE PORT EXHAUST,

is found upon one of the most successful air cooled motors. The piston fully uncovers this port in the cylinder wall just as the crank reaches its downward centre, and as the piston is moving quite slowly at this portion of the stroke, a considerable period is afforded the hot gases to escape to the atmosphere through this auxiliary path while the ordinary exhaust valve is opening. The expansion of the remanent charge due to escape through the side port must, it would seem, reduce the temperature around the valves in the head to a very considerable extent, and thus conduce to their long life and to the moderation of the head temperature. In the engine in question the auxiliary exhaust checks are mechanically operated, and thus add a degree of complication to the motor which, to a certain extent, may balance the advantages due to the supplementary exhaust.

There are a good many pros and cons to the use of this side port exhaust, but it can hardly be doubted that it achieves the purpose for which it is employed, even though it may entail some attendant difficulties.

DIRECT INLET OF CHARGE.

Placing the inlet valve so as to open directly into the combustion space, and thus avoiding the intervention of any passage forming a part of the heated head, delivers the charge to the firing chamber measurably free from pre-expansion and at an initial temperature such that a higher degree of compression may be employed without self ignition than would otherwise be the case.

In general it may be stated that the reduction of internal exposed wall surface and the facilitation of the exhaust are two important directions of improvement leading to reduced heat losses to the cylinder.

HEAT RADIATION.

Considering the second division of the subject—the improvement of the rate at which heat is abstracted from the external surfaces of the cylinder—attention seems to be engrossed by two problems: first, the provision of the most efficient conformation for the external surface of the cylinder, so far as its capability of dissipating heat is concerned, and, second, the ensuing of such relations between these surfaces and the cooling medium—air—as shall result in the maximum rate of transfer of heat from the cylinder to the air. Much ingenuity has been expended in devising means of increasing the exposed surface of the cylinder. Threaded metal pins screwed into the cylinder wall, metal combs caulked into vertical grooves, flat strips of steel cast in when the cylinder is poured, metal tubes brazed in, forming a hedgehog arrangement, copper flanges, aluminum combs, coils of copper wire bound circumferentially about the cylinder, and short rodlike protuberances forming a part of the cylinder casting, are all in use. However, the most generally used arrangement is the time honored annular flange or rib cast as a part of the cylinder. These flanges are cast very thin, tapering outwardly, and are generally deeper around the head of the cylinder than toward the crank end and often deeper upon the sides than upon the front and rear faces of the cylinders where the air current is supposedly less active.

RADIATION AND CONVECTION.

Much has been said in the past about "radiating surface" and "radiating flanges," but the opinion seems to be gaining ground that these elements rather deserve the names of "convecting surfaces" and "convecting flanges." In other words, it is being realized that the loss of heat from the cylinders by convection is really the important factor, and that the dissipation by radiation is entirely subsidiary if not practically negligible. If radiation were the main factor, an engine running idle, without a fan, would cool as well as a motor driving its car with the fan in action. Experience shows this to be absolutely contrary to fact. Much experimentation has been profitably carried on as to the depth, taper and spacing of cooling flanges, and as to the length, diameter and spacing of pins or other cooling protuberances, with the intention of finding the most profitable disposition of a certain quantity of cooling metal when subjected to a prescribed air supply. This is, in a way, the same problem, in kind if not in degree, which the manufacturers of finned, tubular radiators have been and are working on. Experience will define the proper proportions for these cooling devices to give the best results with a minimum both of mass of metal and fan power.

CONVECTION THE IMPORTANT THING.

Now that convection is finally understood to be the important thermal phenomenon involved in air cooling, accent is at once placed upon the manner in which the cooling air is supplied to the convecting surfaces. It seems to be a growing opinion that a cylinder of quite restricted cooling surface, efficiently supplied with fresh, unheated air, is a better proposition than a cylinder of enormous surface furnished with air in a "hit and miss" and sluggish manner. Practically all air cooled motors are now supplied with a mechanical air blast, and, in some instances, not only a fan in the front of the hood, but a fan

spoked flywheel in the rear of the motor, are provided "to assist nature." The upwardly sloping footboard of the car allows of the blast escaping under it.

It would seem that in the past too little pains had been expended upon the air supply arrangements, and that air has been directed at the engine rather at random instead of being supplied in an exact manner, such as should insure an actual current of the most efficient velocity along all parts of the cooling surfaces, and prevent useless eddies of air and the pocketing of heated air in contact with the convecting surfaces.

THE CAREFUL STUDY OF FANS

has led to improvements in their efficiency so far as the rectilinear movement of the air and the avoidance of useless eddies is concerned. By contracting the cross section of the hood to as nearly as practicable the dimensions of the motor, and by the use of properly shaped and appropriately placed deflectors, the air supply is confined more nearly to the surfaces requiring it than hitherto, and its aimless circulation somewhat reduced. In order to insure that the air supply is actually made to infringe upon the surfaces with which it should come into contact, and that at a considerable velocity, one successful car employs a fan forcing air at a very perceptible pressure into a manifold placed over the engine. From this pipe a vertical, downwardly directed discharge pipe of appropriate shape surrounds the valve chambers and the upper portion of the pin studded cylinder. A separate air duct is used for each cylinder, so that the valve housings and the cylinders themselves are constantly surrounded by thin sheaths of rapidly moving air which escape near the lower portion of the cylinders.

On general principles it seems quite obvious that this is the correct manner to air cool a motor cylinder or rather "air jacket" it; for the use of the air in this manner is closely analogous to that of the employment of water in a water cooled engine. The ordinary use of the fan in connection with an air cooled engine is more comparable to water cooling an engine by playing upon it with a hose from a distance—a method which might prove effective, but could never be efficient. It is safe to say that more attention will be paid in the future than there has been in the past to delivering air in a definite manner to the surfaces requiring it, and, above all, of keeping that air in constant brisk motion in a definite path toward a discharge point. Dead air, sluggishly moving or indefinitely directed air is inimical to a free transfer of heat by convection.

TYPICAL 1906 AIR COOLED MOTOR.

Considering air cooled motors which are actually offered for 1906 it is found that the following is a rather typical arrangement: Four cylinders arranged tandem, under a tight hood rather contracted in cross section, with a fan in front. Cylinders cast separately from their heads and provided with annular cast cooling flanges. Mechanically operated valves of large diameter and interchangeable, located directly in the cylinder heads, with elbow shaped flanged housings, easily removable. Valve gear of the rocker arm type, with springs in the operating linkage to gather up the backlash with a view to preventing noise. Fan belt driven and carried upon ball bearings. Splash lubrication for cylinders. Spark plugs set horizontally into the combustion space.

Recent improvements in the location of valves and other details have enabled manufacturers of air cooled motors to somewhat increase the degree of compression employed from the rather low values hitherto regarded as maxima for safe operation.

Much has been said in criticism of the air cooled engine regarding the possibility of cylinder deformation, due to heat, and its consequent impairment of piston fit. Great care is now exercised to guard against this danger. Cylinders are designed of almost perfectly symmetrical form and uniformity of mass through their entire length. The danger of warping is thus reduced to a minimum. One manufacturer goes so far as to machine the outside of the cylinder as well as the inside, forming the cooling flanges by means of a multiple tool, in order to secure a greater degree of uniformity of mass as a safeguard against deformation by heat. Cylinder bores and the heads of the piston, as well as their cylindrical portions, are carefully ground by the more careful manufacturers. Some of the best engineering talent in the automobile business is engaged in the perfection of the air cooled motor, and the efforts put forth are bearing fruit. Furthermore, the public seems very ready to avail itself of the product of their labors.

Flywheel Design.

By Morris A. Hall.

Recently, having to design two new engines of the four cylinder, vertical, water cooled type, the writer had occasion to go into the subject of flywheels and flywheel design. On consulting the literature on gas and gasoline engines we find little or nothing on this important subject.

Clerk, in his voluminous work on the subject of gas engines, says nothing as to the detail or the practical side, but simply theorizes. Homans, in his "Self Propelled Vehicles," has no opinions of his own, but quotes Kent and Roberts, particularly the latter. Among other things, he says that the outside diameter of the flywheel should be between four and five times the length of stroke. In most automobiles other considerations, such as the spacing of the subframe members, available room above the frame, best size of clutch, etc., limit the size of the flywheel diameter to 2½ to 4½ times the length of stroke, the former being used in large, long stroke engines, and the latter or values just below it for short stroke, high speed motors. In taking the average of fourteen of the prominent American cars we get a value of 3.8 times the stroke for the outside diameter.

In Roberts we find the following empirical formula given:

Weight of flywheel

$$= \frac{\text{I. H. P.} \times 111{,}600{,}000}{f^2 N^3 E},$$

in which f is the diameter of the centre of gravity of the rim, N the number of revolutions per minute, and E a constant (co-efficient of permissible fluctuation). He gives a value of .15 for E, and in a later work, .335 for automobile engines. The writer has often tried to use this formula, using the latter constant, but without any success. At normal or maximum speeds it gives a ridiculously low value.

Roberts in his later work says that the minimum speed, or, say, 300 r. p. m., should be used. At this speed the formula gives ridiculously high values, so that in the use of this formula the designer must be guided mainly by his own common sense, or his innate sense of right and wrong. Using this formula seems like a cut and try method at best.

Lucke in his recently published work on "Gas Engine Design" goes into the subject of flywheels very thoroughly, but, unfortunately, derives no formula of practical use. From reasoning similar to that of Unwin and Roberts, he derives a formula very like the latter's, but much more complicated. His expression is:

$$\text{Weight} = \frac{11761\, R_e' \text{Plan}}{D_n^2 N^2 K},$$

in which R_e' is a constant for each engine, and must be found from the indicator diagram for that particular engine. K is another constant to be assumed. He gives the same formula in terms of the indicated horse power thus:

$$\text{Weight} = \frac{2{,}125{,}200\, R_e' \times \text{I. H. P.}}{V^2 K N},$$

in which again appear R_e' and K, one to be found and one to be assumed. For these constants he gives no figures, data or suggestions, so that the formula as left contains two very uncertain elements, and may be handled so as to give any old weight.

Unwin, in "Machine Design," Part II, goes into the flywheel and its necessity and uses very thoroughly. He says: "For most of the purposes for which engines are used, considerable regularity of speed is important. For any period of time the effort and resistance vary so that during the period there must be an alternate excess of effort and resistance producing a fluctuation of speed. To moderate this fluctuation flywheels are used which alternately store and restore energy.

"The effect of all the rotating parts may be neglected except the flywheel. If
take $\triangle$ E as the quantity of en
nately stored and restored
weight of the rim, W, a
arms, R as the radius

gravity of the rim, V_1 and V_2 as the minimum and maximum velocities of the radius R, then

$$\triangle E = (W_r + \tfrac{1}{3} W_a) \frac{V_2^2 - V_1^2}{2g}$$

Hence, to reduce the fluctuation of speed for any given excess or defect of energy, $\triangle E$, it is obviously necessary to put as much weight as possible in the flywheel rim, and to make its radius as large as possible."

Rankine figures the co-efficient of fluctuation of energy at .25 for single cylinder steam engines, and .18 for compound steam engines. But in a gas engine the fluctuations are greater, and must, moreover, be reckoned for two revolutions and not for one, as in the steam engine.

The co-efficient of fluctuation of speed varies from 1-20 or .05 for pumping purposes to 1-300=.003 for direct driven electrical machinery, with 1-100=.01 as a fair average.

From the above we may derive

$$W + \tfrac{1}{3} W_a = \frac{g \triangle E}{N V^2} = \frac{g \times K \times E}{N V^2}$$

which reduces to $\frac{48{,}200{,}000 \times K \times I.H.P.}{R^2 N^3 n}$

Prof. Barr gives us 43 as a mean value of $\frac{K}{n}$ which he has derived from a great number of experiments. Substituting this, and eliminating the arms on the assumption that the weight of the arms or web and the hub taken together equal 1-3 of the rim weight, so that the toal weight is one and one-third times the rim weight,

$$\text{Weight of rim } W_r = \frac{1{,}500{,}000 \times I.H.P.}{R^2 N^3}$$

Now the I. H. P. may be all right in steam engine practice, but in gas engine work it does not mean anything. The important question is, What brake horse power will the engine give? So, as the engine is designed to produce a certain B. H. P., it will be more practicable to have the formula expressed in B. H. P. Taking the B. H. P. = .8 × I. H. P., or I. H. P. $= \frac{B.H.P.}{.8}$ and substituting in the formula above,

$$W_r = \frac{1{,}875{,}000{,}000 \text{ B. H. P.}}{R^2 N^3}$$

Now in this formula N is the R. P. M., and the speed with which we are principally concerned is the minimum speed, for it is at the minimum speed that the flywheel is most necessary. At higher or maximum speeds the flywheel is hardly needed, for the impulses are then practically continuous and there is no storing and restoring of energy as at slow speeds. The average minimum speed in American practice is about 250 R. P. M., at which speed an automobile engine is said to be "just turning over." If we substitute this in the above formula, we simplify it very much and we have also fixed 250 R. P. M. as the slowest speed at which our motor will be run.

Then N = 250 and $N^3 = 15{,}625{,}000$, and substituting we get

$$W_r = \frac{120 \text{ B. H. P.}}{R^2}$$

Taking into account the fact that we get an explosion every fourth stroke only (in a single cylinder), we have the equation in the final form

$$W_r = \frac{30 \text{ B. H. P.}}{R^2} \quad \ldots\ldots\ldots\ldots\ldots\ldots (1)$$

But in using this it must be remembered that this is for a single cylinder, and at 250 R. P. M. minimum speed, so that the B. H. P. substituted in the formula must be for one cylinder and at 250 R. P. M.

In the accompanying Table No. 1 of the engines and flywheels of some of the prominent American makers we have the flywheel sizes and weights given, as the manufacturers use them. And in table No. 2 we have a few figures on the subject using the empirical formulas herewith given.

Taking an example at random, let us apply the formula to the Haynes model R, 50 horse power at 1,000 r. p. m. Estimating the power at 250 as 10 H. P., one cylinder will give $\frac{10}{4} = 2\frac{1}{2}$ H. P. Then from the data given we find R = 10½ inches = .875 foot. Substituting we have $W_r = \frac{30 \times 2\frac{1}{2}}{875^2} = 98$ pounds for the rim alone, and adding one-third inch for the web and hub gives 98 + 32 = 130 pounds for the total, which practically agrees with the maker's weight of 125 pounds.

In going through table No. 2 it appears that this formula gives good results on large engines, but results slightly too large on small motors.

A great many, in fact the majority, of engine builders use a solid web in preference to arms. In the matter of arms, Roberts gives six as the standard number, but for automobiles I find that three is the correct number. In the case of the spoked flywheel there enters the question of casting. There is great liability of a fracture during the shrinkage of the iron where the heavy rim and light arm meet. A great many flywheels with arms show cracks at the junction of arm and rim, despite large fillets, so that manufacturers are generally making flywheels with a solid web. In the case where a cone clutch on the flywheel is used the spoked, ribbed or other open flywheel is out of question, owing to the entrance of dirt, etc., which gets into the clutch and spoils the surface of the cone. So with the cone clutch on the flywheel a web is necessary.

Taking the formula (1) above, anybody wanting to find out primarily the size of the rim and not the weight, could soon figure the cubical contents of the rim by dividing the weight of the rim by the weight of a cubical unit. But it is much easier to introduce this into the formula and figure it directly.

TABLE I.

NAME.	Franklin G. Air Cooled.	Franklin D. Air Cooled.	Franklin H. Air Cooled.	Nordyke & Marmon. Air Cooled.	Autocar XII.	Peerless.	Thomas.	Packard.	Brew-Hatcher.	Mack Brothers No. 1.	Haynes O.	Haynes R.	Elec. Veh. Co. XLVI.	Elec. Veh. Co. XLVII.	Smith & Mabley.	Average.
Designation number.....	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
(a) Number of cylinders....	4	4	6	4	4	4	4	4	4	4	4	4	4	4	4	
(b) Bore of cylinders.....	3¼	4	4	4¼	4	4½	5½	4½	4	5½	4½	5⅛	4	5	4½	
(c) Stroke.....	3¼	4	4	4	4½	5	5½	5½	4	6	5	6	4½	5	5½	
(d) Ratio of bore to stroke..	1-1	1-1	1-1	1-.94	1-1.12	1-1.11	1-1	1-1.22	1-1	1-1.09	1-1.11	1-1.17	1-1.12	1-1	1-1.22	1-1.07
(e) Brake H. P.....	12	20	30	22	25	30	50	40	20	45	30	50	28	45	33	
(f) At R. P. M.....	1800	1500	1200	1000	1200	900	800	1200	1000	1000	1000	1000	1800	1500	1000	1190
(g) Flywheel diameter.....	19	20½	20½	18⅛	16	19	20	19½	15¾	18½	20	22	20	18.2	17⅛	18⅛
(h) Flywheel width.....	2	2	2	4	4½	4	2⅝	4¼	5¼	3½	5	5¼	4	6.5	4⅛	4
(i) Flywheel thickness.....	½	7/32	7/32	1 1/16-2 1/16 1 = 1½	1¼	1⅛	1¼	1½	2	1	1	3/4	1	1 1/16	1
(j) H. P. by $\frac{d^2}{3}$	14	21.3	32	24	21.3	27.1	40.4	27.1	21.3	40.4	27.1	39.2	21.3	33.3	27.1	
(k) H. P. for 1 cylinder.....	3.5	5.33	5.33	6	5.33	6.77	10.1	6.77	5.33	10.1	6.77	9.8	5.33	8.33	6.77	
(l) H. P. per cyl. at 250, estimated.....	66	1	1	1.35	.9	1.69	2.89	1.52	1.2	2.27	1.62	2.2	1.2	2.35	1.66	
(m) R for flywheel.....	.771	807	.807	.719	.615	.74	.787	.75	.594	.688	.792	.875	.805	.717	.65	
(n) Flywheel weight.....	29	51½	51½	99	84½	96	105	115½	100	113½	105	125	85	110	80	

TABLE II.

Designation number.....	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Aver
(n) Flywheel weight.....	29	51½	51½	99	84½	96	105	115½	100	113½	105	125	85	110	80	
(o) H. P. for 1 cylinder $\frac{d^2}{3}$ ..	3.5	5.33	5.33	6	5.33	6.77	10.1	6.77	5.33	10.1	6.77	9.8	5.33	8.33	6.77	
(p) Flywh'l w'ght per $(o) = \frac{n}{o}$	8.3	9.65	9.65	16.5	15.85	14.2	10.4	17.1	18.75	11.25	15.5	12.75	15.95	12.2	11.9	Fan Wheel $\frac{9.2}{14.3}$
(q) Rim weight by $\frac{30 \text{ B. H. P.}}{R^2}$	34.5	46	46	78	75	92½	139	81	101¼	144	72.6	86.2	55.5	137	117	
(r) Total weight $q + \frac{q}{3}$.....				103½	99¾	123	185	107½	134½	191½	96½	114½	73¾	182	156	
(s) Difference between above (r) and actual (n) %.....	+19	—12	—12	+4.5	+18	+28.1	+76.2	—69	+34.5	+68.7	—8.	—8.4	—13.2	+65.5	+95	+23
(t) Rim w'gt by $\frac{18 \text{ B. H. P.}}{R^2} + L^2$	30.6	43.6	43.6	64	63	80.5	114.4	78.6	77.2	122.4	68.2	87.7	53.5	107.3	100.8	
(u) Total weight $t + \frac{t}{3}$.....				85.3	84	107	152	104.5	102.5	163	90.8	116.5	71.2	143.	134.4	
(v) Difference between above (u) and actual (n) %.....	+5.5	—15.3	—15.3	—13.6	—0.59	+11.5	+44.7	—9.6	+2.5	+37.	—13.5	—6.8	—16.2	+30	+68	+7.2
(w) Average of total weights by (r) and (u).....	32.5	44.8	44.8	94½	91.8	118	168	106	118.5	177	93.7	115.5	72.5	162.5	145.2	
(x) Difference between above (w) and actual (n) %.....	+12.	—13.	—13.	—4.5	+8.6	+23	+60.	—8.2	+18.5	+67	—10.8	—7.6	—14.7	+47.7	+81.5	+16.4

Then W_r = area of rim × the circumference of the centre of gravity × the weight of a unit = $\frac{b'' h''}{144} \times 2\pi R' 450$.

We already have an expression for this, viz., $\frac{30 \text{ B. H. P.}}{R^2}$ and equating the two we have

$$\frac{2 \pi R b h \times 450}{144} = \frac{30 \text{ B. H. P.}}{R^2}$$

from which

$$b h = \frac{1.53 \text{ B. H. P.}}{R^3} \quad (1\,a)$$

b and h being in inches and R in feet, as before. To apply this formula to an example, take the Peerless from Table No. 1. R = 8.875 inches = .74 foot, 30 h. p. at 900 r. p. m. would correspond to, say, 7.2 at 250 r. p. m. and 1.8 h. p. per cylinder, at 250 r. p. m.; then $b h = \frac{1.53 \times 1.8}{.74^3} = 6.8 \square$ inches. If the rim were 1¼ inches thick it would be from the formula about 5¼ wide, whereas the flywheel actually used is 1¼" × 4".

In the case of the Haynes model R (used as an illustration once before) this formula gives 1" × 5¾", whereas the flywheel is 1" × 5¼".

In looking over the results from this formula as given in Table 2, it seemed to give the poorest results in the case of long stroke motors, so the writer took the form $\frac{20 \text{ B. H. P.}}{R^2} + L^2$, in which L is the stroke in inches. This did not work well, so 18 was substituted for 20, giving us the form $\frac{18 \text{ B. H. P.}}{R^2} + L^2$. The results from the use of this formula are found in Table 2 as item *t*.

There are three classes of results from formula (1)—those heavy but very close to actual practice; 2, light but very close, and 3, decidedly different and too heavy. Using the first formula, 3 fall in class 1, viz., Nos. 1, 4 and 5; 6 fall in class 2, viz., 2, 3, 8, 11, 12 and 13. The rest, 6 in number, fall in the third class; they include Nos. 6, 7, 9, 10, 14 and 15. In the first class we find the three all have different ratio of stroke to bore, that is, No. 1 has them equal, ratio 1:1; No. 4 has a shorter stroke than bore, ratio 1:.9.4, and No. 5 has a longer stroke in the ratio of 1:1.12.

In the second class (too light) we find Nos. 2 and 3 with equal stroke and bore, while the rest all have longer stroke; thus No. 8 has a ratio of 1:1.22, No. 11 a ratio of 1:1.11; No. 12, 1:17, and No. 13 a ratio of 1:1.12. Thus it is noticed that no shorter stroke than bore is found in this class.

But the matter is complicated in examining the third class, with Nos. 6, 7, 9, 10, 14 and 15, for three have equal bore and stroke and three others a longer stroke; thus Nos. 7, 9 and 14 have a ratio of 1:1; No. 6 has a ratio of 1:1.11, No. 10 a ratio of 1:1.09, and No. 15 a ratio of 1:1.22.

Passing on to the results of formula 2 we find the same complications. In class 1 we still have No. 1, and in addition Nos. 6 and 9 from the third class. In class 2 we have Nos. 2, 3, 8, 11, 12 and 13, as before, and Nos. 4 and 5 from class 1, the remaining four being too heavy by from 30 to 68 per cent.

This would seem to indicate that as far as formula (1) is concerned the introduction into it of the stroke has very little effect on its results, at least in the way of improvements.

Now, considering the lack of good or even serviceable formulas on this subject, and the difference of opinion which designers hold—some considering that too heavy is on the safe side and others holding that an excess flywheel weight of 25 to 50 pounds, when using aluminum for the sake of lightness, with the cost of the two at 4 cents and 50 cents a pound, to be a sin and a shame—considering all these things, the writer thinks that to produce a formula that agrees within 2 per cent. in the case of nine out of fifteen machines selected at random, and another that agrees within 6½ per cent. in eleven out of fifteen examples is something—at least a step forward. These two formulas, with the accompanying data, I offer in hopes that someone may find them useful and convenient; also that some others may see the flaw in them, and so improve them that a serviceable formula useful to all may result.

In the matter of flywheel fastenings, the practice varies somewhat. Where the flywheel is placed in front it transmits no power, so that most any simple connection is suitable and sufficient. But the majority are placed back of the engine. For these, which transmit the power, there are three styles of fastenings used—the taper driving fit, the driving fit with a key, and the bolt and flange connection. Probably 90 per cent. of the engine builders use the last named. It offers the advantages of simplicity, cheapness and easy adjustment; it is easy to put on and remove, easy to figure out, and generally more satisfactory.

The bolt and flange method has its variations, too. There is the method of using studs screwed into the flywheel, in which case the expense would be slightly more, and which would require either more studs or larger ones, owing to the reduction of area by the threads. Then many makers find it cheap to lay the flange upon the flywheel, so that the whole of the flange lies above the surface of the wheel in a horizontal direction, the bolts serving to fasten together and for alignment also.

The third, which the writer considers to be the best method of all and also the neatest, is to place the flange in a counterbore in the flywheel, the two being a nice tight fit. The counterbore, being turned in while the flywheel is in the lathe, is exactly central, and so, too, is the flange on the

crank shaft. Thus there is no trouble with the two getting out of alignment. As a nice little detail which only adds refinement to the whole, a small tit is sometimes left on the crank shaft beyond the flange, which fits into the flywheel also.

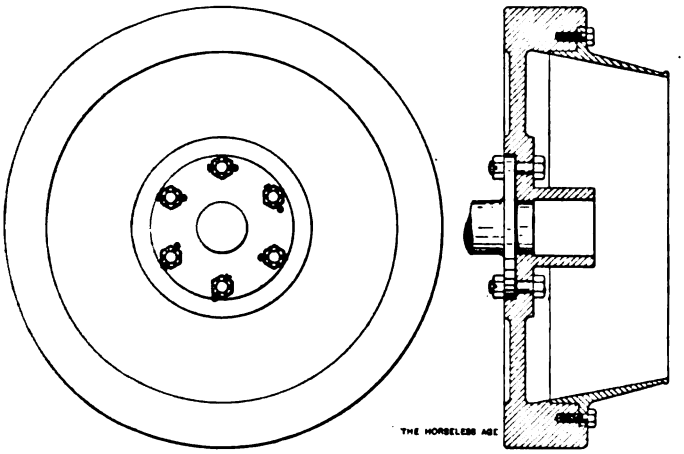
The sketch shows a typical high speed flywheel, female cone, and flywheel fastening.

To repeat the above formulas for convenience. Weight of rim in pounds =

$$\frac{30\ B.\ H.\ P.}{R^2} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (1)$$

where the minimum engine speed is taken at 50 r. p. m.; B. H. P. is the brake horse power per cylinder at that speed, while R is the radius of the centre of gravity of the rim in feet. Or, if it is easier to use the diameter of the centre of gravity in feet, the formula becomes

$$\frac{120\ B.\ H.\ P.}{D^2} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (1a)$$



METHOD OF FASTENING FLYWHEEL.

From these the rim area is found, or it may be figured directly by using the formula

$$b\,h = \frac{153\ B.\ H.\ P.}{R^3} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (1b)$$

$$\text{or } b\,h = \frac{12.24\ B.\ H.\ P.}{D^3} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (1c)$$

in which b is the width and h the thickness of the rim, both in inches. Also

$$\text{weight of rim} = \frac{18\ B.\ H.\ P.}{R^2} + L^2 \ldots\ldots (2)$$

$$\text{or } \frac{72\ B.\ H.\ P.}{D^2} + L^2$$

in which L is the stroke in inches, and the others are as above.

A handy little formula for the stress due to centrifugal force in cast iron flywheels is: Stress $f = .0071\ V^2$, in which V is the linear velocity at the centre of gravity in feet per second. Then, at speeds of feet per second, 30, 40, 50, 75 and 100, the stress is in pounds per square inch, 87.4, 155.3, 243, 546 and 971 respectively.

It is also advisable to check up the linear velocity of the rim by means of Kent's well known little formula for the maximum diameter in feet:

$$\text{Diameter (maximum)}^1 = \frac{1910}{R.\ P.\ M.}$$

Electric Automobile Motors and Controllers.

BY ALEXANDER CHURCHWARD.

In designing electric automobiles the primary thought was formerly given to the battery as the limiting feature both in weight and mileage, and it still is the greatest item of expense when maintenance is considered. The battery on the average commercial vehicle was generally so proportioned that the free running current of the vehicle on level hard roads corresponded to the four hour discharge rate of the battery (which is the normal rate of discharge for most types of automobile batteries), the motor or motors having a continuous rating to correspond.

A few years ago the vehicle manufacturers demanded the lightest weight motor possible consistent with limited outside dimensions, and at the same time insisted on a very high efficiency at normal and over loads. The mere efficiency of the motor, or motors, at normal and over loads is not, however, a ruling factor. When designing automobile motors great consideration must be given to the necessity of obtaining the greatest torque (i. e., turning moment) per ampere at all loads.

With a given free running current a properly designed automobile motor should increase its torque to approximately five times, with 2.5 times increase of current. Such a motor will take care of the battery driving it on all roads, for it will accelerate the vehicle rapidly without exceeding 2.5 times the normal free running current, and it will be capable of climbing a 7.5 per cent. grade without exceeding the same limit.

Such a motor, as described above, must be designed so that the magnetic flux in the armature increases in proportion to the work to be done. Therefore the magnetic circuits of the entire machine must not be restricted by conditions calling for low weight and too small dimensions, the torque being proportional to the product of the magnetic flux in the armature and the ampere turns on the armature. The turns on the armature being a fixed quantity, the only variables are the magnetic flux and the current.

Many attempts have been made from time to time to use the motor as a generator when coasting or braking, and to charge the battery when so doing. This calls for a special field winding, and also unnecessarily complicates the connections and the controller. From actual tests in this country there seems to be no gain whatever with this style of machine, as the type of winding necessitated destroys the characteristics which have been already described. The very best motor for all around service is the straight series motor, with a characteristic such as described above.

Within the last few years the single reduction motor, mounted on the axle, has been rapidly displaced by the higher speed double reduction motor, mounted on the body of the vehicle. This type of motor has many advantages over its older rival, among which are the following:

1. It is suspended from the vehicle body, therefore there is less wear on the tires and gears, due to direct hammer blows when riding over rough roads.
2. Flexible drive by chain between motor and wheels, whereby the losses due to binding of the driving parts are reduced to a minimum.
3. Much less noise, owing to the fact that the first reduction spur gears can be run in oil in a gear case, and the chain or second reduction can also be enclosed.
4. Most important—by using a higher speed motor better characteristics can be obtained with the same weight.

The fact that a light motor does not necsarily keep the total weight of a vehicle low cannot be stated too strongly. That is to say, if the vehicle has to perform a certain number of ton miles with a given battery, the properly proportioned—although heavier—motor will consume less energy per ton mile than the unduly light motor not having the proper proportions and characteristics. Furthermore, the additional weight of battery required to run the light motor will in most cases amount to more than double the additional weight in a motor properly designed, with a corresponding increase in care and expense.

Of course, if the vehicle were designed to run on a perfectly level, smooth track, with a minimum of stops, the light weight motor would be satisfactory; but in actual service grades more or less severe are encountered continually, and stops are very frequent, especially in crowded streets.

Again, after a suitable motor has been chosen for any given condition, it is very necessary that the proper gear ratio is selected, otherwise when hill climbing and accelerating the current consumption will be out of all proportion to the capacity of the battery, resulting in less mileage from the battery than was calculated.

There are a number of vehicles on the market today that could be improved in energy consumption per ton mile, radius of action, and in hill climbing ability, if they were equipped with motors and gears suited to the weight and speed of the vehicle, and to the battery with which the vehicle is equipped.

Next in importance comes the method of control. With a properly designed controller the acceleration from the first notch of the controller to the last, or full speed position, should be very gradual.

The Advantages of Alternating Current Dynamos in Engine Testing.

By Benjamin F. Bailey.

The use of a dynamo as an absorption dynamometer in place of the usual Prony brake has become quite common. The electrical equipment is more costly, but, leaving this out of consideration, it is undoubtedly the better method. It is not my intention here to go into the discussion of the relative advantages of the two methods, as the subject has been extensively treated by other writers, but to take up two points that I have never seen mentioned, both of which are of great importance, and indicate the superiority of the eelctrical method.

The first is that in testing for the best adjustment of spark, mixture, etc., any change is shown immediately by the electrical instruments. With the Prony brake, the weight must be adjusted, the speed taken, and the result computed before one can be sure whether or not an improvement has been made. Thus, much valuable time may be saved, and the conclusions reached are more reliable, as the indications are immediate, and no time is given for other factors to change and possibly vitiate the result.

The other advantage is that in a dynamo the torque drops off about in proportion to the speed, other factors remaining the same. This is not true of the Prony brake. The torque for any given tension is approximately constant. Hence, any cause tending to change the speed of the engine, as a slight variation in mixture or in the spark, will cause much less of a change in speed when using the dynamo than is the case if the brake is employed. Probably the variation would be about one-third as great with the dynamo. It is thus easier to hold the speed at any desired point, and this is a great advantage when testing an ungoverned engine.

ADVANTAGES OF ALTERNATING OVER DIRECT CURRENT MACHINE.

I would advise the use of an alternating current generator, preferably single phase and having a revolving field. The last item, however, is of slight importance. The use of an alternator presents several advantages over that of a direct current machine. In the first place the output can be read directly on a wattmeter. With a direct current machine it would be necessary to use both an ammeter and a voltmeter, and to multiply their indications together to obtain the power output. A wattmeter is not reliable on a direct current circuit unless the current and voltage be reversed. The use of one instrument obviously saves time and prevents mistakes.

Another point in favor of the alternator is that a short circuit is much less liable to do harm to the generator and engine. The current developed is much less on account of self induction, and there being no commutator to burn, no damage would be liable to result.

The absence of a commutator is in itself a great advantage, as it in general causes more trouble and requires more care than all the other parts together. This is especially true if the machines do not receive the best of care and are exposed to the dirt, dust and oil which are usually present in testing rooms. To be sure, an enclosed type of generator could be used, but they are much more expensive. I have in mind a case where the efficiency of several direct current generators, used in gas engine testing, was found more than 5 per cent. lower than it was a couple of months before, the trouble being due entirely to lack of care of the commutators.

Important as are these incidental advantages, it is however more on account of the ease and accuracy with which the real input of power to the dynamo may be obtained that I wish to recommend the alternating current system. As is of course obvious, there is some loss in transforming from the mechanical power of the engine to the electrical power of the circuit. Hence, the output of the engine is greater than that of the generator. This may be allowed for in two ways.

Probably the more obvious way is to have prepared a curve of efficiencies, on which are plotted various outputs of the dynamo and the corresponding efficiencies. The input of the dynamo is then obtained by dividing its output, i. e., the product of the volts and amperes or the reading of the wattmeter, by the corresponding efficiency. The result is the input in watts to the dynamo, or the output of the engine, and should be divided by 746 to reduce it to horse power.

An improvement on this is to perform beforehand a number of such calculations, and to plot the results in the form of a curve between outputs of the dynamo in watts and inputs in horse power. This saves all calculation.

An extension may be made to this, particularly with the alternating current system, by calibrating the scale of the wattmeter to read directly in horse power input, instead of watts output. Thus, instead of marking the point corresponding to, say, 10,000 watts, as it would usually be done, we may, assuming 90 per cent. efficiency, perform the calculation $10{,}000 \div 746 \div 0.9 = 15$ and mark the point 15 horse power. This makes an extremely convenient arrangement, but is not adapted to very accurate work, since the efficiency may change with time and use, and moreover the efficiency curve will be different for each particular speed. Probably the best arrangement of all would be to have a wattmeter with two scales, one calibrated in horse power output, the other in horse power input. The latter scale would be computed from the efficiency curve for the most usual speed, and would be used for approximate results. For accurate work, particularly at high or low speeds, the readings of the output scale would be used and corrected, as will be described later.

OBTAINING THE INPUT OF A DYNAMO

The most accurate method of the output of which is known is to add to the output all the losses in the machine. This method is based upon the law of the conservation of energy and is strictly accurate. Moreover, it is fairly easy to determine accurately these losses, most of which will not change with time, and those which may can be easily checked. My principal reason for advocating the use of an alternating current dynamo is that about half of these losses can be eliminated entirely, and those thus gotten rid of are the ones that are most likely to change, and are at the same time most difficult to determine.

The losses in a direct current machine are due to

1. Journal friction and windage.
2. Commutator friction.
3. Current in field winding $I_f^2 R_f$.
4. Current in armature winding $I_a^2 R_a$.
5. Resistance of brush contact on commutator.
6. Resistance of carbon brushes $= I_a^2 R_b$.
7. Current in coils short circuited by brushes.
8. Sparking, if present.
9. Magnetization of iron, i. e., hysteresis loss.
10. Eddy currents in iron and copper.

Of these losses Nos. 2, 3, 5, 6, 7 and 8 are from the nature of the machine absent in an alternator. Moreover, these are precisely the losses that are both difficult to determine, and are also apt to be extremely variable. For example, the friction of the brushes on the commutator is very variable, and is sure to change every time the commutator becomes dirty or sticky, and for each change in brush spring tension.

The power required to excite the field is one of the principal sources of loss, and is entirely eliminated in the alternator, since it would be separately excited from some outside source. Alternators are frequently compounded much like a direct current machine, and a portion or all of the armature current rectified to excite the series field. The use of such a machine would require extra calculations, and its use is not advised. If no other type is available it would be used with the series field cut out.

The loss due to the resistance of the brush contact is difficult to determine, and is extremely variable with the state of the brushes and commutator. Moreover, it is difficult to calculate with different loads, since the resistance is not constant, but varies with each change of current. The loss due to this cause, as well as that due to the resistance of the brushes themselves, is present in an alternator as well as in a direct current machine, but is much less, particularly if the generator is of the revolving field type or if it has metallic brushes.

The loss of energy in the short circuited coils of a direct current machine cannot be accurately determined, and, moreover, it changes enormously for slight changes in

the brush position. The same remarks apply to the loss due to sparking. Thus at once the alternator has a great advantage over its rival. To be sure some of these losses are small, but taken together they constitute at least half the total losses.

It is possible to go one step further and get rid of the armature loss. This can be done by providing a separate winding of light wire, to supply the current for the pressure coil of the wattmeter. The voltage developed per turn of this wire would be the same as that in the main wire, but it would not be decreased by the drop due to resistance, as is the case with the other. Hence it is the true pressure developed in the machine, and the wattmeter would show the output plus an amount equal to the armature $I_a^2R_a$ loss. This winding could usually be incorporated with the larger wire while the machine was being built, without much trouble or expense. It would not need to have the same number of turns as the other wire, provided the ratio were known, and the wattmeter ordered to correspond.

Thus we have left only losses 1, 9 and 10. Of these the friction should not change appreciably. Any great variation could be detected by the resistance offered to turning the machine by hand. A more accurate method would be to wind a light cord around either the shaft or pulley, and determine the least weight which will just keep the field or armature, as the case may be, in rotation. If it should be found that the friction has increased appreciably, the journals are at fault, and the remedy is usually obvious.

The three losses—friction, hysteresis and eddy current loss—could in most cases be most readily measured in the shop before the machine is shipped. This can easily be done by means of a small electric motor. The three can be obtained together by a single measurement, and should be taken for a large range of speeds and for various field currents. The curves so obtained should be plotted, preferably all on the same sheet, with speeds as abscissas, horse power lost as ordinates, and each curve marked with the field current to which it refers. These curves should be reliable for years if care is taken to see that the friction does not change. The hysteresis and eddy current losses will remain the same provided the field remains central in the armature.

To determine the speed of rotation the most convenient means would be one of the new electric tachometers. These consist merely of a small direct current magneto, belted or direct connected to the machine under test, and supplying current to a voltmeter. The latter is calibrated directly in revolutions per minute, instead of in volts. A reading can be taken instantly, and any variation or unsteadiness is at once apparent.

With such an outfit, to make an approximate determination of the power developed by the engine, a mere reading of the scale of the wattmeter, calibrated as before described to indicate engine output, would suffice. For more accurate work three readings would be necessary—the reading of the wattmeter on the other scale, calibrated to read in generator horse power output, the speed taken either as before described or with an ordinary speed counter, and the current in the field. From an inspection of the curve the loss corresponding to the speed and field current would be taken and added to the wattmeter reading. This will give a very accurate result, since the total correction will usually be only 5 or 10 per cent. of the wattmeter reading, and any small error in obtaining it will affect the result very little. With reasonable care the latter can be relied upon to about 10 per cent.

Nothing has been said about belt loss. The dynamo should if possible be direct connected to the engine by means of a flexible coupling. If it seems better to employ a belt, its friction loss can be measured and included in the curve. Care should then be taken to keep the belt tension the same all the time, and have it great enough to prevent slipping. The use of a belt, however, introduces more uncertainty than all the other factors together, and it should be avoided if possible. This is easily done with a high speed automobile engine.

If the auxiliary winding before described is not used it will be necessary to measure the current in the armature circuit and multiply the square of its value by the resistance of the armature. The result, reduced to horse power, should be plotted as a curve between amperes and other losses. This loss would, of course, be plotted as a curve betwen amperes and horse power. Unfortunately the resistance, and consequently the loss, varies with the temperature. This change is rather small, but all uncertainty would be avoided by using the auxiliary winding.

The load used to dissipate the energy received from the dynamo should be non-inductive, preferably a water rheostat or a bank of incandescent lamps. If the latter is used care should be taken to secure the poorest lamps obtainable. By "poorest" I mean those consuming the greatest amount of energy per candle power. A smaller number of such are needed to dissipate the energy, and they likewise withstand better an accidental excess voltage. Lamps of 32 or 50 candle power will also be found cheaper for a given energy loss than those of 16 candle power.

The alternator should be wound preferably for 440 volts. The lamps used should be 120 volt ones, and the lamp bank so arranged that when testing at full speed four sets of lamps may be connected in series. Below half speed two sets should be in series (the alternator giving then 220 volts or less), and below one-quarter speed all the lamps should be in parallel. This allows practically the full capacity of the lamps to be used at any speed. The same end might be attained by winding the alternator with four coils arranged for connection in series or parallel or by the use of a transformer giving different ratios.

The most valid objection that can be urged against this system is that a separate source of direct current is required for the fields. This in many cases could be procured from the regular city lighting mains and the cost would be small. If this source is not available, a small storage battery would supply the current. This could be recharged from the alternators by means of an electrolytic rectifier. The same battery could have taps brought off from every three or four cells and a pair of these run to each testing stand would supply current for the engine ignition.

In conclusion, the advantages of the alternating current system are those of accuracy, simplicity and reliability. Accuracy, since the greater part of the dynamo losses are eliminated, and those remaining are not subject to much variation. Simplicity, since almost all calculation may be avoided, and what remains is of the simplest character. Lastly reliability, on account of the elimination of the commutator and the lessened danger of burning out the armature.

A New Propeller and Water Tank Testing Device.

By R. M. Shewmacher.

Every manufacturer has a method of testing his motors before putting them into service, and there are a number of different devices of greater or less efficiency. The best devices are costly, as a general rule, and not every concern cares to go to that expense when they feel that they can rely for satisfactory results on some simpler and cheaper method.

The Prony brake is used to quite an extent, but is not very satisfactory on account of the extreme care necessary to get accurate records and to keep it in good working order. The dynamo offers a better solution to the problem, and there is not nearly the amount of trouble in keeping it in good working order. But the cost of such an installation, with switchboard, meters, etc., is rather high, and is considered prohibitive by a great many, especially the small concerns. Some use a propeller wheel or paddle wheel of some form, in a tank of water, to furnish the necessary resistance in testing their motors, and the following description is of one of these devices:

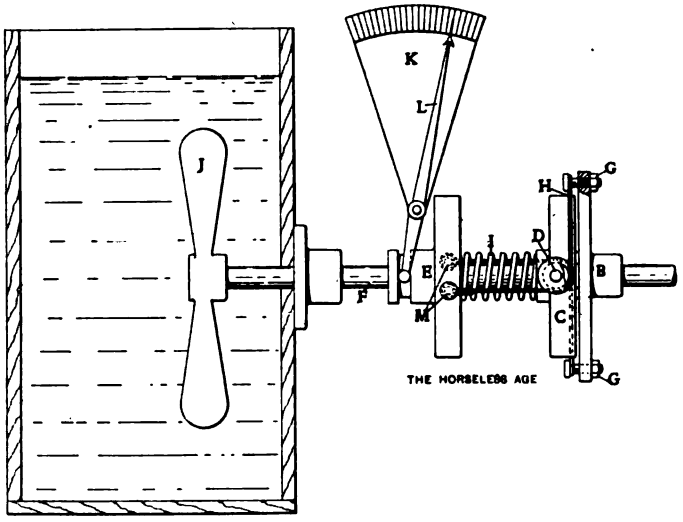
The propeller or paddle wheel may be of two or more blades of ample size, and may be of the reversible type, such as are used on small motor boats, so that the resistance may be varied at will while the motor is working. Referring to the sketch, the motor to be tested is connected by a suitable device to shaft A. B is a spider, with two studs G G fastened in its outer edge. Spider B is keyed to shaft A. To the studs G G are fastened cables H, which pass over the drum C, around pulleys D, and fasten to studs M, which are screwed into di-

Drum C is keyed to shaft F, which ends between drum C and spider B. Disc E is loosely keyed to shaft F and is free to slide on the shaft.

Thus the power of the motor is transmitted through shaft A and spider B, thence through cables H around pulleys D to disc E and the spring I to the propeller J.

The resistance of propeller J in the tank of water will cause the spring I to be compressed more or less according to the resistance. Pointer L is so connected that it moves whenever the spring is compressed and consequently registers the resistance on K, and when the distance from the centre of shaft F to the centre of pulley D is known, as well as the strength of spring I, the calibration of K is an easy matter.

The propeller blades may be so arranged as to work against each other to equalize the end thrust on the shaft, but a ball thrust collar would most likely be necessary for accurate reading. A speed recorder may be connected to the shaft F and this connected to dial K, so that the horse power may be read directly from a third dial.



HYDRAULIC MOTOR TESTING RIGGING.

Such a device as this does not take up much room; is not too costly to install; is not hard to keep in repair or understand, and may be applied to large and small motors alike.

Unclutching in Rounding Corners.

Some useful hints were given at the British Ladies' Automobile Club at the last of R. Sedgwick Currie's technical lessons on the internal combustion engine. Mr. Currie said that if motorists wished to prolong the life of their tires, they should be careful never to round a corner with the clutch in, as by so doing a very severe strain was put on the back tires, which would soon result in their being worn flat. When tires are put away for the winter, they should be hung in a cool, dark, and yet dry room. Dark, because rubber invariably hardens and perishes when kept in the light. A moist or a very warm atmosphere will also cause it to harden ·ickly.

Some General Comments on Change Speed Gearing.

BY DEMPSTER M. SMITH.

A review of some features of the change speed gearing situation at this time is of interest. Aside from the power plant, and possibly excepting systems of control, with which it should have equal rank, the transmission gear should be given the closest attention. The gasoline motor furnishes only a limited power, but the gearing multiplies this by three or four, and enables the car to "get there" along with its friend and enemy, the steamer, when otherwise it would at times be left somewhat in the rear.

THE GEARLESS CAR.

The chief thing desired by many in connection with change speed gearing now seems to be to dispense with it. At least this somewhat Hibernian sentiment is voiced so often that one is convinced that most of the gearing now in use is not quite all that might be desired. The promise of a "gearless" car is truly an alluring one; the vision of a vehicle consisting of little besides wheels, frame, motor and necessary accessories and a clutch—and very little of that, for with the ideally flexible engine the clutch would be seldom disengaged except in starting and stopping. Until the gas engine can be converted to some of the virtues of the steam or electric motive power, however, there are some very serious obstacles to the attainment of this pinnacle of simplicity. Anyone who, in a hilly country, has seen cars of imposing mien and 5 horse power rating pause to shift gears and "take a fresh hold" a good deal oftener than the catalogues allow, will be inclined to endure this useful mechanism yet a little while.

Aside from what appears under present conditions to be the absolute necessity for its continued use, it is doubtful if gearing will ever be abandoned in gasoline cars, except perhaps in those whose owners can afford to entirely disregard considerations of economy. This feature of the gearing problem has never been adequately considered. The great determining tests of first investment and operating expense will be applied here as everywhere else, and will have more effect upon the transmission gear question than all the gas engine improvements of a decade.

COST AND MAINTENANCE VERSUS GEARING.

It is obvious that in order to propel a car of moderate size over "what comes" in the way of roads and grades, without speed change gearing, a motive plant must be installed which is capable of propelling the car under the severest possible conditions. These conditions demand so much propulsive effort that an engine of (at a moderate estimate) four times the power required to do the work through the low speed of a suitable change gearing must be provided. This forces us to imagine an able bodied touring car, without gearing, but with a motor of at least 100 horse power, following for a fair comparison the rather generous manner of rating now in vogue. This motor weight would more than equal the saving in gear weight, and tire expense would be increased rather than dinimished. The entire car design would have to be revised in order to carry the great weight forward. But, by far the greatest consideration, the purchaser of such a car would be called upon for an investment on a 100 horse power scale, and to buy fuel and lubricating oil for a motor of whose full power he would (or should) ordinarily be afraid to avail himself. Maybe once in 25 miles of road he could "throw her wide open" on a grade; but at all other times he must pay for the hauling around and deterioration of several hundred pounds dead weight of motor which is of no earthly use to him. A little consideration of such points as these should convince the designer that the gearless car is as yet far in the future.

It is, of course, well known that a prominent steam car maker has adopted a change gear, chiefly for hill climbing and steaming purposes, and in this connection it is interesting to note that in a recent development of a popular car having a two cycle, four cylinder motor, which should be of very great efficiency and flexibility, apparently the usual amount of attention has been devoted to gearing.

But if the speed gearing, by many considered an undesirable complication, cannot be dispensed with, its presence can be rendered less objectionable by removing some of its annoying faults which have given rise to the call for the gearless car.

SLIDING AND PLANETARY GEARS.

In discussing forms of gearing, the sliding gear naturally claims first attention by reason of its extensive use. Most of the new 1906 cars have it, including the new products of some makers who have heretofore used the planetary gear or some other individual clutch system. The new light four cylinder cars have sliding gear transmissions in many cases where two years ago such cars appeared largely with planetary gears. The wisdom of this wholesale abandonment of the planetary type, especially in light cars, is questionable. While the sliding gear may be more economical of power on the low speeds, there are probably not three styles of the sliding gear in use today which will show as little consumption of power between the motor and the wheels when on the high gear as the planetary, owing to the fact that in the latter none of the gear contacts are in operation and the gearing revolves with the shaft

as one mass, while in the former there is at least one set of gears, and frequently two, running in contact at all times. In other words, by the use of the planetary gear the ideal result of "gearlessness" is actually obtained on the high speed, while with the sliding form the same old complaint of gear troubles holds good for all conditions.

The ideal gearing would be, of course, one in which each of the lower speeds could be obtained with a minimum of frictional loss, and the high speed without any loss due to idly running gears.

The planetary two speed gear still holds its own, chiefly in the large class of low priced American runabouts. A considerable objection to the use of this type of gear on the larger cars is its generally accepted limitation to two speeds. There is, however, one car of quite pretentious size and price which employs a three speed gear of this style. This is the only well-known example of a three speed planetary gear, and it has probably not been in use long enough for a thorough trial, or to gain any great following. It is difficult to see, however, any fatal obstacle to the production of a successful three speed planetary gear.

FAULTS OF THE SLIDING GEAR.

Some of the disadvantages of the sliding gear transmission have been frequently discussed. The chief of these is generally considered to be the fact that the gears of the various speed ratios must be forcibly brought into mesh while they are running at different pitch line speeds, and one of them, together with other revolving parts, often of considerable total inertia, must be accelerated or retarded to the speed of the other practically instantaneously. This causes chipping of the teeth as they are brought together and strains that must be met by the use of special and expensive steels.

Another fault of this style of gearing which has never been very much emphasized is that in shifting gears the clutch must be entirely disconnected, thus losing the propulsive effort of the motor entirely while the gear change is being made, and often when the use of the motive power is most desirable; for example, when bringing the car up to high speed for a stop. In this respect the planetary gear is less at fault, since the changes can as a rule be made more quickly, but neither form gives ideal results in this particular.

The change speed gear which shall give a positive transmission of power (that is, through toothed gears), and shall be capable of changing speeds while the motor is operatively connected with the driving wheels and actually propelling the car, has not been given the attention it deserves. Two or three efforts have been made to obtain it, but apparently without much success.

The sliding type will, because of the simplicity of the gearing proper, probably continue in extensive use, but in view of its well defined limitations it is hard to believe that it is the final form.

A Gear Ratio Table.

By F. E. Watts.

Accompanying is a table which has proven very useful to me in transmission calculations. The method of using is almost self evident, still a few words of explanation may not be out of place.

The values in columns 5, 6, 7, 8 and 9 make no allowance for tire slip or compression; doubtless some of the speedometer makers could supply data on these points if it were needed for exact calcu-

SPEED, REVOLUTIONS AND TIRE PULL.

1	2	3	4	5	6	7	8	9	10	11
Miles Per Hour.	Time Per Mile. M. S.	Feet Per Second.	Feet Per Minute.	Revolutions Per Minute for Different Wheel Diameters. 28 in.	30 in.	32 in.	34 in.	36 in.	Lbs. Pull At Tires of One H. P.	Energy of One Lb. Foot Lbs.
1	60	1.4666	88	12.005	11.204	10.503	9.887	9.336	375	.0333993
4	15	5.87	352	48.02	44.8	42.0	39.55	37.3	93.75	.5334
5	12	7.34	440	60.025	56	52.5	49.43	46.6	75	.8349
6	10	8.81	528	72.03	67.2	63	59.3	56	62.5	1.2025
7	8 34	10.28	616	84.04	78.4	73.5	69.2	65.3	53.57	1.6365
8	7 30	11.75	704	96.04	89.6	84	79.1	74.7	46.88	2.1374
15	4	22	1,320	180.07	168	157.5	148.1	140	25	7.5145
16	3 45	23.5	1,408	192.08	179.2	168	158.2	149.2	23.44	8.5495
17	3 31.8	25	1,496	204.08	190.4	178.5	168	158.7	22.06	9.6525
18	3 20	26.5	1,584	216.09	201.6	189	178	168	20.83	10.840
19	3 94	28	1,672	228.09	212.8	199.5	187.8	177	19.74	12.057
20	3	29.5	1,760	240.10	224	210	197.6	186.6	18.75	13.360
21	2 51.4	31	1,848	252.10	235.2	220.5	207.5	196	17.86	14.725
22	2 43.6	32.25	1,936	264.11	246.4	231	217.5	205.5	17.04	16.164
23	2 36.6	33.75	2,024	276.11	257.6	241.5	227.4	214.5	16.31	17.665
24	2 30	35.25	2,112	288.12	268.8	252	237.2	224	15.64	19.239
25	2 24	36.75	2,200	300.12	280	262.5	247.2	233.2	15	20.872
26	2 18.6	38.25	2,288	312.13	291.2	273	257	242.5	14.42	22.575
27	2 13.2	39.75	2,376	324.13	302.4	283.5	267	252	13.9	24.350
28	2 8.6	41	2,464	336.14	313.6	294	277	261.2	13.4	26.170
29	2 4.2	42.5	2,552	348.14	324.8	304.5	286.5	270.6	12.93	28.080
30	2	44	2,640	360.15	336	315	296.6	280	12.5	30.600
31	1 56.2	45.5	2,728	372.15	347.2	325.5	306.2	289.4	12.1	32.091
32	1 52.6	46.75	2,816	384.16	358.4	336	316	298.8	11.72	34.200
33	1 49.2	48.5	2,904	396.16	369.6	346.5	326	308.1	11.37	36.361
34	1 45.8	50	2,992	408.17	380.7	357	336	317.4	11.03	38.610
35	1 42.8	51.25	3,080	420.17	391.9	367.5	346	326.8	10.71	40.901
40	1 30	58.5	3,520	480.2	448.2	420	395.5	373	9.4	53.439
45	1 20	66	3,960	540.2	504.2	472.5	445	420	8.35	67.625
50	1 12	73.25	4,400	600.25	560.2	525	494	466	7.50	83.495
60	1	88	5,280	720.30	672.2	630	593.5	560	6.25	120.225
100	36	146.5	8,800	1,200.5	1,120.4	1,050.3	988.7	933.6	3.75	333.993

NUMBERS BELOW REFER TO COLUMNS.

Values for any other speed (miles per hour).
For 2 and 10 ÷ value for 1 mile per hour by number miles per hour.
For 3 to 9 × value for 1 mile per hour by number miles per hour.
For 11 × value for 1 mile per hour by square of number of miles per hour.

To find revolutions per minute for any other wheel diameter ÷ 4 by circumference of wheel in feet.

lations. My usual method is to assume a normal piston speed in feet per minute, obtain from this the number of revolutions per minute of the engine, and select from the table the value for the proper wheel diameter and the desired speed. The ratio of this value to the engine revolutions will be the gearing ratio to be divided among chain, gears, etc. For instance: Assume 28 inch wheels, 5 miles per hour on first speed, and 800 revolutions per minute with 5 inch stroke, the piston speed being 666 feet per minute. Value from table is 60.025. Gear ratio is $800 \div 60.025 = 13.3$; or the engine revolves 13.3 times for each revolution of the wheels on first speed.

Column 10 gives the tangential pull in pounds at the tires of 1 horse power, the full wheel diameter being assumed and no compression on tires considered; from these figures we can obtain the pull acting on the chain or bevel gears by multiplying by the wheel diameter and dividing by the pitch diameter of the sprocket or gear.

Column 11 gives the energy in foot pounds which 1 pound will possess due to motion at the given speeds; these values would be decreased by friction and by wind resistance. Multiplying them by the weight of the car in pounds will give a measure of the energy which must be absorbed by the brakes in order to stop the car. Dividing this last quantity by 778 will give the heat in British thermal units which the brakes must get rid of, and show why so many brakes "burn up." For example: At 20 m. p. h., to stop a car weighing 2,500 pounds loaded would require $2,500 \times 13.36 = 33,400$ foot pounds, and $33,400 \div 778 = 43$ British thermal units must be absorbed by the brakes, bearings and wind resistance.

The values in column 4 are exact, and the others are near enough for most practical work. The values for 1 mile per hour form a compact table for a pocket notebook, since from them any value in the table may be easily found.

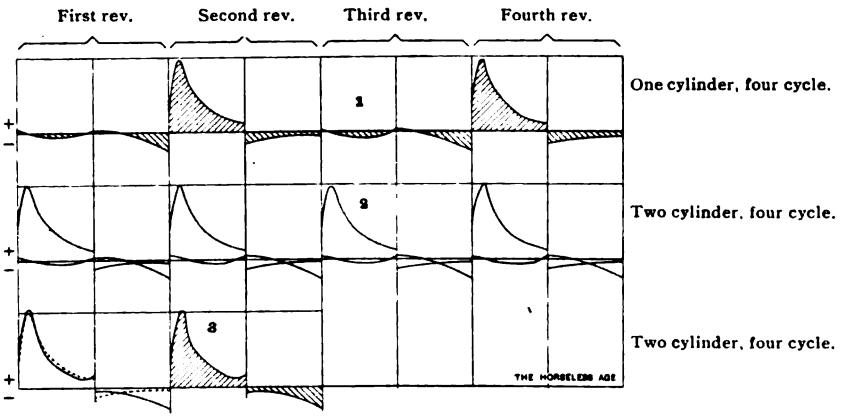
The Principles of Speed Control for Gasoline Automobiles.

By L. M. Dieterich, M. E., C. E.

If a trackless power driven vehicle is to be used for the transportation of any kind of a load, the ability to control its speed is a condition necessary for its practical operation. From a purely kinematical point of view the solution of this problem is simplicity in itself. A one speed motor, the most direct connection with the driving wheels and a gradual working clutch or brake—such arrangement would allow perfect speed control, gradual between maximum and zero, but be at the same time a mechanical monstrosity and practical impossibility.

From a practical point of view the solution of this problem is a very difficult one and is so far only partially solved, although only one condition has to be satisfied: The maximum effective energy deliverable at the rims of the driving wheels shall be a known constant, but the ratio between power and speed shall be changeable to any desired degree at the will of the operator in a positive or negative sense; such changes to be effected without loss of energy additional to such inevitable losses as are inherent in every positive power transmission."

The first power driven vehicles, having steam as their motive source, possessed, in the character of the steam engine itself, the proper conditions for the ideal solution of this problem. The use of explosion motors as motive power for vehicles at once altered these conditions, the internal combustion motor being in its infancy practically devoid of any flexibility. We therefore find in all vehicles driven by internal combustion motors, or to name the class here in view, in all gasoline automobiles, between the motor and the wheels devices whose sole duties are to effect changes in the speed and power ratio of the effective energy, regardless of the action of the motor.



With few exceptions gasoline automobiles at present on the market are all fundamentally of the constructive character originated by Gottlieb Daimler, and we have therefore only two means of effecting the speed control—the motor and the change gear. The flexibility of the automobile gasoline motor has not yet reached a limit during the many years of the existence of the motor, and although in practical use in both of its representative types, the four cycle and two cycle motor is still in a developing state, as no construction has been found so far in which, even theoretically, satisfactory flexibility has been developed.

The change gear has only two of its numerous forms which are adapted for general use, the epicyclic gear and the sliding gear, which predominates. It is a rather uncomfortable truth that such a form of change gear has found almost universal adoption. With this device cost, weight and complication restrict the number of changes to a very unsatisfactory limit; its action is so crude and its practical operation is so full of dangerous possibilities that it is only satisfactory when used in connection with a fairly flexible motor and under at least semi-expert handling. It further necessitates the provision of a specially designed and operated clutch, the construction of which, under these conditions, becomes a problem itself.

The flexibility or speed changing capacity of the gasoline motor is influenced by the means for charge variations in volume and pressure and valve and explosion timing as far as a single cylinder is concerned, and by the number of such cylinders coupled to one common crank shaft. With four cycle motors as much as eight cylinders have been used for one motor, with this end in view, as well as for other advantages derived from this arrangement, which gives one impulse for each quarter of a crank shaft's revolution. (See Sketch 7.) The same result is reached by using only four cylinders of the two cycle type.

The sketches 1 to 7 show in empirical form the crank shaft torque for four cycle, one to eight cylinder motors, and Diagram 7 approximately for a two cycle, four cylinder motor also. In these diagrams only the internal pressures in the cylinders are characterized in their positive or negative torque effect on the crank shaft, and must not be compared with indicator diagrams, which are of a different character although similar in form. For simplicity's sake these diagrams are based on valve timing coincident with crank shaft dead centres.

Without going into details, we can read from these diagrams that without the consideration of any inertia of moving masses (flywheel, etc.) eight four cycle or four two cycle cylinders are necessary in one motor to obviate any negative torque in one cycle or to maintain a constant effective torque. The near proximity of the undulations (Fig. 7), which are much smoother in practice than shown in sketch, permits of a very light flywheel, which fact tends greatly to increase the flexibility of the motor.

CONCLUSIONS.

From the above, taken in conjunction with the practical results which may be derived from modern gasoline automobiles, we may draw conclusions as follows:

1. It is not practical at present to effect

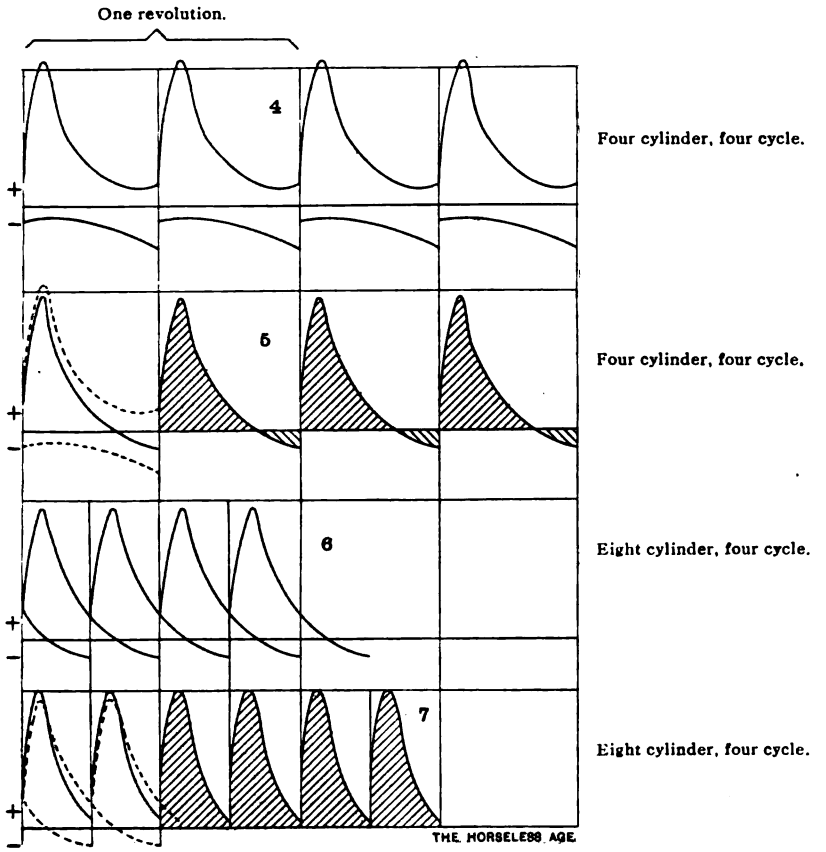
the speed control of gasoline automobiles either by motor or by change gear alone.

2. The speed flexibility of a vehicle increases with the number of cylinders, considering the change gear a constant.

3. The efficiency of a vehicle is greatest if the desired speed and power ratio are derived from the change gear alone, while the motor is running under such speed as is most efficient for the given value timing.

4. Speed control by motor action alone is the most desirable as far as gradual operation and simplicity of handling is concerned.

5. It is desirable to reduce the number of speed changes in the change gear construction and counteract this reduction by reducing the ratio of motor power and vehicle weight.



Four cylinder, four cycle.

Four cylinder, four cycle.

Eight cylinder, four cycle.

Eight cylinder, four cycle.

6. A one quarter revolution impulse motor should be most satisfactory, and a two cycle, four cylinder motor is the practical exponent of this class.

7. Under condition 6 a two speed epicyclic gear should be satisfactory even for high powered automobiles.

8. The efficiency of a multicylinder motor for different speeds and thereby its flexibility materially increase by making valve and explosion timing a function of motor speed, automatically operated by the motor itself.

9. Conditions 8 make the most economical speed flexibility a function of throttle control.

10. The advent of auxiliary self-starting devices, in connection with condition 8, carried to the reversing point, should eliminate the change gear.

The Heat Treatment of Steel.

By Cecil Hamelin Taylor.

Steel is iron associated with certain substances which, without removing its malleability while hot, give it the property of having its physical characteristics decisively altered when subjected to a certain thermal treatment. The substance most commonly introduced into iron for this purpose is carbon, which may be termed the ruling element in fixing the relations of heat treatment to the ensuing physical properties of the metal. The theory of heat treatment, as at present accepted, rests upon the influence of the rate of cooling on certain changes in structure, occurring at high temperatures in the solid state, analogous to those taking place during the segregation of crystals from a mother liquor, together with certain allotropic modifications in the uncombined iron. The present article will be confined to the practical side of the subject, and attention will be paid more particularly to those points of importance which are not generally understood.

During the process of raising most alloys from ordinary temperatures to their fusing points, the relations, both physical and chemical, of their constituents undergo certain changes. These alterations are of two classes—critical and progressive. The former occur periodically, each change taking place suddenly between certain rather narrow temperature limits, usually with rapid evolution or absorption of heat, while the former proceed gradually as a simple function of the temperature rise. Every critical change in structure of the metal produces a corresponding alteration in the physical properties. It has been found that by controlling the rate of cooling, certain states, normally existing only at high temperatures, may be caused to persist after cooling, and that the physical properties attending such states may be very different from those of the normal metal. All thermal treatment has for its object the development of that combination of physical qualities in the cold metal which will enable it best to withstand the duties for which it is destined.

The factors influencing the results of a heat treatment are:

1. The original chemical and physical properties of the metal.

2. The composition of the gases or other substances in contact with the metal during heating and while hot.

3. The form of the temperature rise curve for each unit of metal.

4. The maximum temperature attained by each unit of metal.

5. The length of time the metal is maintained at the maximum temperature.

6. The form of the temperature drop curve for each unit of metal.

Factors 3 and 6 will in turn be influenced by the size and form of the object; by the difference in temperature between it and the heating and cooling mediums; by the thermal capacity and conductivity of the latter, each of which may vary widely within the temperature range to which it will be subjected.

Departing somewhat from the above order we may consider factors 1, 2, 3 and 4 as being but elements of the heating process. The method of heating the object is of importance, especially from considerations of the mechanical injury which may result from too rapid an increase in temperature in the external layers of the metal, and of the final temperature attained.

HEATING.

At a temperature in the neighborhood of 600° Fahr. most steels lose their ductility to a great extent, and become thereby unfitted to resist strains which may be imposed upon them by differential expansion of the unevenly heated metal. It is therefore important to have the temperature rise curve from the lower limit to 600° a gradual one, after which it may be as sudden as is convenient without incurring danger from overheating. A reducing atmosphere is always preferable to an oxidizing one, although unless the metal be permitted to remain at a high temperature for a considerable time, the chemical state of the surrounding gases is of importance only when the outer layer of the piece is not to be removed by machining.

The maximum temperature to which the metal must be subjected is greater than that of the highest critical change, advantage of which is to be taken. This temperature for quenching is ge

that of the solidification of the first entectic solution of the mixture, which for pure carbon steel is about 1,250°. Not only must the metal be brought to this temperature, but the active cooling process must be inaugurated considerably above it, in order that the desired effect in checking the crystallization of the structure be produced. If the metal be maintained above a certain temperature, variable with the analysis of the steel, in an oxidizing atmosphere, not only will the surface of the piece become rapidly covered with a scale of iron oxide, but the oxidization will extend to the elements combined with the iron. When these oxides are volatile at the temperature of formation, little harm is done beyond reducing the superficial layers of steel, but when they are involatile and remain within the metal they tend to form a layer or film of separation between the metallic grains, preventing cohesion between the latter. Such steel is said to be "burned," and no process is capable of regenerating it without fusion, the removal of the oxides and the replacement of the oxidized elements. While metal is maintained within the crystallogenic zone in any atmosphere, disaggregation proceeds, so that the longer the metal is subjected to such a temperature, and the higher the temperature, the more unhomogeneous it becomes and the coarser its grain after quenching. Steel injured in this manner is said to be "overheated" or "soaked." Partial regeneration may be obtained by repeated forging above the critical temperature, followed by positive quenching.

THE LEAD BATH.

Of the various methods of heating the more sensitive special steels which are coming into general use for automobile work, that involving use of the lead bath seems to give the most perfect results. The steel is first heated gently in a gas furnace to about 800°, when it is removed and immersed in a tank of melted lead maintained at the maximum temperature to which the piece is to be heated. A pyrometer attachment indicates exactly when the object, having reached the temperature of the bath, no longer absorbs heat therefrom. The piece is then removed from the lead and quenched. Every part of this process is perfectly controllable, and the personal equation is eliminated. No portion of the piece can ever attain a temperature above that of the bath, nor can its surface be acted upon chemically during the process.

QUENCHING,

in the metallurgical sense, is the rapid cooling of a metal, usually from a state of incandescence. What Osmond has termed "negative quench" occurs when any steel in cooling passes through a critical temperature zone, in which the crystallogenic forces are maximum, at a rate equal to or below that which will give to the metal the greatest attainable elongation when cold. This critical rate of cooling, which separates the mechanical results of quenching into two distinct divisions, varies as an inverse function of the carbon contents where the influence of other elements does not predominate, and for very low carbon steels it becomes higher than can be attained in practice, with the result that steels below about .25 per cent. carbon are incapable of taking a positive quench.

Negative quenching leaves the tensile strength and elastic limit about equal to those of the annealed metal, and produces the maximum possible elongation, with a high contraction of area, and usually the highest attainable shock resistance. Positive quenching, as it becomes more and more pronounced, increases the tensile strength and elastic limits, at first slowly, then more and more rapidly, the ratio of the first to the second property becoming gradually less. The other three characteristics decrease as an inverse function of the tenacity. It is thus evident that by variation in the factors governing the activity of the quenching bath any given steel may be caused to assume its most suitable state for any given purpose. Indeed, all possible methods of quenching are but means of varying the rate of cooling, and the art of heat treatment may be reduced to the selection for each particular case of the cooling medium, which, under the conditions, will produce that rate of cooling during each of the critical temperature zones of the metal which will give it the desired properties. The following

MORE COMMON BATHS

are enumerated approximately in the order of their intensity upon steel of .90 carbon: Mercury; water with the addition of sulphuric acid, nitrate of potassium, sal ammoniac, common salt, carbonate of lime, or carbonate of magnesium; pure water; water containing soap, sugar, dextrine or alcohol; sweet milk; various oils; beef suet; tallow; wax. It must be borne in mind that the various baths cannot act under all conditions with the same relative intensity, since their conductivity and viscosity vary greatly with the temperature. The curves of intensity are therefore very irregular, crossing each other frequently. Except with oils and certain greases, the quenching effect is greater the lower the temperature of the medium. These exceptional materials give a nearly constant action at all temperatures. Sperm and linseed oils at from 32° to 250° act approximately as does distilled water at 160°. Certain advantages follow the use of a process giving a rapid fall of temperature through the critical zones, and a more gradual fall subsequently. This is usually realized by what is termed "dual quench," where several baths of decreasing intensities are used successively during the course of cooling.

ANNEALING OR TEMPERING

after quenching is resorted to in order to correct in some measure any exaggeration of certain properties in the metal which the quenching process may have impressed upon it, and, by relieving any strains existing in the metal, to return it to a state of molecular equilibrium at atmospheric temperatures. Owing to the difficulty of controlling the cooling process, the latter is frequently applied more energetically than would be necessary to produce the desired result, with the idea of subsequently reducing the characteristics so obtained by the more easily controlled tempering or annealing process. With very massive pieces it is often necessary to cool the external layers more rapidly than is desirable in order to produce essential modifications in the internal structure, and tempering is required to modify the external layers.

The proper temperature to which a piece should be raised depends upon the composition of the metal, the purpose for which it is desired and the condition of the quench. The annealing temperature must never reach that of the critical quenching point, which varies with the analysis. A maximum limit of 1,100° will be found safe for nearly all steels, and except in rare cases no advantage is to be gained by raising the temperature above 1,000°. This maximum temperature should be maintained only long enough to ensure the objects being evenly heated.

After any process tending to throw the metal out of equilibrium, such as forging, rolling or rough machining, annealing should be resorted to in order that it may return to a state of repose. Annealing before quenching is always to be recommended, and becomes of great importance in the case of complicated pieces of the special alloys.

CASE HARDENING

is utilized to produce a hardened surface upon a body of tougher metal. A number of important parts of a motor car are usually treated in this way. Abroad it is common practice to case harden all shafts, and until quite recently transmission gears. Wrought iron and most steels when heated above 1,250° in intimate contact with many nitrogen-carbon compounds absorb carbon slowly, the external metallic layers, to a depth depending upon time and temperature, becoming more highly carbonized. Positive quenching then produces a hardened surface, while the body of the metal below the carbonized skin acts independently of it. The degree of carbonization of the skin depends principally on the temperature attained, while the depth is dependent more upon the extent of time during which the metal is exposed to the carbonizing influence. Evidently a piece built up, as it were, of steels of widely different properties, will act in a more or less complicated manner during cooling. To reduce the internal strains and conse-

quent distortion in the metal due to quenching, it is usual, and with some alloys absolutely necessary, to anneal the piece between the carbonizing process and the quenching. This should always be carried out in a neutral or carbonizing atmosphere, and the most common method is to allow the hardening pot and its contents to cool undisturbed after carbonization is completed. The pot is then again brought to a quenching heat, after which the object is removed and quenched. Attempts at quenching irregular pieces without intermediate annealing often result disastrously.

INFLUENCE OF COMPOSITION.

The influence of the original physical structure and chemical composition on the results of heat treatment is most complicated and obscure, resting as it does on more or less complete empirical data. Iron and carbon, which may be termed the essential elements of steel, are usually associated with other substances, some of which are impurities remaining from the ore which have not been entirely removed in the smelting and refining operations, while others may have been intentionally introduced, either to neutralize the injurious tendencies of some of the former substances, or to produce certain desired properties in the steel. Silicon, manganese, nickel, chromium, vanadium, tungsten, molybdenum, titanium, arsenic, aluminum and cobalt have been added to steel in various combinations with a view to producing desirable qualities in the metal, and their effects on the physical characteristics of the metal under a variety of thermal treatments have been the subject of careful study.

The great number of the variables, however, together with their wide range and the difficulty of controlling their variation, has thus far prevented the laws governing the subject from being accurately determined. The presence of phosphorus, sulphur, the metallic oxides and hydrogen, which enters steel probably in solution, exert a strongly injurious influence on the resistance of the metal. Sulphur causes brittleness or "hot shortness" beyond a nascent red heat, while the presence of the other three materials result in brittleness at atmospheric temperatures. The law of Roberts-Austen, indicating the relationship between the position of the elements in the periodic classification of Mendelejeff, and their influence upon the physical properties of steel, seems to hold except where the foreign bodies exercise an individual mechanical influence independent of their atomic relations to iron; in other words, where they enter the alloy physically rather than chemically.

The addition of carbon alone to pure wrought iron raises the tensile strength and elastic limit of both the quenched and the natural metal as a function of the carbon contents, but lowers the reduction of area, elongation and shock resistance in inverse ratio. The sensitiveness to any heat treatment increases rapidly with increase of carbon, which also seems to have the property of accentuating the influence of injurious materials co-existing in the metal, and of reducing that of beneficial elements. The effect of strong, positive quenching from about 1,400° is roughly to double the tensile strength and elastic limits of .50 per cent carbon steel, and to reduce the elongation and reduction of section to one-tenth its former value. The greater the carbon contents and the more energetic the quench, the more extreme will be the corresponding changes.

Since it is difficult to obtain

SILICON IN STEEL

without the presence of manganese, its direct action is difficult to determine. The influence of silicon upon the results of quenching seems to be not unlike that of carbon in many ways, and it is greatly dependent upon the coexisting amount of the latter element, as well as of manganese. Steels containing from 1 to 2 per cent. silicon in conjunction with somewhat less than 1 per cent. carbon have been used very successfully as hard tool steels. Below a contents of about 1 per cent silicon ceases to exert a marked individual influence on quenching, and the metal may be considered more as a special carbon steel. Without the presence of a considerable amount of manganese silicon steels show very low shock resistance, whether annealed or quenched, the figures being higher the lower the carbon. Beyond a contents of 5 per cent. silicon steels are quite unfit for any structural purpose. In

MANGANESE STEELS

containing approximately .25 per cent. of carbon the ductility decreases as the manganese contents is increased up to about 6 per cent., when the elongation becomes insignificant, the metal acquiring extreme brittleness. The higher the percentage of carbon the less manganese is required to produce this result, until within the neighborhood of 1 per cent. carbon, 2 per cent. manganese is sufficient. Quenching has less effect on manganese steels than on most other varieties, and what little is produced is due to the carbon, the manganese seeming to antagonize it. Silicon neutralizes the injurious tendencies of manganese, and for this reason is often alloyed with it. Racing car springs and gears are now constructed of silico-manganese steels abroad.

NICKEL

exerts a tendency similar to that of manganese, but much less marked. The effect of quenching on its influence depends upon the sum of the carbon and nickel contents. The tenacity and elastic limits up to about 5 per cent. nickel are much increased by positive quenching, especially with high carbon percentages. Below .50 per cent. carbon and 5 per cent. nickel the reduction of area remains nearly unchanged, and the elongation but slightly decreased by this treatment. Beyond .75 per cent. carbon, even 3 per cent. nickel steel becomes supersensitive to quenching, and difficulty is experienced in preventing the formation of fissures.

Chromium resembles carbon in its influence on the hardening qualities of steel. It has a strong tendency to prevent the development of the crystalline structure, thereby refining the grain remarkably. Its action becomes decisive above a contents of 1 per cent. Chromium intensifies the sensitiveness of steel to the quenching process, and while extreme hardness may be produced by its means, the resistance to fracture will be higher than in a carbon steel of equal hardness. In combination with nickel, chromium raises the shock resistance to a very high figure, especially where localization occurs, and opposes itself to the propagation of cracks which may be produced by sudden strains.

VANADIUM

may be said to lie between carbon and chromium in the properties it impresses upon steel. Small amounts up to .50 per cent. increase the tenacity, and particularly the fatigue resistance of the metal, in both the annealed and quenched conditions. It has been added to both chrome-nickel and silico-manganese steels with good results.

It has been found possible to use certain empirical formulæ to predetermine approximately some of the physical characteristics of steels containing known quantities, within usual limits, of those elements most commonly existing in steels. Deshayes proposed the following:

$T = 42{,}000 + 25{,}000\ C + 51{,}000\ C^2 + 25{,}000\ Mn + 14{,}200\ Si + 21{,}000\ Ph.$

$L = 42 - 36\ C - 5.5\ Mn - 6.Si.$

Where T = tensile strength of the natural metal; L = its per cent. elongation in 4 inches; C, Mn, Si and Ph represent the percentages of each element present in the metal. Similarly Osmond has proposed the two following formulæ for Bessemer and Siemens-Martin steel respectively:

Bessemer: $T + 37{,}000 + 85{,}000\ C. + 33{,}000\ Mn. + 15{,}600\ Si + 92{,}000\ Ph.$

Martin: $T = 37{,}000 + 66{,}000\ C. + 30{,}000\ Mn. + 15{,}600\ Si + 92{,}000\ Ph.$

Where the steel is of high quality, with little phosphorous contents, Juptner proposes $T = 35{,}500 + 94{,}000\ C. + 20{,}600\ Mn. + 41{,}000\ Si.$

In a general way it may be stated that positive quenching increases the ratio of the elastic limit to the tensile strength. For carbon steels up to about 1 per cent. carbon, oil quenching gives a value for the above ratio of about .65, and the corresponding increase in tenacity may be roughly obtained by the formula

$$T^1 = T + .92\ (T - 45{,}000)$$

where T^1 is the tenacity after quenching, and T that of the natural metal.

The most important effect of using the proper material for each part of an automobile is that the total weight may thereby be reduced to a minimum, decreasing the strain on tires and improving the fuel economy.

The Comparative Value of Steels.

By Thos. J. Fay, E. E.

A comparison of metals for automobile construction may be of interest, especially in view of the recent activity with respect to the use of alloy steel for motor car work. The writer has selected some good examples of the various alloys, and tabulated them in such a way as to set off their qualities in contrast. With one or two exceptions the tests tabulated are of specimens actually investigated by the writer, and in nearly every case the steel was used in motor car work.

In some of the cases the steel was used extensively, and tried out under a variety of conditions, which is a decidedly important matter, for, as is well known, alloy steel is something to be handled with care, else the unexpected will happen. To illustrate the point, nickel in steel may be added up to 35 per cent. with good results, but all percentages of nickel within the stated limits may not be used with good results.

Schneider & Cie., 42 Rue d'Anjou, Paris, produce nickel steels of the percentages and having physical properties as given in the accompanying table.

The above treatment record refers to the nickel steel specimen No. 7 of the table of compression.

Nickel steel possesses other valuable features besides its wide range of physical properties, such as the ability to withstand shock stresses even though the shape be intricate and perforated with holes. If high in carbon, nickel steel does not seem to stand hardening very well, especially local hardening, although oil tempering may be resorted to without difficulty. In one instance the writer tried some differential shafts of 3½ per cent. nickel steel, with forty points carbon, and upon attempting to harden the thrust end, found it could not be accomplished with safety.

Nickel steel is very liable to show "pipes" and "seams," as well as other mill imperfections. Indeed, it is said of this alloy that a surface defect in the bloom will show up somewhere in the product in every case. Notwithstanding its apparent good qualities, nickel steel is not the equal of nickel chrome steel in any way. The accompanying table (by the Krupp Steel Works) gives shock tests, and the figures are in accordance with the writer's own experience.

Inferior carbon steel would in all probability have ruptured on the first blow. It is plain from the above that nickel steel, however good, cannot compare with nickel chrome steel. While there is a considerable difference in the performance of nickel chrome steel and nickel steel, there is a far greater difference between nickel chrome and carbon steel, as the latter in general is not better than the specimen tested, while, on the contrary, it is often much inferior to the test piece.

A glance at the tests will suffice to show that .30 carbon steel of a good quality, as received from the mill, untreated, is the equal of nickel steel in the untreated state. Carbon steel may be had in a large variety of grades, which is an advantage. The qualities of carbon steel follow the percentage of the carbon component in a very regular way, as the table for variations in carbon will plainly show.

The qualities of carbon steel are susceptible of change by the process of tempering and annealing, the same as the qualities of alloy steels. The higher the carbon the more chance there is of damaging the product. In fact, it is extremely difficult, if not impossible, to case harden steels with more carbon than mild steel, without destroying the qualities and strength of the steel. Carbon steel does not seem to withstand alternate shock stresses with anything like the tenacity of the alloy steels, nor does it possess the virtues of any of the alloy steels when it comes to the question of overload of any kind.

"Sudden rupture" is a term especially applicable to carbon steel products, and it was to avoid this undesirable property that led up to the investigation of nickel steel, and eventually to the use of nickel-chrome steel.

Soft Norway iron is in every way more reliable than any grade of carbon steel, but iron is not a high strength metal; nevertheless, for lamp brackets, guard irons and many other parts subject to vibration, but not to great stresses, soft Norway iron will resist the stresses indefinitely, while carbon will give trouble almost from the start. If carbon steel is used for any such parts the lower the carbon the better, and sulphur should also be as low as possible. The cheaper grades of Bessemer steel run about 10 points of carbon; but the phosphorus goes as high as .105, which is very high indeed. The phosphorus should not run

Schneider & Co.—Nickel Steel.

% Nickel.	Tensile Strength.	Elastic Limit.	Elongation in 4.72 Inches.	Treatment.
1 to 1½	78,000	48,000	18	Water tempered at 900°.
2½ to 3½	97,000	82,500	15	Medium hard.
2½ to 3½	80,000	68,000	20	Medium soft.
2½ to 3½	85,000	60,000	23 to 13	Medium hard structural material.
2½ to 3½	71,000	50,000	28 to 16	Medium soft structural material.
4½ to 6	102,000	74,000	15	Hard for strenuous work.
4½ to 6	121,000	107,000	12	Hard, but annealed at 870°.
4½ to 6	88,000	63,000	20	Medium hard.
10 to 12	199,000	114,000	6	Annealed at 900° C.
22 to 26	110,000	45,000	40	Water annealed at 900° C.
22 to 26	114,000	50,000	35	Annealed at 900° C.
30	80,000	28,000	44	Water tempered at 900° C.

To show the extent to which nickel may be swayed by treatment, the following record of a test is appended:

Composition.	Tensile Strength.	Elastic Limit.	Reduction of Area.	Elongation % in 2 Inches.	Specimen.
3.25 Ni.	88,200	62,000	58.6	28	A
0.27 C. 0.127 Si.	133,500	133,500	6¼	20	B
0.04 S. 0.05 P.	223,800	190,000	37.6	12	C
0.40 Mn.	226,000	226,650	19.5	8	D

Shock Test.

Kind of Steel.	Specimen No.	Deflection by Shock in Inches. 1	2	3	4	5
Nickel chrome.....	1	0.71	1.30	1.89	2.40	2.80
Nickel chrome.....	2	0.83	1.54	2.17	2.76	3.03
Nickel steel.....	7	1.26	2.24	3.03	3.58	3.82
Carbon steel.....	8	1.38	2.44	3.23	3.70	3.94

Dimensions of test piece, 1.18x1.18x11.81 inches; distance of supports, 9.45 inches; weight of hammer, 448 pounds; height of fall, 89.87 inches.

GOOD OPEN HEARTH STEEL, WITH CARBON PER CENT. AS FOLLOWS:

Properties.	.10	.15	.20	.25	.30	.35	.40	.45	.50	.60	.80	.100
Tensile strength in pounds per square inch.....	49,000	55,000	60,000	80,000	85,000	90,000	98,000	104,000	110,000	125,000	135,000	143,000
Elastic limit in pounds per sq. in.	28,000	34,000	35,000	48,000	51,000	54,000	58,000	61,500	65,000	70,000	77,500	80,000
Elongation in 8 inches, per cent.	34	31	28	20	19	18	15	12½	10	8	5	2.6
Reduction of area, per cent.....	66.5	68.5	58	45	42½	40	30	27½	25	20	10	5

RELATIVE VALUES OF SOME STEEL MIXTURES.

RECORDS OF TESTS.

Name.	1	2	3	4	5	6	7	8	9	10
Nickel	3.30	2.09	4.40	3.38	2.00	....	3.25	....	....	....
Chromium	1.40	0.71	1.53	1.87	1.25	3.5	....	....	1.00	....
Molybdenum	....	....	....	....	....	....	....	....	....	1.12
Vanadium	....	....	....	....	....	....	....	....	0.25	....
Wolfram	....	....	....	....	1.00	....	....	....	....	....
Tungsten	....	....	....	....	....	13.5	....	....	....	13.12
Carbon	0.31	0.36	0.253	0.238	0.34	0.50	0.27	0.28	0.23	0.65
Silicon	0.26	0.21	0.244	0.183	0.09	0.20	0.127	0.21	0.129	0.22
Sulphur	0.028	0.015	0.012	0.026	0.022	0.011	0.04	0.019	0.038	0.104
Phosphorus	0.015	0.013	0.013	0.025	0.015	0.014	0.05	0.023	0.02	0.012
Manganese	0.41	0.35	0.73	0.35	0.10	0.18	0.40	0.50	0.43	0.140
Difference	94.207	96.222	94.188	94.998	95.188	74.095	95.913	98.968	97.903	84.636
Total	100	100	100	100	100	100	100	100	100	100
Tensile strength in pounds per sq. in.	120,000	112,000	154,000	123,800	152,500	116,000	88,200	85,000	120,000	134,000
Elastic limit in pounds per sq. in...	101,000	87,000	133,300	80,000	147,500	80,000	62,000	66,000	100,000	91,200
Elongation per cent. in 2 inches.....	16	14.5	12	10.6	10.5	18	28.5	24.5	17	13.5
Reduction of area in per cent.....	67	64	25	53.2	22.8	35	58.6	63.3	48	38.2
Diameter of test proof in inches.....	0.59	0.59	0.59	0.59	0.505	0.59	0.505	0.505	0.505	0.505

above .06 in this metal, while .04 would be decidedly better.

Vanadium steel undoubtedly possesses valuable properties, and it is a moral certainty that vanadium steel will be extensively employed in the future, to the exclusion of nickel, tungsten and molybdenum steel, and replacing chrome steel to some extent; but at present vanadium steel does not seem to excel chromium steel in the hardened state. There are a number of points about vanadium steel that are not as yet settled. For instance, we do not know the extent to which vanadium steel may be forged, hardened and manipulated in general. We must know all about these points before vanadium steel can be accepted as trustworthy for motor car work.

Only a short time ago a very clever representative of a foreign mill called upon the writer and endeavored to get him to substitute vanadium steel for nickel-chrome steel, on the ground, as he put it, that "vanadium steel is absolutely the peer of every other steel, but you must purchase it from us, as we own the only considerable source of vanadium." The reason given for the adoption of this steel was hardly sufficient. While, as before stated, vanadium is a promising ingredient for alloy steel, the evidence thus far offered as to its adaptability is not enough. The records regarding the use of vanadium steel that have thus far become public rather tend to show that the steel mills have overlooked desirable qualities in steel, not alone for motor cars, but for many other purposes besides.

In investigating the steel situation independent of the steel makers there are grand opportunities to miss the most important facts in nearly every case. In a number of cases it was purely a chance shot that brought to light the presence of certain elements in the composition, for in submitting a specimen for chemical tests it is practically necessary to predict the elements in the composition or test for every element, else the very element that fixes the qualities of the metal would in all probability be overlooked. True, the steel maker who predetermines the elements he wants to use can proceed with the analysis without wasting time bothering about other than the elements he knows are actually present, but an outside investigator may not proceed in such an easy fashion.

A Study of Bearings.

By George Frederick Higgins, M. E.

The chief function of a bearing is to give support, generally to a journal transmitting energy, and incidentally to perform this duty with as little loss of motion due to friction as possible. It has long been recognized that in any simple machine, if its parts are absolutely rigid, or not subject to deformation, the only loss of energy is due to friction. From this Professor Thurston deduced the corollary that the efficiency of a machine is known when all its fractions are determinable. Since friction tends to resist the action of a moving force, it is a matter of vital importance that the resisting force be reduced to its lowest terms, for it is clearly a matter of dollars, and is manifest to the automobilist in his fuel bill.

The gasoline engine using gasoline as a fuel is the most costly power in common use. The following table is a partial summary from a series of tests of prime movers for comparative efficiency:

Type.	Fuel.	Price.	Cost Per H. P. Hour.
Gasoline engine	Gasoline	14c. per gallon	$0.0175
Simple steam	Bituminous coal	$3 per ton	.00669
Steam turbine	Bituminous coal	$3 per ton	.00302
Gas engine	Producer gas from bitum. coal	$3 per ton	.00167

If it is a fact that power from the gasoline engine costs three times that of the simple engine, six times that produced by a steam turbine, and ten times that of its sister type, the producer gas engine, it behooves the automobilist to investigate and to insist that every refinement be applied to his purchase to increase its efficiency, and reduce the operating cost. Not least among these agencies is the perfecting of the bearings as a means of reducing friction.

That some study is being directed to this subject is evidenced in the increased use of ball and roller bearings in the 1906 models, and the extended adoption of the pressure feed lubricator. The main criticism is the failure to extend both to every power journal. In its present transition stage one type, which is allowed to be up to date, registers a reduction of 53 per cent. in its friction by dynamometer test. On the same basis a further saving of 33 per cent. is in sight by the introduction of the best refinements known. To decry the well tried metal bearing is unwise, for long experience and hard usage have established the fact that a well designed and carefully made metal bearing has a large number of possible applications, and is quite efficient when properly applied. The introduction in some medium grade machines, in the past, of a poorly designed and badly made ball bearing, proves the wisdom of adhering to the old until we are prepared to pay the price for the best in the new.

BEARINGS AND FRICTION.

A long series of tests and experiments proves that as yet there are insufficient data at hand for a hard and fast rule to guide the automobilist in his choice of style and application of different bearings. These

must still be left to the expert to insure the best practice. There are, however, some fundamental principles that all may understand.

1. Friction is the one force that always acts to retard or prevent motion, and is caused by roughness and unevenness of the surface in contact.

2. Absolutely smooth and absolutely hard spheres or cylinders, rolling on absolutely hard and smooth surfaces, meet no frictional resistance.

3. Bodies with rough surfaces, made from compressible material into irregular forms, exert greater friction as these defects are magnified.

4. Frictional resistance depends upon the character of the material as well as the form of contact.

On every surface there exist microscopic irregularities which offer resistance to the passage of one surface over another, therefore the greatest care must be exercised in the preparation of these surfaces. The lubricant introduced between the two surfaces tends to fill these irregular spaces, and causes conditions to approach more nearly to the ideal.

A perfectly lubricated bearing would be one where the surface of the journal was separated from the bearing by a thin film of fluid. This is approached in practice by the use of pressure feed oilers, forcing the lubricant uniformly throughout the bearing. In general practice we usually find that the solids are not completely separated by the fluid film, but are partially in contact and partially supported by a layer of lubricant retained only by adhesion or capillary attraction. This results in the abrasion of the parts, producing wear, as indicated by the rate at which the lubricant becomes discolored, and charged with particles of metal. The work of friction is transformed into heat, which is disposed of, principally by radiation and conduction as the bearing becomes hot.

VALUE OF FLOOD LUBRICATION.

Recent investigation develops that, contrary to earlier opinions, the best method of using oil, particularly on fast running journals, is to supply it as freely as possible; collecting the rejected portions to reapply after thorough filtration and cooling. The value of an efficient pressure oiler is thus clearly seen, as it tends to produce the film between the surfaces; to furnish quantity as the exigency of the case demands; and further, the oil when properly expelled and cooled is a most active agent in carrying away heat.

Much study has been made to discover metals which would work together with the least friction. But long experience and tedious experiments have failed to discover a bearing metal that will fill every condition. It has, however, developed that the metal must first of all possess the property of adhesion for a lubricant and a readily wetted surface. It must be softer than the shaft—so that in the absence of a lubricant or the presence of a hard, gritty substance, the bearing may sustain the injury rather than the journal. The metal must be hard enough to retain its form under any condition of temperature and pressure likely to be imposed in actual practice. It must, however, melt at a temperature below that at which any injury may happen to the shaft, yet when melted should not adhere or weld to the journal.

BABBITTS AND BRONZES.

Careful tests have demonstrated that for light pressure and high speed bearings babbitt metal, consisting of about 85 per cent. tin, 5 per cent. copper and 10 per cent. antimony cast vertically, is adapted to a wider range of uses than any other metal. When this alloy has failed to "make good," examination has proven in nine cases out of ten the substitution of lead for tin, apparently to cheapen cost. An analysis of several guaranteed genuine babbitt metals on the market shows the presence of lead, or zinc, which is worse, because of commercial impurities prevalent. Lead makes a soft bearing that may fail at a critical time to sustain its load, and being a poor conductor of heat is very likely to cause the bearing to run hot. For heavy slow speed bearings, phosphor bronze gives the highest efficiency. For an alternate, soft yellow brass is generally satisfactory. A patent white bronze anti-friction metal on the market is composed of about 50 per cent. aluminum, 25-30 per cent. zinc, and 20-25 per cent. tin.

Until recently most experiments on

BALL AND ROLLER BEARINGS

were directed to determine the crushing strength under a dead load. In service, balls or rollers do not fail in this way. The designers who worked on this theory were responsible for much of the abuse these valuable adjuncts have suffered. More recent and valuable research has been conducted to discover the behavior of these bearings when running at varying speeds and under gradually increasing pressure. Efforts were directed to determine the power consumed, together with the cause and manner of previous failure. The phenomena developed in the course of these experiments have added much to our fund of facts and righted many misapplied theories. The principle that balls must be perfect spheres, exact in size and of uniform hardness, is accepted. Hardness, uniformity and resistance to distortion are the measures of value. The largest size ball consistent with the limits of the bearing is desirable. The relation of the race plate to the balls was long misunderstood, and the costly error of overloading had to be learned. Any bearing attached to an automobile that will show the least wear on race or ball in two years' legitimate use, must be faulty in construction or design.

BEARINGS ON THE NEW CARS.

It is unnecessary longer to go abroad for our bearings. There are American manufacturers who can construct and are marketing bearings which will guarantee this record, and a saving of 75 per cent. in friction over the substitutes found in many cars. With the present state of perfection attained there seems to be no legitimate reason why 1906 automobiles should not be equipped in every journal, from crank pin to axle, with the most approved ball and roller bearing. It is the privilege of the purchaser this year to use great deliberation in his choice of a car. The difference in design will not be so great as variety of values.

The maker who has not paid his respects to refinements deserves ostracism. It is time the old style methods of bearings with archaic oilers, splash lubrication for cylinders, and malleable iron parts, gave place to more advanced practice. With the advent of extreme power engines this year, close study should be given to the strength and rigidity of the vehicle. We hope not to find a manufacturer compelled to truss his frame through error in design and construction.

If our experience with gas engines avails anything, the three bearing crank shaft found in some big machine, without any provision for retaining or adjusting for alignment, leaves a small factor of safety, and will prove a constant menace when the full power is suddenly applied. Greatly to their advantage would be a bearing between each two adjacent cranks. The extra inches of cylinder space cut but small figure with 140 to 160 inch frames, but will add much to the life of the car.

PRESSURE OILERS AND ENGINE LUBRICATION.

A feature of the new cars to be commended is the pressure oiler. Its adoption should become universal, and the lubrication of the cylinder be given special attention through this medium. But let the buyer beware of the system in which oil is drained into the crank case, from there to be re-circulated through bearings and cylinders. It is vicious in principle, and must invite trouble. To this receptacle will be washed the abrasion and grit from the bearings, and the carbon deposit from the cylinders. To further complicate matters the escaped hot gases from the cylinder tend to change the physical, if not the chemical, characteristics of the oil. The inert acids in some oils thus rendered active cannot fail to do injury to parts. The heating of the oil tends to counteract much that is essential in a lubricant, reducing the viscosity to a point where it loses in effectiveness, and further deprives it of its value as a circulating cooling agent. No oil should be circulated a second time without being filtered and cooled.

The use of the crank case as an oil collecting receptacle calls to mind an instance where one machine draws its air for the carburetor from the crank case in order to utilize the gas leaking past the piston rings. The idea may have a value here.

Oil filters for depriving oil that has been used for lubrication for some time of the contained metal particles, etc., are in use in most large engine plants.

Automobile Axles and Bearings.

By Samuel S. Eveland.

The axles are most important parts of an automobile, as, if they are not designed properly, they cause trouble in nearly all other parts of the car. In selecting the best bearing to use for automobile axles, the problem is a difficult one, owing to the fact that the average owner of an automobile generally has no mechanical knowledge and therefore very seldom understands how to properly care for the axles. They are generally abused to such an extent that it is a surprise to the manufacturer that they run as long as they do, and efforts are constantly being made to simplify the design and construction, so as to make them, as far as is possible, "fool proof."

ADJUSTMENT AND ALIGNMENT OF BEARINGS.

In applying any class of ball or roller bearings to front axles and hubs, it is very essential that the hubs be bored true, so that the bearings in both the front and rear of the hub are in perfect alignment,



Fig. 1.

and placed upon the axle in the same manner. If this is not done, one bearing has to take the greater part of the load, and if they are out of alignment, the strain is so great that injury may be done it; the axle even may be bent and eventually broken. The inner bearing, or the one that is at the collar end of the axle, takes the greater part of the load, and should, therefore, be larger than the front one, the latter acting merely as a guide to hold the wheel true and in alignment. In designing an axle with a nut to hold the bearings in place, care should be taken that it is made in such a manner that it cannot be adjusted too tightly. It is much better to have the bearings and wheels run a trifle loose than to have them tightened to such an extent that something has to give way before the wheels can revolve properly. Many users of automobiles take the nut off their axle without jacking up the wheel, and then put it back in place, tightening the nut, without attempting to see if the wheels would revolve freely. Where the nut permits of much adjustment, and when treated in this manner, any class of bearing will break or cause trouble.



Fig. 2.

FRONT AXLES AND HUBS.

While there are many modifications in the design of front axles, there are three



Fig. 3.

standard forms which are generally used. These are the square, or round, solid steel axle, tubular axle and I beam axle. The last is used very largely abroad, but not so extensively in this country. The knuckles or steering axles used with each of the above types of axle are the Elliott, which is the ordinary yoke type, with the steering arm projecting from the centre or end of the post, and besides this the Lemoine, which is used very largely on foreign cars. Each of these classes of steering knuckles is fitted with an ordinary bronze thrust, to take the upper strain or end thrust, or is fitted with ball thrust collar bearings of the type shown in Fig. 1. While these bearings aid in making the car steer easier, they are not essential, but owing to the fact that they do not require as much oil and



Fig. 4.

attention as a bronze bearing, there is an advantage in using them.

The style of hubs most used, known as the artillery type, is made of various shapes and forms, all of which, however, are modifications of the original hub and wheel used on artillery, they being made of malleable iron, steel castings or pressed steel.

CLASS OF BEARING TO USE.

There are many types of bearings used on front axles. The ordinary cup and cone type of bicycle bearing, if properly designed and sufficiently large balls used, with proper radius to both the cup and cone, gives satisfaction on light runabouts. (Fig. 2.) In touring cars, however, this class of bearing is not the best to use, as it is not strong enough for the purpose. Among the bearings which have given good service for such purposes is the one shown in illustration 3, which consists of a hardened and ground steel sleeve to be forced upon the axle, and a similar hardened and ground sleeve to go in the hub, with the roller bearing, having rolls also hardened and ground, running between the two. Owing to the thrust that all automobile front wheels have to take in rounding a curve, or on the side of a road, in which case one side of the car is lower than the other, it is necessary to take care of the side or end strain, and with the roller bearing above referred to a ball or roller thrust bearing is introduced (Figs. 4 and 5), which relieves the journal bearing of all end strain. This bearing, as described, is not adjustable, and it is impossible to tighten it or destroy the alignment of the rollers in any way. The bearing above referred to is provided with a cage, having sockets in which the rollers rest, with a ball at the end of the rolls, which prevents wear of the cage and keeps the rollers always in perfect alignment with the shaft. Another class of roller bearing which has given good satisfaction in both front and rear axles is shown in Fig. 6, and is also fitted with hardened and ground steel sleeves to



Fig. 5.

go upon the shaft or axle, and with a similar sleeve or casing to go in the hub or housing. This bearing has the ends of the rollers bevelled, and this bevel is taken by a similar bevelled piece in the casing and sleeve, in this manner taking up much of the end strain. The rollers are run upon pins which are hardened, the entire bearing being electrically riveted.

The Grant roller bearing (Fig. 7) has been extensively used in automobile work, as it has tapered or conical rolls and is capable of being adjusted, and has a thrust ring which takes the outer strain of the rolls, so that it is unnecessary to use a separate ball thrust bearing in the front hubs. While this bearing is adjustable, care should be taken not to tighten the bearing too much, as, if so, the difficulties above referred to would be experienced. The cones are loose upon the shaft, producing a floating bearing, giving a new point of contact and wear, as the cone revolves occasionally in use. Another class of bearing which has been used more extensively abroad than in the United States



Fig. 6.



FIG. 7.

is the ring or annular bearing, which is used on many foreign cars. Although but few have been used in the United States, especially for front axles, they have given excellent satisfaction when used, either of the full type or of the silent type. The most satisfactory bearing of this class of the full type (Figs. 8 and 9) is the one having the solid ring, made without the small loose section screwed in place, which was formerly used abroad, but which is not sufficiently strong to stand the rough usage experienced on American roads.

REAR AXLES.

In considering the proper class of bearing to use on rear axles, a distinction must be made between those to be used for chain, bevel gear and hub driven axles. While there is a great demand for bevel gear axles, the hub drive is mechanically the best as well as the strongest and most durable, and is used very extensively on foreign cars. One advantage that it has over the bevel gear axle is that if any parts are strained or bent out of alignment, owing to shock or strain, the car can continue to run successfully, which is not so likely to be possible with the bevel gear. In using the hub drive the rear axle differential is placed on the countershaft, the axle being merely an ordinary straight one, with bearings in the hubs, similar to those used in the front hubs but larger in size, as more of the load and strain is taken on the rear than on the front axle. The rear flange and body of the hub is faced off to take the sprocket or gears, which are held by the same bolts that hold the spokes, giving a very strong, rigid and durable construction.

CHAIN DRIVE AXLE.

In constructing an axle with chain drive, either open spiders or closed housings are used over the sprocket and differential, the closed housing being preferable, as it gives better protection from dust and dirt. Hollow tubing, with the axle running in it, is used between the housing and the brake support. It is necessary in designing this class of axle to have it as thoroughly water and dust proof as possible, as if either gets to the bearings much injury may result. On account of the great thrust which rear axles have to stand, it is absolutely necessary to allow the bearing to run free, and a ball or roller thrust bearing should be placed in such a manner as to entirely relieve the journal bearings of all end thrust.

The anti-friction bearings above referred to are all used with success in the rear axle construction in connection with the ball thrust or roller thrust bearing, as shown in the illustrations. The hardened and ground steel sleeve for the bearing should be pressed on the shaft with the hardened and ground steel casing into the housing, and also used under the brake support, with a thrust bearing placed next to each of them to take the end strain or thrust which comes when the car is on a curve or on the side of a road.

BEVEL GEAR AXLE.

The same bearings used with the chain and hub drive axles are used with the bevel gear, but as this axle has to stand not only the ordinary strain but also that caused by the thrust of the bevel gears, it is essential that thrust bearings be placed back of the bevel gear as well as back of the pinion, and some class of journal bearing, either roller bearing or ball bearing, should be used at both sides of the pinion shaft to support it in place and keep it in alignment, so that the gears may always mesh properly. The adjusting nut for the bearing is placed inside the brake drum, and is made in the lock form so that it cannot become loose, and also made so that it can be removed easily when the hub is taken off. It is very essential that bearings should be placed as close to the differential as possible, and also as close to the pinion and gear as convenient, to add to their rigidity, strength and durability. The bearing on the pinion shaft should be made double or longer than the other bearings because of the extra strain coming when the car is started when it is in the mud, sand or gravel.

The lower half of the housing used on bevel gear drive axles is generally made from malleable iron or steel castings and the other half from aluminum, and so that it can be readily removed when necessary. This latter piece merely acts as a cap to keep dirt and foreign substances from the differential and gearing; and as it has no other service to perform, it gives good satisfaction when made from aluminum. It is desirable to use on the rear axle construction a truss rod, to relieve the bearings as much as possible.

OILING.

There seems to be a general idea that ball and roller bearings and, in fact, all classes of anti-friction bearings do not require oiling. This is a great mistake, and manufacturers should give the strictest instructions to their customers that all classes

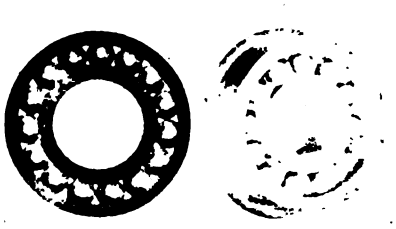


FIG. 8.

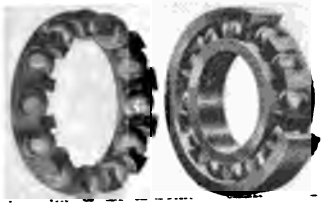


FIG. 9.

of ball and roller bearings must be properly lubricated. They do not require as much oil or attention in this respect as a plain bronze bearing, but when they are allowed to run dry they will cause trouble, the same as any other bearing, and they will also become rusted and their efficiency thereby greatly reduced. Any class of machine oil, cylinder oil, coach oil or grease that is free from animal matter or foreign substance gives good satisfaction when used on ball and roller bearings. When bearings are kept clean and properly oiled the care given them is repaid many times.

It is essential to use bearings that are properly ground, with balls that are also true in size. Frequently balls are used with cups and cones that are not ground true and trouble is experienced, as the load is thrown upon only a few of the balls. Accuracy in finish and alignment is the most essential point to consider in any bearing. Both ball and roller bearings, to give the best satisfaction, should be made of steel, hardened and ground, accurately fitted in proper alignment with the shaft, and also cleaned and oiled regularly and fitted with as large size balls and rollers as possible, depending upon the revolutions per minute and the load to be carried, and if used as above recommended, they will return their cost many times over within a very short time.

Bearings.

BY HARRY E. DEY.

What kind of bearings are best to use in the various parts of an automobile? If this question was asked of the various manufacturers, there would be a wide divergence in the replies. One man would say, "Plain bearings, because they never break"; another, "Balls, because they never stick, and, besides, they save power"; another would reply that "there is nothing like rollers, as they have the anti-friction qualities of the ball and the strength of the plain bearing."

The writer firmly believes that it will not be many years before a plain bearing will be unknown in an automobile, except possibly in the wrist pin of the engine. Anti-friction bearings are steadily gaining ground. Three years ago I was designing a four cylinder car for one of the prominent companies, and it was our ambition that it should equal, if not excel, in up-to-date features anything here or abroad. I designed the end bearings of the crank shaft with ball bearings, containing liberal sized balls, but the president of the com-

pany objected to these bearings, stating that he would never trust them on a crank shaft. He assented to ball bearings in the slide gear, however. Since then the Hotchkiss Company and others have proven the ball bearing crank shaft to be thoroughly practical.

It is only natural, of course, for people to be influenced by their former experiences. Many have tried ball bearings and given them up as total failures, owing to their want of experience in this line. A ball bearing looks simple, but there are many elements in its makeup that spell success or failure. The most important point is to have the balls of a good liberal diameter, preferably such a size that six balls will just fill the cups. This, however, in most cases makes too clumsy a bearing, and, besides, a very expensive one, as the price of large balls is very high. A compromise must be made, and balls somewhere between one-half an inch and 1 inch are used in most work around an automobile.

There are other points also to consider. A three point bearing is generally consid-

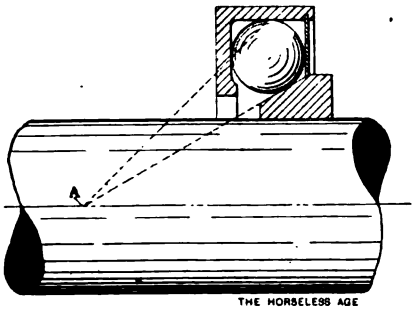
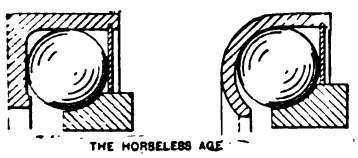


FIG. 1.

ered to be more efficient than a two point, if designed so that the line intersecting the two contact points on the cup intersect the axial line at the same point (*a*, Fig. 1) as the face of the cone projected, as this does away with all twisting motion. It has been found, however, that this straight line form of bearing is not very durable, as the point of contact is so small that the metal is soon grooved. To overcome this the cone should be made concave with a radius slightly larger than that of the balls. This greatly improves the wearing qualities of the cone. The cup, having two points of contact, is not affected so much, but it in turn is improved by changing it from a two point to a single point contact, by changing the straight surfaces into a curve with a radius slightly greater than the ball. There will be more friction in the bearing as now altered, but it will be practically inappreciable, and the capacity of the bearing



FIGS. 2 AND 3.—THREE AND TWO POINT BALL BEARINGS.

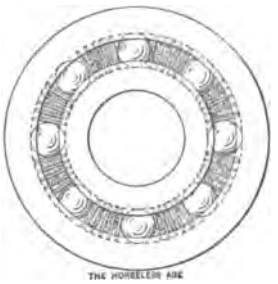


FIG. 4.—RING BALL BEARING.

will be greatly increased. These bearings are all of the adjustable kind.

During the past few years a two point bearing has been placed upon the market that is not adjustable, and has apparently given excellent satisfaction, which is claimed to be partly due to its design and partly to the special steel used in its construction. Its construction will be readily understood from the illustration.

Tool steel and machine steel both have their partisans for use in ball bearing. The tool steel advocates state that it is impossible to case harden a piece so that the hardened skin will not crush through, while the machine steel people say that the tool steel advocates do not know how to case harden properly. The proper way to do the job, they say, is to boil the parts (as it were) in the bone or leather for several hours, until they are carbonized about 1-32 inch deep. The process should be so timed that the parts will be ready to take from the fire at quitting time, and then they should be left in the mixture over night. After cleaning the mixture from them the next morning, heat to a low red and quench in oil or water, according to whether they are light or heavy. In other words, treat them as you should tool steel. This gives a much finer grain than would be the case if the over night annealing were left out. The kind of steel used with this process is not of much importance. Cold rolled shafting is used to a

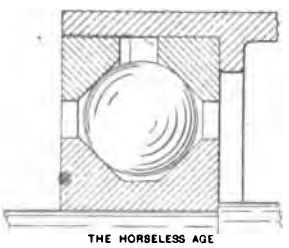


FIG. 5.—FOUR POINT BALL BEARING.

large extent. The following specification is in this line:

OPEN HEARTH STEEL.

	Per Cent.
Carbon	.20 to .25
Phosphorus below	.10
Manganese	.70 to 100
Sulphur below	.08

For those desiring to use tool steel it may be of interest to state that J. F. W. Harris, in a paper read before the A. S. M. E., recommends a steel known to the trade as crucible tool or file steel, and a special steel made by the Carpenter Company, used by them in the manufacture of projectiles. Brine is used as the hardening agent.

For high speed duty the four point is probably the best design. The points of contact coming close to the axis of the ball, a slow relative movement is obtained, and the rolling motion is theoretically correct, so far as prevention of wear is concerned, there being no sliding motion of any kind between the balls and races. The illustration herewith shows a bearing for specially heavy duty. The right hand row of balls takes care of the end thrust, while the other two, combined with the first, support the weight. End thrust bearings, as shown herewith, are usually used in conjunction with roller bearings.

In designing ball bearings the cups should be made of such a diameter as to just comfortably hold the required number of balls, allowing not over one-thousandth of

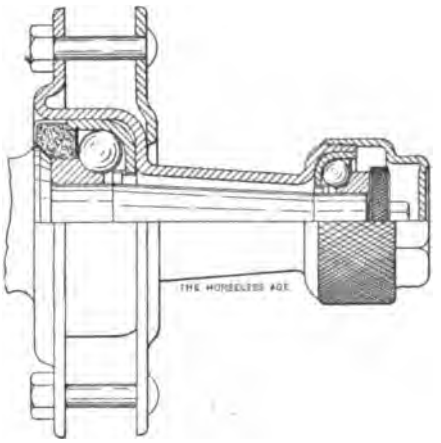


FIG. 6.—BALL BEARING FRONT HUB.

an inch clearance for each ball. As the method of determining the diameter of the circle of ball centres is quite a puzzle to many draughtsmen, I will illustrate my method of obtaining this diameter. I first decide upon the size and number of the balls to be used. The balls should be of such a size that about ten will fill the race, the number being governed by the size of the shaft, plus the necessary thickness of the cone. Drawing the cross section of the bearing gives the approximate diameter of the cup. Then dividing the circumference of the circle intersecting the centre of the

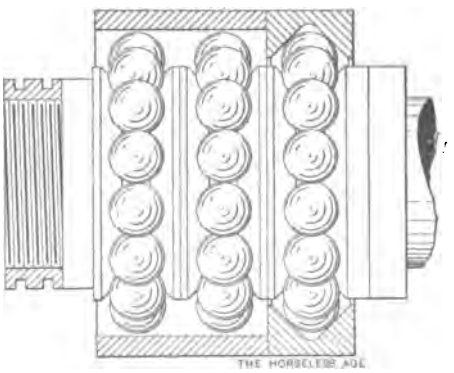


FIG. 7.—MULTIPLE ROW BALL BEARING.

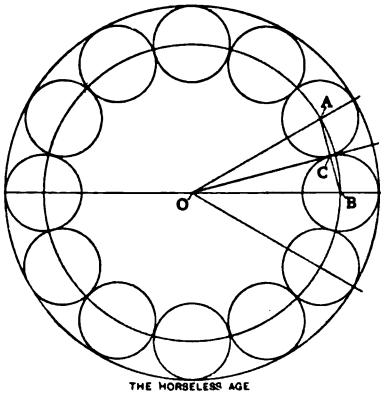


FIG. 9.

balls by the ball diameter gives us the number of balls required.

Now by making a sketch it will be seen that the angle A O B is equal to 360° divided by the number of balls in the circle, and A O C equals one-half of this angle. The line A C = sine of A O C = radius of ball. Dividing the tabular sine of the angle into the ball radius gives us the proper radius O A; multiplying this by 2 gives the diameter of the circle through the centre of balls, and adding the diameter of the ball, plus a few thousandths (.003 or .004) for clearance, gives the size of the ball cup with absolute accuracy.

ROLLER BEARINGS.

Theoretically the roller bearing is much stronger than the ball bearing, but in the past it has been subject to a great many unlooked for troubles that have prevented its superseding the ball bearing during the period of development of the latter. Consequently the two stand about evenly matched at the present time. The early rollers had a bad habit of acting as a drill and boring holes through the heads of their cages; also of getting out of alignment and thus breaking. Finally a flange was provided as an end thrust for the rollers. This greatly helped matters. Several makes of bearings are made with this arrangement now.

The anti-friction qualities of a well made roller bearing are fully equal to those of ball bearings. A few years ago a 600 pound wheel was exhibited at the Automobile Show, which would revolve when a weight of considerably less than an ounce was placed on any of the horizontal spokes, showing that the co-efficient of friction was extremely small.

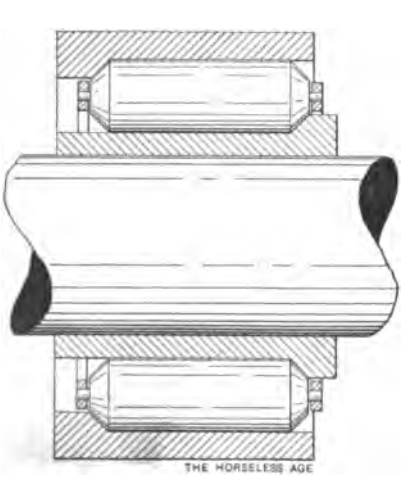


FIG. 10.—STANDARD ROLLER BEARING.

Roller bearings are generally divided into three classes, the straight or parallel roller, the cone roller and the spring roller. Fig. 10 represents a bearing made by the Standard Roller Bearing Company. It is of the parallel type, with flange end thrust.

Fig. 11 illustrates the construction of the American roller bearing. In this bearing the friction of the main rollers (*f*) against each other, or the cage, is avoided by a series of small rollers (*g*) interposed between them. These separators have enlarged ends (*h*) overlapping the ends of the large rollers, which prevents them from twisting, and they are so mounted as to roll upon the supports (*i j*) without any rubbing or dragging.

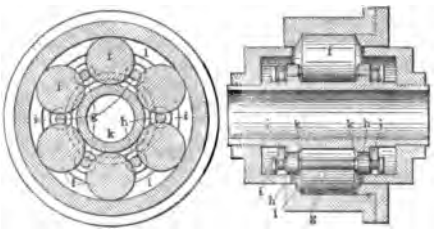


FIG. 11.—AMERICAN ROLLER BEARING.

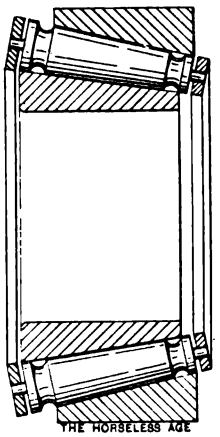


FIG. 12.—TIMKEN ROLLER BEARING.

The Hyatt roller bearing has the unusual feature of flexibility in the rolls, which are formed of a thick ribbon of steel rolled up in the form of a helix. Besides their flexibility, the manufacturers call special attention to their desirable form for distributing the lubricant. The fact that the rollers are hollow and have a spiral groove renders them ideal for this purpose. As roller and ball bearings as a rule require very little lubricant, however, it does not impress the writer that the last feature is very important. Of the cone type of roller bearings, the principal ones on the market at present are the Grant and the Timken.

PLAIN BEARINGS.

Plain bearings are of a very large variety of forms and material, and are so well known that the subject will be referred to only briefly here. In a large majority of cases they consist substantially of a journal box lined with some kind of anti-friction metal, either poured in after the manner of babbitt metal or inserted as a split or unsplit bushing. Lead and tin are excellent anti-friction metals, but are too soft for any great pressure, so they are usually alloyed with antimony or other metals to obtain the necessary compression strength.

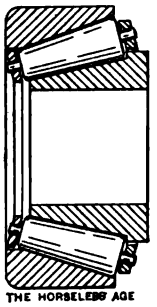


FIG. 13.—GRANT ROLLER BEARING.

In all kinds of plain bearings careful attention must be given to grooving for oil. The grooves should be on the open side, where the pressure is constant. Where it is alternating, as in an engine, grooves on both sides are desirable. It is said to be a good plan to cut away 90 degrees of the bushing on each side of the bearing and fill the space with a felt pad. It is claimed that it decreases the friction by one-half and only requires one-quarter of the lubricant. I have never tried this, but it appears reasonable. This cutting away of the sides does not, of course, reduce the effective bearing surface by one-half, as at first sight it might appear to, because of its being so far over the side. The actual reduction is equal to twice the versed sine of 45° = 29 per cent.

A plain bearing has a much higher friction co-efficient when starting and at low speed than when running at higher speeds. The friction co-efficient keeps steadily decreasing until a velocity of 100 to 150 feet per minute is reached (at light load). With heavier loads the co-efficient increases quite rapidly above these speeds. It also decreases as the temperature rises.

One great fault with plain bearings is that in case of failure of the lubricant at any time, they are liable to "grip" and possibly wreck important parts, while ball or roller bearings may run a long



FIG. 14.

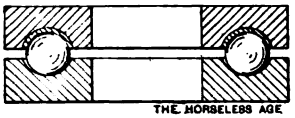


FIG. 15.—BALL THRUST BEARING.

time without any lubricant. Take the universal joint, for instance. With plain bearings it has always been a problem to lubricate, requiring frequent attention in a very inaccessible place. I have used ball bearings for this purpose with very satisfactory results. It will be noticed in Fig. 16 that a felt washer keeps them dust tight where the spindles enter, and the heads are capped with stamped brass covers to keep them closed, these brass covers being also ornamental. One packing of grease should last a whole season without further attention.

Odometers and Speed Indicators.

BY ROY S. DRAKE.

Among the important and interesting accessories the odometer and the tachometer or speed indicator offer entertaining speculation on the problems involved in their design, manufacture and application. The function of the odometer is to indicate the distance traveled by the vehicle to which it is attached, while that of the tachometer, as made for motor cars, is to indicate the rate of speed in miles or other units per hour.

USEFULNESS OF THE ODOMETER.

The general use of the odometer is due to a variety of reasons, more or less individual to the owner of the car. For some the odometer readings simply satisfy an idle curiosity as to the mileage of the day or of the season, which latter may be made the subject of a little harmless boasting when proper occasion offers. Others, with an understanding of the value of method in the care of their cars, determine upon mileage periods for packing this part with grease, lubricating that, and examining or tightening another. They substitute the odometer readings for calendar readings, and in this they are frequently assisted by the manufacturer of the car, whose instruction book is quite likely to contain valuable suggestions as to doing this or that after every so many miles running.

An odometer is frequently employed as a

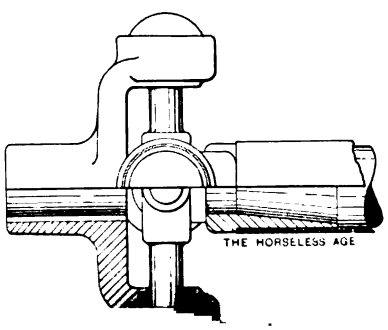


FIG. 16.—B

check on the chauffeur. It may be said to exercise a restraining influence against his driving the car without leave, though the chauffeur who is both dishonest and ingenious can by a little work and skill "fix" any mechanism of the kind so that there will be no record of merry, moonlit miles with members of the chorus. He has the trouble, however, of putting it in proper running order again before his employer sees it in the morning.

The newly created class of "traffic engineers," who seek to reduce the present empiricism of the commercial motor vehicle to something more exact and definite, find the odometer readings on cars and trucks in actual use a much better element in their calculations than the former "estimated" mileage figures.

Users of electric vehicles, who know approximately how many miles they may go on one charging of the accumulators, look to the odometer for guidance as to when to turn back or make for a charging station, instead of risking being stalled in some forlorn locality.

The value of the odometer, in conjunction with a touring roadbook, which indicates the distance between points, affords another reason for its use, and all these reasons, separately and in combination, together with others which might be enumerated, have given the instrument a wide popularity as an accessory.

VALUE OF SPEED INDICATORS.

The speed indicators or tachometers have grown in demand as a means of protection against speed prosecution and persecution. The unwonted activities of the constabulary in England in "trapping" motorists have brought forth a multitude of speed indicators for motor use in that country, and in America the passage and enforcement of stringent speed laws in various localities has in each case been followed by a greatly stimulated demand for speed indicating devices.

Speed legislation pending before the legislative bodies has often been and may still be influenced favorably for automobile users by judicious demonstrations to the legislators of exactly what 12, 20 or 25 miles an hour means. At most speeds up to 15 or 20 miles an hour the average observer thinks that the machine is moving at a slower speed than it actually is, while above 20 miles the estimate is apt to exceed the actual speed, so that when the speed reaches 30 miles an hour it is quite likely to be reported as 40 or 50 miles an hour.

There is, of course, an undoubted interest in speed readings aside from the matter of speed regulations. Prospective customers are frequently shown the speed possibilities of the machines they think of buying, and some owners of high powered cars are only too eager to show their friends that they can push the indicator to its highest reading, "and then some."

Odometers and tachometers, therefore, having become accepted features of car equipment, a consideration of the problems encountered by the manufacturer of these instruments may not be without interest.

PROBLEM OF ODOMETER GEARING.

If odometers were attached to wheels of vehicles running on steel rails with no curves, or with curves that offset each other, the matter of making accurate odometers would be very simple. The gearing would be a plain question of mathematics. The pneumatic tire and the irregular courses described by motor cars seriously complicate the problem. It is apparent that the indicated diameter of the pneumatic tire as it comes from the factory is not the true working diameter. Allowance must be made for the average compression of the tire when in actual use. The true working diameter may be accepted for practical purposes as being twice the distance from the centre of the hub to a point directly beneath the centre of the wheel, on the side of the tire where the surface of the tire leaves the ground and curves upward to the rim, or a more simple conception of it is as twice the distance from the centre of the hub to the ground. What the true working diameter is with various size tires and different weight cars is only learned by a vast amount of experiment and experience. When tables of the nominal and actual diameters have been prepared, there comes the question of selecting the proper gearing.

The manufacturers of one of the well known odometers have a working list of some 7,220 different possible gear combinations, from which they find it possible, of course, to meet almost any requirement. In actual practice they have not found it necessary to use more than 300 or so of these combinations, but the whole list is readily available from stock parts or with gears that could be made in a few hours.

DRIVING MEANS.

For cars of moderate speed odometers of the star wheel and striker principle were entirely suitable, but as the speed increased this type was found more and more likely to suffer mishaps due to the star wheel being struck with such force by the rapidly whirling striker as to make it spin, with the result that the registrations will be inaccurate, and the star wheel might stop with the end of one of the prongs directly in the path of the striker, the next revolution of which would knock the odometer into the dust.

Positive gearing is therefore used, and it becomes doubly necessary for instruments which lead to the dashboard with a flexible shaft. If a star wheel operation were depended upon in connection with a flexible shaft there would ordinarily be no registration. The star wheel would move while the striker pressed against it, but it would immediately fly back to its original position because of the spring quality of the ordinary flexible shaft, and

no movement would be communicated to the instrument.

FLEXIBLE SHAFTS.

The flexible shaft for instruments of this type is now made in various forms. There are the piano wire dental shaft, the shaft made of a series of small Cardan joints, special link and double fork forms, etc., all of which have their respective merits and faults. There is a variety, also, in the kinds of flexible sheathing offered. Flexible metallic tubing, of the style used for horn tubes, is largely used. The fancy braided tubing has been found to fray and get very dirty, and its use is being abandoned. A spring sheathing, covered with porpoise hide to keep in the lubricants in which the shaft is packed and to keep out water, is proving highly satisfactory.

ATTACHING FIXTURES.

While it is possible to design two or three fixtures, one of which may be made to fit almost any car, some of the manufacturers of odometers have preferred to design special attaching fixtures for each different make of car, until hub and knuckle construction should become more generally uniform. This policy has permitted the use of light, simple fixtures instead of the heavier, more complicated adjustable brackets.

Odometers are generally connected to one of the front wheels, both for greater convenience and greater accuracy. It has been found by test that of two odometers alike in all respects, one attached to the rear wheel and the other to the front wheel, the one on the rear wheel will over register by about 1½ per cent., because of the slippage due to the power being applied through the rear wheels.

TYPES OF SPEED INDICATORS.

Of tachometers or speed indicators there are some six or seven general types, viz., air, magnetic, friction drag, electric, mechanical centrifugal, liquid centrifugal, plunger pump, etc. They all depend on one quality which they have in common, i. e., that some force capable of operating an indicator against spring resistance or gravity is developed in proportion to the rapidity with which the mechanism is operated, or, if not in direct proportion, in accordance with some known ratio.

Each of the general types is divided into groups of its own. The air tachometers, for instance, are of several kinds. In one type the indicator hand is attached to a shaft at the lower end of which is a two blade fan. Below these blades there is a rotary fan operated from the revolving wheel of the car. The more rapidly the car goes and the rotary fan is revolved the more the upper fan is drawn around by the air movement, the indicator hand being moved accordingly over the upper surface of the graduated dial. In another type air is pumped or forced, by the rotations of a small blower, into an indicator tube in which there is a light metal "floater," which rises or falls in the air current according to the force and volume of the latter. Suitable graduations back or at the side of the tube make it possible to take readings.

Temperature changes affect the readings of instruments using air, by altering the density and viscosity of the air, though these variations may be so slight as not to concern the average user.

The electric tachometers are small electric generators in connection with voltmeters graduated in miles or kilometers instead of volts. The more rapidly the generator is operated the greater the voltage, and the voltmeter is designed to indicate these variations as translated into miles or kilometers per hour. The delicacy of both essential parts of devices of this character has so far militated against their success.

The friction drag idea is carried out in several forms. In one foreign type there is a comparatively heavy wheel. On the upper end of the shaft of this wheel the indicator hand is fixed. When the device is operated a small hammerlike arrangement revolves, and at each revolution strikes a lug on the heavier wheel. The more of these impulses there are crowded into a given period of time the farther the heavy wheel is carried around the spring resistance which seeks to return it to the zero position. Another type has a revolving clutch which rests against the inner surface of a cylindrical member to which the indicator hand and the resistance spring are attached. The faster this clutch is revolved the more it tends to pull the movable member around against the spring resistance. The movement of the movable member is, of course, communicated to the indicating hand in connection with suitable graduations in terms of miles per hour.

The magnetic tachometer employs a permanent magnet so mounted as to revolve proportionately to the speed of the car. The lines of force of the magnet generate currents in a disc or cup of metal above the magnet and exert a drag or pulling action like that of the armature of an electric motor. This drag tends to turn the disc in the direction of the rotation of the magnet and against the light spring resistance which is provided. The face of this cup bears the graduations, which are observable through a small window, exposing that portion of them which corresponds with the speed attained, and a stationary arrow assists in determining the readings more exactly.

The mechanical centrifugal speed indicators operate on the same principle as does the well known governor on a steam engine. In one type a ring of metal surrounds the shaft, which is revolved by the movement of the car. Two rigid arms, projecting from the shaft, support the ring, and these arms form an axis or bearing on which the position of the ring may be changed from an oblique plane to one at right angles to the main shaft. When the device is at rest the ring is held obliquely in relation to the main shaft, but as the latter revolves the centrifugal force created tends to pull out the two sides of the ring lying most closely to the main shaft, until as the speed increases, the ring approaches a position as nearly at direct right angles to the shaft as the spring resistance opposed to it will allow. The change of position of the part of the ring is communicated to an indicating hand on the dial. Other instruments working on the same principle have two movable arms on the main shaft, like the engine governor, which tend to fly out or distend as the speed increases, and the movement of which in relation to the main shaft is followed by the indicating hand.

The liquid tachometer has a reservoir of suitably colored liquid, such as wood alcohol, and from this reservoir there is a passage to the centre of a centrifugal pump. This pump consists of a casing enclosing a paddle wheel mounted on a shaft. From the periphery of the pump there is a passage to an indicator tube, in connection with which a suitable scale reading in miles per hour is provided. The faster the car goes the more rapidly the paddle wheel in the pump is revolved, and the higher it forces the liquid up in the indicator tube. The height of the liquid against the graduated scale indicates the speed. The law in this instrument is that the height of the surface of the liquid in the indicator tube above the surface of the liquid in the reservoir will be approximately proportional to the square of the speed, so that if the speed is doubled the liquid will rise to four times the height, etc.

In another type of speed indicator using a liquid there is a small pump which forces oil from a reservoir into a cylinder in which is a movable piston. The more rapidly the pump is operated the further the piston is pushed against the spring resistance which holds it in the cylinder. The piston is connected mechanically with an indicating or recording hand, which gives the readings in connection with a graduated dial or a ruled record sheet operated by clock mechanism.

CLOCKWORK SPEED RECORDERS.

Those instruments employing clockwork, other than the type just desciribed, may more properly be termed speed recording devices than speed indicators, though on some of them the recording periods are made so short and the changes follow so rapidly that they constantly indicate the rate of speed at which the previous half minute or quarter minute was run.

Incidentally, of these speed recorders there are now being developed many types, the hope of most of which is in their possible general adoption on commercial vehicles for keeping records of the work of the drivers. Whether or not the drivers would make such devices inoperative, if their vehicles were so equipped and they found the records getting them into trouble, is a serious question. The unfortunate experience of some of the railroads in having valuable instruments of this kind ruined "accidentally on purpose" by train employees who

did not take to the record idea may give occasion for pause on the part of those contemplating their use for checking drivers.

FACTORS AFFECTING ACCURACY.

But the questions the manufacturer of speed indicators has to face, if he be seriously concerned about having his instruments accurate, are whether he shall choose friction, air, momentum, electricity, magnetism, mechanical centrifugal force, liquid centrifugal force, or some other principle, and whether he shall oppose to that force spring resistance or gravity.

In one type of air speed indicator we have the air pumped into a cylinder against a movable piston, in the same manner as the instrument using oil, and the piston gets its resistance from a spring. In another the air raises a light "floater" or weight, and although the tube in which this "floater" moves up and down is tapered, being larger in diameter at the top than at the bottom, and thus providing an automatic valve system, the only real resistance that is offered the force of the air is that of gravity.

SPRINGS VERSUS ACCURACY.

The magnetic and the mechanical centrifugal tachometers all depend upon spring resistance as offering the simplest and easiest construction, while the liquid tachometer, with its reservoir and indicator tube, has no springs at all, depending on gravity to exert an opposing force to the action of the pump in raising the liquid in the tube. It might appear at first that in the latter case the specific gravity of the liquid used would largely determine the reading, and that at the same speed a liquid light in weight would give a high reading, while mercury would bring the reading down very low. The difference in weight, however, is compensated for by the difference in centrifugal force in the pump. With the heavier liquid the centrifugal force is correspondingly greater, and the lighter the liquid the less the centrifugal force, so that in actual practice no matter what liquid is used the readings will be practically the same. Such very slight differences as do occur (and they are so small as to be negligible outside a laboratory) are due more to a difference in the viscosity of the various liquids.

It may be said for gravity that it is always constant and always dependable, whereas spring tension may vary from one cause or another. There is a difficulty in getting any large number of springs to run uniform, which is bad from the manufacturer's standpoint, because, unlike clock or watch construction, the springs are not controlled in their action by other forces.

Of the speed indicators now on the market some excel in accuracy and durability, others in neat appearance and compactness, some in the ease with which they may be read, and some apparently in none of these qualities.

The number of brands of odometers offered is considerably less than of tachometers. The manufacture of odometers has been largely left to a concern fitted by experience and equipment to handle the problems it offers.

Springs and Spring Checks.

By P. M. Heldt.

The design of springs for automobiles received comparatively little attention until about three years ago, when the high powered and fast car appeared on the scene. The ordinary carriage spring served well enough for the low powered, slow moving vehicles of the early years of the automobile movement, and there were indeed more important problems confronting the automobile designer than that of suitably suspending the running gear frame and body. With the increase in the speed of cars it became a serious problem, however, to provide flexible suspensions adapted to protect the propelling mechanism from road shock and to insure a requisite degree of comfort for the passengers, especially those occupying the rear seat, which is nearly always directly over the rear axle, where the jolting and vibration are the most severe.

TYPES OF SPRINGS USED.

Formerly the full elliptic spring was very generally used on American cars, and served its purpose fairly well. However, with the increase in the speed of cars it became necessary to carry the frame and body low, to bring the centre of gravity of the car as low as possible and thus insure great stability of the car, and this led to the general adoption of the semi-elliptic spring, which was used by the French manufacturers from the start. The full elliptic spring possesses undoubtedly greater flexibility than a semi-elliptic spring of the same length, but in addition to leading to an unsightly and unstable construction of car, it is open to the objection that unless distance rods are used for both the front and rear axle the spring fastenings are subjected to great wrenching strains. The single front cross spring, providing in connection with the two rear springs a three point flexible suspension, has been tried by a number of American manufacturers, but has not achieved any great popularity. This cross spring also necessitates distance rods with ball joints to the front axle, which are more or less of a nuisance. At present the prevailing tendency seems to be to use semi-elliptic springs in front and platform springs in the rear, the cross member of the platform spring being secured to the rear cross member of the frame. A deviation from this latter practice, in which the cross member of the platform spring is placed in front of the rear axle, has been brought to public notice recently.

INCREASED LENGTH OF SPRINGS.

The length of the springs has been constantly increased during the past several years, with the object of securing greater flexibility. Simultaneously, in order not to reduce the strength of the springs, the width and the number of leaves have been increased. In ordinary touring cars of the better grades, rear springs 56 inches in length are now not uncommon. The front springs are usually somewhat shorter. In most cases the number of leaves is either the same in front and rear springs, or one more in the rear than in the front springs. In one Italian car, notable for luxurious design, ten leaves are used in the rear springs, or four more than in the front.

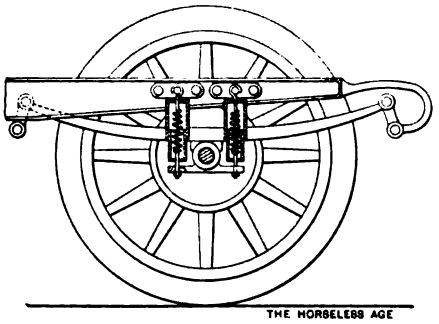
SUSPENSION DIFFICULTIES.

The adoption of long and extremely flexible springs on high speed cars also brought new problems to the automobile designer. At first it was found that if the springs were made light enough to respond to the road unevennesses at comparative low speed, and when the car was only partially occupied, they would close up or "strike bottom" when driven with a full complement of passengers at high speed, and were also inclined to break. The immediate remedy applied was to provide rubber bumpers on the axle under the spring. It must have occurred to the designers, however, that this method of preventing bumping and spring breaking was only a compromise, for at present these pumpers are little used. The proper remedy of the above difficulty consists, of course, in allowing sufficient clearance and so proportioning the springs (by using a considerable number of leaves) that their resistance increases rapidly at large compressions. This principle appears to have been applied in the design of the springs on the latest model touring cars, and the springs no longer "strike bottom" when the wheels meet an obstruction at high speed. On the other hand, one other evil of driving fast over more or less uneven roads has probably been aggravated by this improvement in the springs, viz., the violent rebound after a compression. Let us consider a wheel to strike a fairly large stone lying on the road—too large to embed itself in the pneumatic tire. In passing over the stone the centre of the wheels is raised a distance almost equal to the height of the stone, but the vehicle body, owing to its great inertia, cannot be raised so quickly, and the rise of the wheel and axle is compensated by the compression of the spring. From the beginning of the compression the spring exerts a pressure tending to raise the body, which gradually increases until the spring reaches its maximum compression. This pressure, if the speed

high, is so great as to throw the vehicle body and passengers up violently into the air. After the compression force of the springs has exerted itself, both body and passengers come down again, the body invariably faster than the passengers, with the result that the latter leave the seat for an instant and the next moment strike the seat board with great force. Besides, during the instant the passengers are off the seat, no propelling force is imparted to them, so that their speed in the direction of driving becomes slightly lower than that of the car, with the result that when they land on the seat again a sharp forward impulse is imparted to the lower portion of their body, causing them to sway back in the seat (it being assumed, of course, that they are not leaning against a high back). This makes riding in a tonneau at high speed over any but an extremely even road anything but comfortable. The reason the vehicle body comes down quicker than the passengers is that it is drawn down not only by the force of gravity, but also by the force of the springs, which, during the rebound (owing to the inertia of the car body), pass by the neutral point (the main leaf only, of course), and at the end of the rebound draw down on the body. The passengers are drawn down by the force of gravity only, and hence accelerate slower than the vehicle body.

The direct cause of this discomfort to passengers is the violent rebound of the springs. The rebound is also responsible for frequent breaking of the main leaves. When the compression force of the springs has been expended on the body during the rebound, the momentum thereby imparted to the body carries it farther and results in bending the main spring in the reverse way, causing it to separate from the other leaves. Main leaves are thus frequently broken. A method of suitably checking the rebound of springs would, therefore, "kill two flies at one stroke," inasmuch as it would prevent breaking the springs and insure comfort to the car occupants. The development of the spring check, a device by which this object is attained, has been rather gradual, and the problem has received numerous radically different solutions.

The first and crudest method employed for limiting the rebound of the springs consisted in interposing a double leather strap between the axles and the frame, limiting the distance to which the springs could open out. This undoubtedly had a tendency to prevent injury to the springs, but whether it made the spring action on rough roads any more comfortable is questionable. In fact, when the relative action between axle and frame is suddenly checked by the leather strap the passengers are bound to leave the seat, and the cause of the discomfort is therefore present.



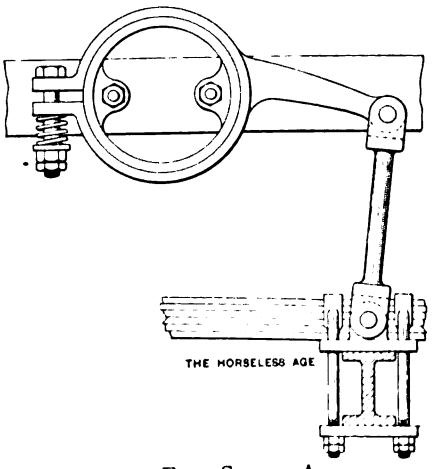
SPIRAL REVERSE SPRINGS.

SPRING CLIPS.

Another early method to reduce the rebound, and which is still in very extended use today, consists in placing a clip over the spring at the ends of the third or fourth leaf. This distributes the force due to the momentum of the body during the latter portion of the rebound over several leaves, thus tending to render the riding qualities of the springs more comfortable and preventing the breaking of the main leaf. Instead of the ends of the several larger leaves being held together by a clip, they are sometimes held together by a bolt passing through oblong holes through the middle of the leaves at the place where the clip would otherwise be located. The holes are made oblong in order that the separate leaves may move slightly with respect to each other, and the bolts are drawn up not quite tight.

REVERSE LEAVES.

The next step in the evolution was the provision of a number of reverse leaves, to relieve the main leaf of some of the strain during the rebound, and also to reduce the rebound. In the case of the semi-elliptic springs, one, two or three short leaves are placed on top of the main leaf and fastened to the rest of the leaves at the centre in the usual manner. If more than one reverse leaf are used they are of different length, the longest being placed next to the main leaf and the rest following in the order of their length. In case of a violent rebound the main leaf is drawn against the reverse leaves and the pressure is distributed among the main and reverse leaves. This type of spring, we believe, was first made in this country, and is now also being exploited in France, where it goes by the elaborate name of "anti-choc-au-retour" spring.



SKETCH OF FIAT SHOCK ABSORBER.

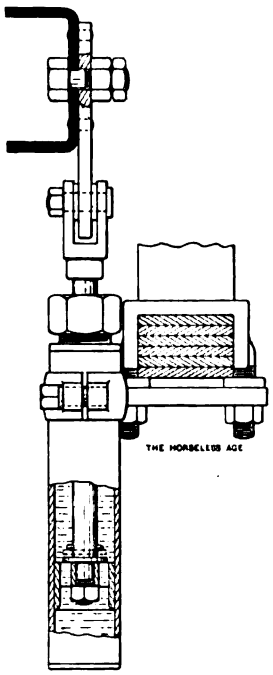
COMBINATION SPRING.

Based on a similar idea is the combination spring of Martin Halfpenny, recently described in these columns. In this spring the reverse leaves, instead of being placed inside the main spring, are placed outside it, the reverse leaves forming a spring by themselves, the ends of which are connected to the frame (in case of a semi-elliptic). The reverse spring effect may also be obtained by means of a coiled spring under tension, as in the "anti-vibrator" E. Potrow, herewith illustrated. Whether the coiled spring is as good for this purpose as the flat spring is doubtful, however.

FRICTIONAL SHOCK ABSORBERS.

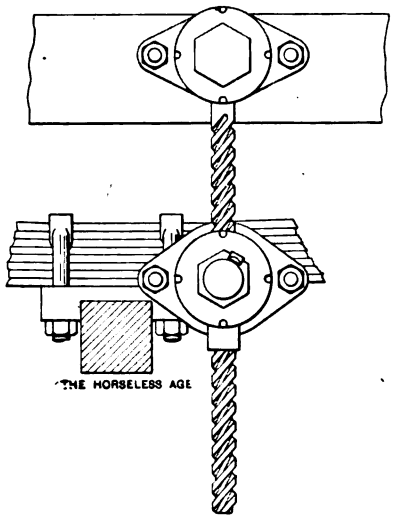
The first of the so called shock absorbers (which have recently been placed upon the market in such large variety) was the Truffault, invented by a French engineer and manufactured both in this country and abroad. Its construction is generally well known, the first description of it in this country having appeared in THE HORSELESS AGE about two years ago. It consists essentially of two pan shaped steel pieces, the handles of which are secured to the frame and pivoted to the spring cap respectively, and the circular parts of which are bolted together with a disc of thick leather between. When frame and axle move relatively to one another, the three circular discs (two steel and one leather) move rotatively one with respect to the other, and as this motion is opposed by considerable friction between the discs, a braking effect is applied to the springs, which prevents not only any undue compression but especially any excessive rebound. The Truffault device has proven it merits in actual use, and is now fitted to several well known makes of cars as a standard equipment. Its success has undoubtedly been one of the causes which led to the recent boom in shock absorbers. Its strongest feature is undoubtedly its simplicity, and the chief defect of the earlier forms, that wear necessitated frequent adjustment, seems to have been entirely eliminated in the latest model, in which a spring steel prong washer is used which automatically takes up wear.

A somewhat similar design of shock absorber was brought out by the Fiat Company of Turin, Italy, last summer. As shown in the accompanying sketch, in it a cylindrical friction brake is substituted for the disc friction brake, but otherwise the principle is the same. A steel drum is bolted to the side frame member of the car and is surrounded by a split metallic brake ring, the ends of



FOSTER SPRING CHECK.

which are provided with lugs, which are drawn together by means of a bolt and coiled spring under compression. The friction ring is formed with an integral radial arm opposite the opening, which is connected by a link to the spring saddle. The modus operandi will be obvious, and it will be observed that this device also



EDO SHOCK ABSORBER.

embodies the feature of automatic adjustment for wear.

Since spring checks of this class have been on the market their theory of action has been the subject of theoretical investigation by many engineers and inventors, and nearly all seem to have come to the conclusion that in order to be theoretically correct the device should exert a braking effect only during the rebound. Their reasoning is somewhat as follows:

When a wheel strikes an obstruction it is the duty of the spring to absorb the upward motion of the wheel and not transmit it to the frame. The spring can never perfectly absorb this motion, because as soon as the axle moves upward the pressure of the spring increases and the frame therefore also begins to move upward. This part of the action of the spring will therefore be the most perfect the less the resistance which opposes its compression. If the spring were not strong enough to stand the full force of compression then it should be made stronger. The easy compression of the springs is no cause of discomfort to the passengers, but the rapid rebound is, and during the rebound a braking action should be applied.

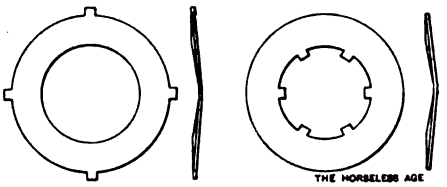
This argument sounds plausible, to say the least, and the fact that the same conclusion is arrived at by quite a few inventors adds to the probability of its correctness. The braking effect should evidently be about equal to the downward pull of the main leaf of the spring on the body, in order that body and passengers may not part company but come down together. But this downward pull of the main leaf is, of course, variable, depending upon the size of the obstructions and the speed at which they are struck, and the proper adjustment of the brake can probably be determined by experiment only.

REBOUND CHECKS.

The "one way" brake action can be obtained in different manners. The House spring recoil check, in which the effect is obtained by means of a split plunger moved up and down in a cylinder with the action of the springs, has already been described in these columns. So has the Kelsey spring check, in which a band brake is compressed on the friction drum by means of a cam actuated by the spring play itself.

In the Foster spring check (made by the Gabriel Horn Manufacturing Company, Cleveland, Ohio) the braking effect, as may be seen from the illustration herewith, is obtained by causing oil to flow from one end of a cylinder to the other through an automatic check valve in the piston as the latter (which is secured to the frame) is moved up and down in the cylinder, secured to the axle. The check valve consists of a disc on the piston rod which nearly closes the opening through the piston when the latter moves upward, thus retarding this motion, and opening the passage wide when the piston moves down in the cylinder, thus opposing no resistance to this motion, which corresponds to compression of the spring. A spring check based on the principle of liquid resistance is also fitted to the latest model Renault cars.

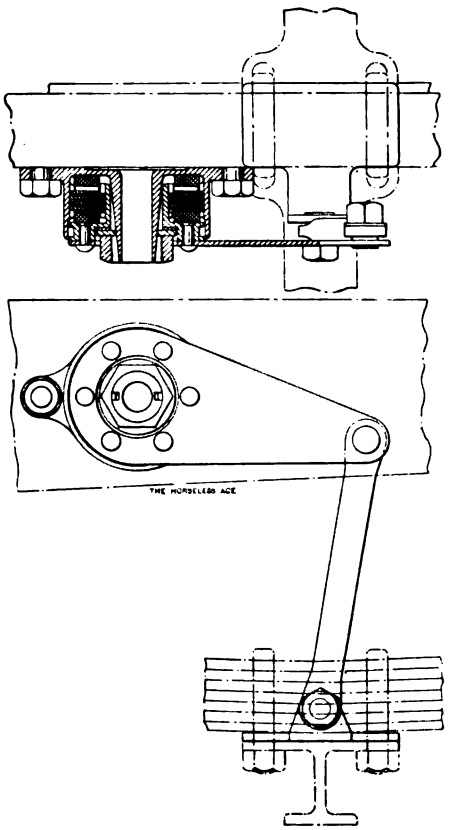
On the Hotchkiss cars at the recent Paris Salon was fitted a shock absorber known as the Edo, the construction of which differs materially from that of all which we are acquainted, thing new in the general principle. As seen from the illustration, a multiple square thread screw is secured to a bracket on the side frame and carries a nut held in a bracket secured to the spring clips. When the spring compresses the screw is forced through the nut, causing it to turn in its socket and pressing it against a ball thrust bearing, so that there is almost no resistance to its rotation. When the spring distends, however, the screw, now moving in the opposite direction, forces the nut against a leather friction collar, which opposes considerable resistance to



DISCS OF TAYLOR'S SPRING CHECK.

its rotation and thus retards the rebound of the spring. Evidently a little wear of the leather washer would not materially affect the operative effectiveness of this device, but owing to the small size of the washer and the high speed of the nut the wear would probably be quite rapid.

Another spring check also opposing the recoil of the spring only has been invented by C. H. Taylor, of Pittsfield, Mass. A side elevation and a sectional view of this device, which is based upon the principle of the disc clutch, are shown herewith. One set of alternate



TAYLOR'S SPRING CHECK.

discs are fitted into a drum bolted to the side frame and having a number of keys on its inner surface. The other set of discs are slipped over a hub with feather keys, to which is secured an arm connecting by a link to the spring saddle. The discs are not flat but are bent as shown in the detail, and the two sets are so arranged, relatively, that when the spring is compressed the discs move into such a position as to relieve the lateral pressure between them, while when the spring rebounds and moves away from the frame the discs are thereby pressed against each other, whereby considerable friction to the relative motion of the two sets is created.

PNEUMATIC SPRING CHECKS.

In addition to mechanical and hydraulic shock absorbers, there is also at least one pneumatic shock absorber on the market—the Kilgore. It comprises a cylinder secured to the spring saddle, in which is adapted to move up and down a piston connected to the vehicle frame. Both ends of the cylinder are closed, and when the piston is displaced in the cylinder, owing to the play of the spring, the air is compressed in one end of the cylinder and escapes through a groove cut in the wall of the cylinder, past the piston to the other end of the cylinder. The size of the groove is proportioned to give the desired retarding effect. When the piston moves beyond a certain point toward either end of the cylinder, the communication between the two ends is cut off, with the result that the air is compressed in that end of the cylinder toward which the piston moves, whereby the resistance to the motion of the piston is very rapidly increased.

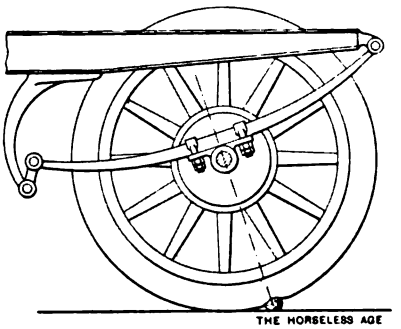
Another pneumatic device for modifying the spring action has been upon the market in France for a number of years. It consists of a substantially spherical pneumatic cushion interposed between the axle and the frame at the middle of the spring. Where this device is used, the weight of the car is evidently partly supported by the spring and partly by the pneumatic cushion, and any modification in the action of the spring would be due to a difference in the law of compression of a flexible air cushion and a leaf spring. A similar pneumatic cushion device has been brought out in this country by Twombly. The action of such pneumatic cushions placed in parallel with the springs must, of course, be quite different from that of the ordinary frictional shock absorber, in that the resistance of the pneumatic cushion varies greatly with the amount of compression, while the resistance of most of the frictional devices is constant, or independent of the compression.

SUPPLEMENTARY SUSPENSIONS.

A comparatively new development in the line of vehicle suspension is the supplementary spring, or the supplementary pneumatic cushion, which is interposed between the vehicle spring proper and the frame. A helical supplementary spring is made by the Supplementary Spiral Spring Company, of St. Louis. This device consists of a double coiled spring hung from the end of the semi-elliptic spring and supporting the frame through the spring horn or bracket. The effect of using such a spring must be to increase the range of spring play, which is equivalent to an increase in the length of the regular springs. A pneumatic cushion interposed in a similar manner between the ends of the leaf springs and the frame is manufactured in France.

INCLINING VEHICLE SPRINGS.

A suggestion as to an improved arrangement of the regular vehicle springs, emanating from a French engineer, may



INCLINED VEHICLE SPRING.

here be referred to. The sketch herewith shows the idea somewhat crudely applied. The object of the spring evidently is to absorb the shocks sustained by the wheel, and a vehicle spring of the semi-elliptic type is best able to absorb a shock when it is applied to it squarely or in the direction perpendicular to the centre portion of the leaves. Now it will be seen from the sketch that in striking a road obstruction the direction of shock is not vertical, but rearwardly inclined, as shown by the centre line. The suggestion is therefore to incline the springs upward toward the front. The idea appears sound.

French Motor Starting Devices.

The first prize in the recent competition of devices permitting of starting a vehicle motor from the driver's seat was divided between M. Isnard, manufacturer of the Cinogène, and the Mors Company. The third prize fell to the Lemale device. These three appliances are radically different in their action. The Cinogène, by means of carbonic acid gas, sets at work an apparatus fixed to the motor shaft, and thus starts the engine by power, as if the usual starting handle were employed. The Lemale system starts the engine from the front, as does the Cinogène, but by purely mechanical action, a spiral spring being used, which is wound up by the motor itself, and liberated when sufficiently charged with energy. The spring is utilized, as required, to start the motor, being brought into operation by a lever at the driver's hand.

Inertia and Its Manifestation in the Gyroscope.

By E. J. STODDARD.

I believe that Professor Perry formulated a dominant spirit of modern science when he said, "I believe that there are very few mathematical explanations of phenomena which may not be given in quite ordinary language to people who have an ordinary amount of experience." A mathematical proof of a proposition may fail to produce a realistic belief, though it may silence opposition—the engineer may assent to the proof, but shrink from embodying the principle.

"Ay, me! what perils do environ
The man that meddles with cold iron!"

I have sought diligently, but failed to find an explanation of the action of the gyroscope that kept near enough to familiar phenomena so that I could hold the whole argument in my mind at once, therefore I have tried to supply one as follows:

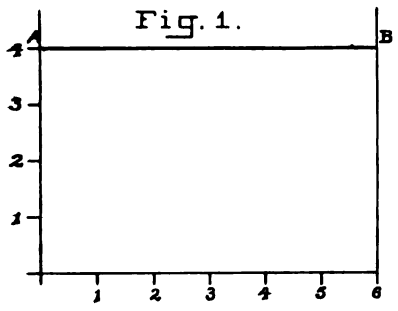
FUNDAMENTAL IDEAS.

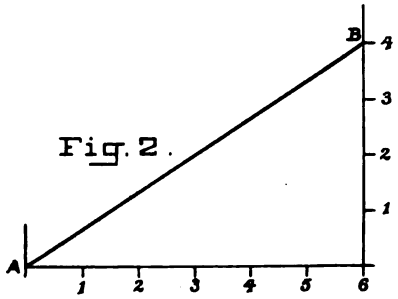
Following Professor Perry, we may say that the unit of mass is that quantity of material that is acted on by the attraction of gravity with a force of 32.2 pounds. It may be called a "slug" (Worthington's "Dynamics of Rotation," page 9). The unit of force is that force which will change the velocity of a mass of one "slug" one foot per second, or, in other words, will produce the unit of acceleration, that is, one foot per second for each and every second, or one foot "per second per second" in a unit mass. It is 1/32.2 slug, or the force produced by gravity upon one pound of material.

Thus the proper and logical measure of a force is its capability of changing velocity, or producing acceleration, and, of course, a given acceleration or rate of change of velocity corresponds to a given force.

If in Fig. 1 we let horizontal distances represent time and vertical distances velocities, the line A B, four units from D C, will represent the condition of a body moving for six seconds at a uniform velocity of 4 feet per second. In the same way the line A B in Fig. 2 represents the condition of a body starting at rest with a uniformly increasing velocity until at the end of six seconds it has attained a velocity of 4 feet per second, that is, its velocity is increasing two-thirds of a foot per second, or its acceleration is two-thirds.

In Fig. 3 the line A B represents the condition of a body moving with a variable velocity. What the rate of change of velocity is at any point of time may be seen by considering that the rate of change of velocity at that instant remains constant for an appreciable time, say, one second; thus if the rate of change of velocity of the body at *a* remained constant, its condition would be represented, as in Fig. 2, by the straight line *c d* tangent to its path at *a*, which evidently represents an acceleration of about unity, as its velocity would increase from 0 at *c* to about 7 feet per sec-



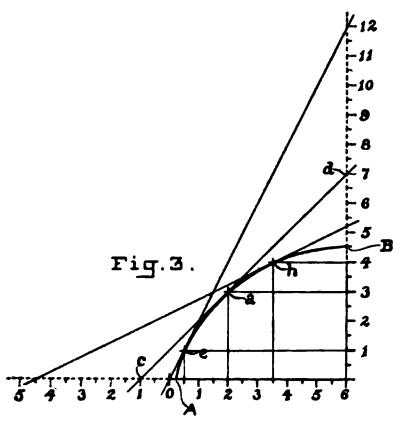


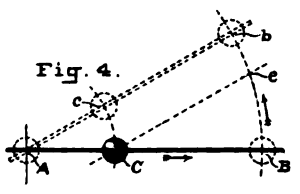
ond at *d*, and this increase of velocity would take place in 7 seconds. So at *e* the acceleration would be much greater (about $\frac{12}{7} = 1\frac{5}{7}$), and at *h* much less (about $\frac{5\frac{1}{2}}{10\frac{1}{2}} = \frac{11}{21}$), as indicated by the corresponding tangent lines.

It is to be noticed that an acceleration or rate of change of velocity is independent of time with reference to the duration of such acceleration. It may continue for an indefinitely long time, or for an indefinitely short time, and have the same value in both cases.

INERTIA MANIFESTED WHEN THE DIRECTION OF THE MOTION OF A MASS IS CHANGED.

It is laid down as fundamental law, discovered by experiment and experience, that it takes a certain force to change the velocity of a mass at a certain rate—that is, to produce a certain acceleration in a certain mass; and it may be stated as a corollary to this that it takes a certain force to change the direction of motion at a certain rate, of a certain mass, moving at a certain velocity.

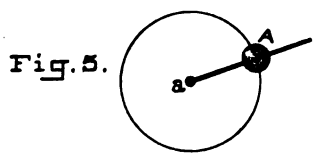




If the direction of the velocity is continually changing it is at each instant of time changing at a definite rate. If we could imagine an apparatus, or conditions, by or under which the instantaneous action would continue for an appreciable length of time, say for one second, it would materially help us to realize just what takes place, inasmuch as an instantaneous acceleration is what the change of velocity would be if the rate of change continued for one second.

In Fig. 4, let A B be a rod turning about the point A with a uniform angular velocity $b\,A\,B = w$. We are to remember that angular velocities are measured in radians per second, or in radii laid off on the arc, or the number of radii in the rectified arc, passed over in one second, or, in other words, the number of radii contained in a straight line equal to the distance that the arc passed over in one second would roll along a flat surface.

Let C be a heavy body sliding along the rod A B with a uniform velocity, V, for any

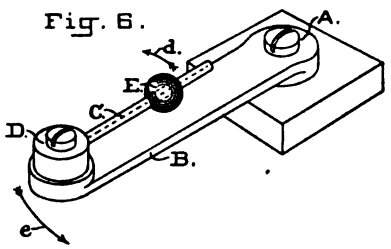


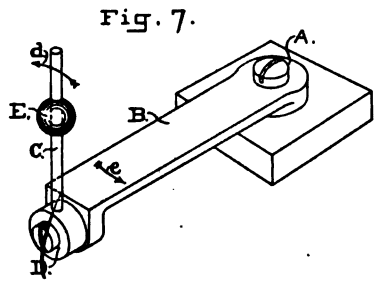
definite period of time, and for convenience we will use a second of time. Now if the body C remained in its initial position relative to the rod, the turning of the rod would make it go the length of the arc *C c* in one second. If it was at B it would go the length of the arc *B b* in one second, and these two arcs represent the velocities of the body due to the turning of the rod in the two positions. If, while the rod is turning, the body C moves from C to B, its increase in velocity due to the turning of the rod is *B b*—*C c*, and if C B is the distance traveled along the rod in one second, then C B is its velocity, V, along the rod, and *B b*—*C c* is its acceleration due to the turning of the rod. But $C\,c = A\,C\,w$ and $B\,b = A\,B\,w$, therefore the increase of velocity or acceleration is $(A\,B - A\,C)\,w = V\,w$. And this is true for every point of the rod, and therefore for the point A about which the rod is turning. But at the point A the body C is advancing and changing its direction simultaneously, just as when moving in a curved path. Therefore the acceleration due to a change of the direction of motion of a heavy body is the rate of motion or velocity, multiplied by the angular velocity of, or rate of change of, direction of the motion.

By the usual method the demonstration of the equation of centrifugal force is, to many, difficult and unsatisfactory; but if we look at it as above suggested, it follows almost without a demonstration. In Fig. 5, let A be a heavy body revolving about *a*. Its velocity, V, or rate of motion in feet per second, is $R\,w$, where R is the radius, *a* A, in feet, and *w* is the angular velocity, in radians per second. By the above proposition its acceleration is, $V\,w = R\,w$, times $w = R\,w^2$, and the force will be Rw^2M, because $Rw = V$, where M is the mass of the body. We see that $Rw^2M = \frac{R^2\,w^2\,M}{R} = \frac{V^2\,M}{R}$, or if we substitute for M in slugs the weight W in pounds we shall have the familiar expression $\frac{W}{32.2}\frac{V^2}{R}$ for the centrifugal force.

THE ACTION OF THE GYROSCOPE.

Fig. 6 is a perspective view of a lever arm B pivoted at A and free to turn about its pivot, and having a second lever arm C





pivoted at D to the free end of the lever arm B. Suppose the lever arm C to be turning with a uniform angular velocity in the direction of the arrow *d*, and suppose a weight E to be moving away from the pivot D along the lever arm C. The weight E will be continually increasing in velocity due to the turning of C, as it gets further and further from the pivot D, and consequently will resist the turning of C, and this resistance will react upon the pivot D, and consequently upon the free end of the lever arm B to turn it in the direction of the arrow *e*.

In the second place, suppose the arm C to be pivoted to B, so as to turn in a vertical plane, as illustrated in Fig. 7. Suppose C to be turning as indicated by the arrow *d*. As the weight E moves from the pivot D it will be accelerated by the angular movement of C, and will oppose such movement with a force which will react to turn the lever B in the direction of the arrow *e*, or toward the observer in Fig. 7.

For the third case suppose the C to be in a slanting or interr tion, as in Fig. 8. The weigl

Fig. 8.

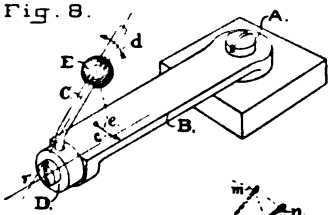


Fig. 9.

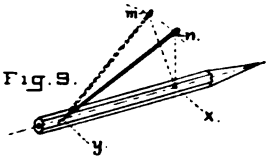


Fig. 10.

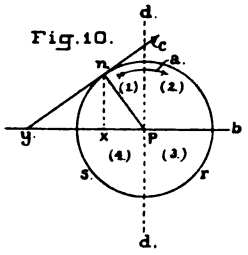
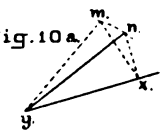


Fig. 10a.



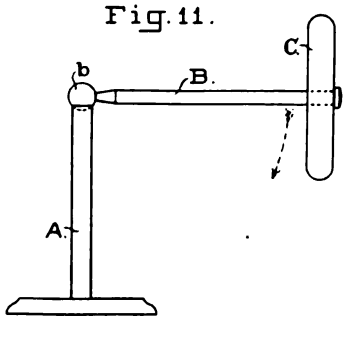
at any instant of time turning simultaneously about and moving away from two centres; the centre F because of its velocity along C, and the centre G because of the vertical component of such velocity, and each of these will have a reaction tending to turn B about the pivot A as described in the two previous cases. If it is not proper to say the weight E is revolving about F, it amounts to the same thing, as the point F is stationary, and the velocity of every other point is proportional to its distance from F.

The third case is a combination of the first and second cases.

This last case (the third) may be easily illustrated as in Fig. 9 by taking a lead pencil and sticking a needle in a slanting position in its side, so that the needle will be in a plane through the axis of the pencil, and turning the pencil about its axis for a small angle. The eye of the needle will turn about a point, x, on the axis of the pencil, through an angle $m\,x\,n$; and about a point y on the same axis through an angle $m\,y\,n$.

It will be seen that the third case, just illustrated, is precisely the case of the gyroscope. In Fig. 10, let the circle $n\,r\,s$ be a wheel spinning about its centre, p, in the direction indicated by the arrow a, and at the same time turning about a diametral axis $b\,p\,x\,y$, so that its upper part is receding from the observer. Take a point n in the first quadrant: it is receding from and turning about y because of its tangential velocity, and because of the turning about the axis $b\,p\,x\,y$, and it is receding from and turning about the point x because of the vertical component of said velocity and the turning about $b\,p\,x\,y$, as indicated in the diagram Fig. 10a.

Fig. 11.



The particle n will be accelerated for both of these reasons, and will react to oppose the motion around $b\,p\,x\,y$, and will therefore tend to turn the wheel $n\,r\,s$ about the vertical axis $d\,d$. If the same reasoning is applied to all the particles of the wheel, it will be found that all particles in the first and fourth quadrants react toward the observer, and all in the second and third quadrants away from the observer. In the second and fourth quadrants the particles are being negatively accelerated.

In The Horseless Age for August 31, 1904, I showed that the summation of the effects of all the particles was a torque T about the axis, $d\,d$, expressed by the following equation:

$$T = w \Omega I,$$

in which w is the angular velocity about p, Ω is the angular velocity about $b\,p\,x\,y$, and I the moment of inertia of the wheel with reference to its centre p.

Now let us look at the action of the toy. In Fig. 11a is a pedestal having a hemispherical cavity in its top, and B is a lever arm having a ball, b, at one end resting in the cavity of the pedestal A. C is a heavy wheel spinning about B as an axis at the free end of B. Now suppose B to be put in position and released, C begins to fall freely immediately, because it has no horizontal or precessional motion. As it falls and gathers motion in the direction of the dotted arrow this angular motion, combined with the spinning of the wheel, sets up a precessional, or horizontal, motion, until the latter, in connection with the spinning motion about P, is not only sufficient to sustain the weight of the wheel C and arm B, but also sufficient to overcome the vis viva stored in the motion of the parts in the direction of the dotted arrow, at which time the falling of the wheel is not only stopped but the wheel is raised to its first position, provided there has been no loss by friction. Thus the instrument continues to precess, or move horizontally, with a series of minute mutations in a vertical direction.

An automobile patent war seems to be threatening in France. While builders were as busy as they could be supplying the market, they took no trouble to see that their patent rights were respected; but now that competition has increased to a point where every advantage must be seized and held fast, those engineers who some years ago secured patents which have come into general use are bethinking themselves of insisting on their rights, and restraining others from employing their inventions. A test case that is spoken of is an action by the Mercédès Company against another firm for the infringement of the Maybach carburetor.

Lubrication.

By Cecil Hamelin Taylor.

Lubrication may be defined as the process of interposing a film of suitable material between relatively movable surfaces bearing upon one another, with the objects of diminishing the frictional resistance to movement between such surfaces, and of minimizing wear.

In a general way we may assume that friction between dry metallic surfaces within the load limits where cutting or seizing does not occur:

(a) Is dependent on the materials and condition of the surfaces.

(b) Is nearly proportional to the normal pressure.

(c) Is nearly independent of the speed, except at very low velocities.

(d) Is nearly independent of the surface temperatures.

On the other hand, with fully lubricated surfaces, that is where the lubricating film perfectly prevents any contact between the surfaces, we find that the resistance to motion:

(e) Varies but slightly with the materials, but to a greater extent with the surface condition.

(f) Is nearly independent of the pressure.

(g) Varies with the speed.

(h) Varies widely with the temperature.

Perfect lubrication seldom is attained in practice, the conditions usually varying between the above extremes, the frictional resistances fluctuating constantly according to variations in the several factors.

THE ACTION OF A FLUID LUBRICANT depends upon its viscosity and cohesion. Viscosity is the internal or molecular frictional resistance to movement of a liquid. Cohesion is a function of the molecular attraction of the substance. No connection has as yet been shown to exist between the two, some substances having high viscosity and low cohesion, and vice versa. Upon viscosity and cohesion depends to some extent the ability of a liquid, when in the form of a film interposed between solid surfaces, to resist reduction in film thickness, and to maintain its continuity, though this ability is affected by other factors which are as yet not well understood. At a speed which is a function of the load and the nature of the lubricant, a film of the latter is carried between the surfaces by the movement of one of them, and they are forced apart to accommodate this film, the bearing being entirely oil borne where the surfaces are parallel. The resistance per unit of area, r, will then be entirely dependent upon the viscosity of the oil film, and will be: $r = \theta \frac{v}{f}$, the total resistance of the area A being $R = \theta \frac{v}{f} A$, where θ = coefficient of viscosity of the lubricant; v =

relative velocity of bearing surfaces; f = thickness of the film.

THE VOLUME OF LUBRICANT

carried past a line on the fixed member normal to the direction of movement of the other will be in the case of surfaces of infinite length and breadth, b, $V_a = \frac{v.\ f.\ b.}{2}$

Where the surfaces are of finite length the volume carried past the entrance will exceed V_a owing to the kinetic energy of the lubricant at this point. This excess of feed must either increase the value of V_a, or must be discharged at the bearing sides. The viscosity and cohesion of the oil film strongly resist any artificial alterations in the value of V_a, which, therefore, produces a considerable increase in the film pressure, resulting in an increased value of f, though not necessarily in the reduction of r and R, owing to the more complex action of the film.

The maximum value of the volume of entrance is $V_n = v.\ f.\ b. = 2V_a$.

Professor Osborne Reynolds, in his recent investigations on the theory of lubrication, found the volume of lateral discharge from between two elliptic plates, having the axes a and b, approaching each other normally without sliding movement, to be

$$V_o = K \frac{f^3 W (a^2+b^2)}{a^2 b^2 \theta},$$

W being the force pressing the plates together.

In order to maintain this expression constant, the same volume must be fed to the film by the sliding movement of the surfaces, whence $V_n = v.\ f.\ b. = V_o$ and the velocity necessary to maintain this condition is

$$v = K \frac{f^3 W (a^2 + b^2)}{a^2 b^3 \theta}$$

and

$$r = \frac{1}{A} \sqrt{\frac{v.\ W.\ (a^2 \times b^2)}{b}}$$

From previous formulas we can derive the co-efficient of friction $\mu = C \sqrt{\frac{\theta\ v.\ b.}{W}}$

Thus for every form of surface the values r, v and μ vary.

The ellipse is here chosen as being an approximation to the effective bearing surface of a rectangular bearing. When the surfaces are free to adjust themselves angularly with respect to each other conditions are again altered. The ratio $\frac{V}{V}$ is either increased or diminished, and the film pressure and lateral discharge vary accordingly. Cylindrical bearings in practice may be regarded as adjustable in this way. The radius of the shaft is slightly less than that of the bushing, and in a state of rest the shaft will touch the bushing along a line, the centres being eccentric. The two surfaces are therefore not parallel, but inclined to one another, and if the oil feed is situated a sufficient distance from the line of contact, at a point where the film thickness is fn, $\frac{V_n}{V_a}$ may assume a high value, with correspondingly high film pressure, owing to the ratio $\frac{f_n}{f}$. When the shaft begins to rotate lubricant is carried from the entrance between the surfaces, contact between which is interrupted. The thickness of the film will decrease to a certain minimum f, beyond which it will again increase. From the entrance toward the point of minimum thickness a wedging action will occur, causing a rise in film pressure, while from this point toward the exit the film again increases in thickness and a drop in pressure takes place. The shaft will adjust itself to a position of equilibrium between the various forces acting upon it, and this position will vary with the load, the viscosity, the velocity and the form of the surfaces. The film pressure acts radially, the resultant supporting the load is therefore less than the total film pressure. Owing to this and to their curvature, the change in relationship of the surfaces, and, consequently, the frictional laws, differ from those of plane bearings. With the latter $R \propto \sqrt{v.\ W.\ \theta\ b.}$ whereas with the former $R \propto A\ v\ \theta$. The effect of heating on the viscosity of the film exerts an important influence on the resistance, and the method of oil feed influences in turn the film temperature. The total quantity of heat generated in a bearing expressed in calories will be $Q = .00235\ \mu.\ v.\ w.$ Where μ = co-efficient of friction; w = total bearing pressure. This heat is partly conducted away by the metallic walls and is partly carried away by convection in the lubricant. The temperature effect on viscosity is shown in Fig. 1 and on the value of μ in Fig. 2.

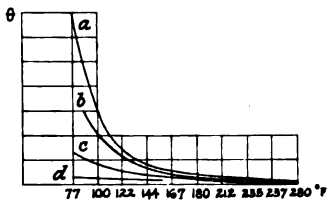


FIG. 1.

a, heavy mineral oil; *b*, heavy gas engine oil; *c*, rape oil; *d*, thin spindle oil.

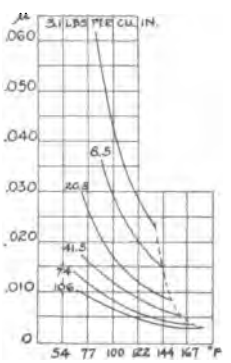


FIG. 2.

From the equation $r = \theta \frac{v}{f}$ we see that even under conditions of perfect lubrication a heavy viscous lubricant may reduce r in a bearing below that obtained when using a lighter oil, since the ratio $\frac{\theta}{f}$ may be reduced. The practical determination of this ratio for various oils under working conditions would seem to be of paramount importance in the study of lubrication, though I have been unable to find a record of any experiments conducted with this object. It is known, however, that f varies greatly with the quantity of oil supplied, the method of supply and the length of the chord of contact.

METHOD OF APPLYING LUBRICANTS.

Considering first the method of supplying oil to a cylindrical bearing, we find, especially in American motor car practice, the widest divergence in opinion. The experiments of Beauchamp Tower clearly show the pressure distribution in an oil borne bearing, 4 inches diameter, at 150 r. p. m. and 340 pounds per square inch mean load. His results are graphically shown in Fig. 3. The curve of pressure arrived at in these experiments agrees remarkably closely with that obtained from Reynolds' formulæ. Tower further showed that oil should be delivered at points where the pressure is low; otherwise, not only is it impossible for oil to be fed, except under high pressure, but openings within the pressure area actually relieve the oil film, enabling the oil collected to be expelled from between the surfaces, thus robbing the bearing of its oil where most needed. No more serious or common mistake is perpetrated by our automobile designers than that of perforating and grooving the pressure side of bearings.

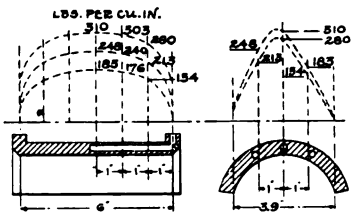


FIG. 3.

Other experiments indicate, however, that under given conditions there is a limit to the maximum unbroken area which can advantageously be used in a bearing, but that this limit is superior to the area of any bearings occurring in even the heaviest motor car practice.

Goodman experimentally found the frictional co-efficients with arcs of contact giving projected areas of 1, .75, .50 and .25 of the shaft diameter to be as 100, 63, 43 and 32 respectively, or varying in the relation $\mu = C + NS^2$, where S equals the ratio of

...sured to shaft diameter, and C and N are ... vary with the conditions.

...to the

FORM OF BEARING SURFACES.

...theory and practice agree as to the importance of ample clearance between the surfaces to accommodate the oil film. Bearing bushings, especially those composed of the softer, so called anti-friction metals, seem to naturally to assume in time a form most favorable to easy running under its particular conditions. The practical difficulties opposed to artificially determining and obtaining this exact form of maximum efficiency result in the accepted practice of "running in" machinery under gradually increasing loads and pressures before placing upon it its working or maximum duties. The greater ease and speed with which the bushes and journals assume their correct form is perhaps the most cogent reason for their use. This alteration in form of the entire bearing surface must not be confused with the minor changes which occur very early in the running process, which consist in the erosion or flattening down of the high spots, which by projecting into the oil film reduce the value of *f* thereby increasing friction, even if they do not give actual metallic contact between the friction surfaces. That the changes in frictional coefficient resulting from the above conditions are independent of those resulting from alteration in the form of the bearing surfaces as a whole is evidenced by the fact that after a bearing has been thoroughly run in under a given set of constant conditions and all local defects removed a change in any of those conditions will result in an immediate increase in the coefficient which then gradually reduces to a minimum after sufficient time has elapsed. Fig. 4 shows the results arrived at by Stribeck of both of these conditions. The curve A shows the variations in a bearing newly bushed in ...g of a 3-inch by 4-inch journal bearing with a light ... and ... under a load of 60 pounds per square inch and velocity of 81 feet per second. Curves 2 and 3 show the corresponding variations in the same bearing at 2 and 3 days, but for ... of 114 and 176 pounds per square inch. The experiments were conducted ... without any alteration of the ... bearing. By a careful study of ... curves ... under loads ... pressures ...

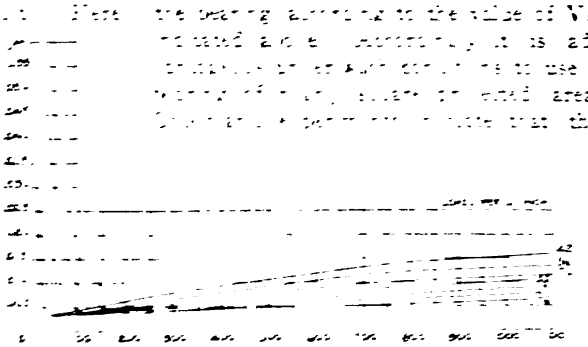


Fig. 5

...estimated to cover all cases, but generally, within the limiting conditions encountered

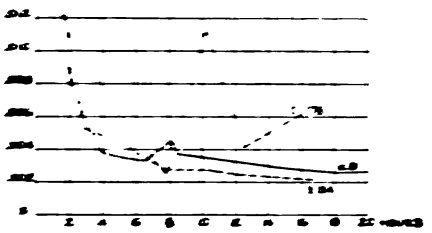


Fig. 4

...in automobile practice, the writer finds the correct initial diametral clearance in bronze bushed bearings to be $c = \frac{\sqrt{D}}{250}$ and for babbitted bearings $c = \frac{\sqrt{D}}{200}$

In Europe a number of prominent manufacturers using white metal bearings allow no initial clearance at all, setting up the bearing caps tightly against each other or against interposed shims with the shaft clamped moderately tightly between them. In this procedure the assembled mechanism is driven by external power, at first very slowly, the speed being gradually increased as the bearings loosen up. During this preliminary running, which may require a week or more, various special lubricants, such as kerosene, soapsuds, soda water and oil emulsions are used. After all bearings have become moderately free, in the case of motors, they are then run carefully under their own power, under constantly increasing duty, until ready for the final power tests. This process, though undoubtedly giving the most perfect results, is expensive, and under present trade conditions could hardly be carried out by our automobile constructors. With the initial clearances derived from the above formulæ very satisfactory results may be obtained and in about one-tenth the time required for the European procedure.

In bearings subjected to alternating or ... loads, for which the maximum specific bearing pressures may be allowed greatly to exceed that permissible where the load is constant. This is due to the period of time required for a portion of the ... to be ejected at the periphery of the bearing according to the value of V_1 ... and ... it is advisable ... to use a ... of ... area ... that the ... curve of rise in frictional resistance due to a suddenly applied load is very nearly a straight line for cylindrical bearings. The relative surface velocity, in conjunction with the method of oil feed and the form of bearing profile, here again has great influence. Nowhere, perhaps, can grease be more advantageously employed than in bearings subjected to alternating loads or shocks, owing to its plasticity. Plasticity differs from viscosity in that, whereas in a purely viscous substance, any force, however slight, will produce a corresponding rate of flow, in a plastic material a certain minimum force is necessary to cause movement. With a plastic lubricant, therefore, V_1 becomes 0 for a certain value of *f*, corresponding to any given specific load, and the formula becomes of the form

$$V_1 = K \sqrt{f} - H \frac{\sqrt{f^2 - f'^2}}{f' \sin \theta}$$

where H might called the constant of plasticity for the equation.

In very slow running bearings, seldom encountered in motor car practice, where the surface speeds are less than from 2 to 4 inches per second depending on the load, great difficulty is experienced in maintaining the film, owing to the small value of V_1, and the values of μ are correspondingly high. Fig. 5 gives the results of Stribeck's experiments, and shows the relation of μ, W and V for a bearing 70 mm. diameter and 230 long under loads from 42 to 176 pounds per square inch, and velocities up to 13 feet per second.

In considering the action of any bearing the varying conditions to which it will be subjected during the starting of the mechanism must not be overlooked. The quantity of heat units resulting from the transformation of work done in overcoming frictional resistance is at first greater than that removed from the bearing surface by conduction, giving rise to a period of "warming," during which changes occur in nearly all the factors. The dimensions and form of the surfaces and the properties of the lubricant undergo important alteration, resulting, as found in the experiments of Stribeck, in the co-efficients of friction after warming being on the average of one-third to one-fourth of those when cold, the temperature range being from 60° Fahr. to 200° Fahr. As showing the extreme variation in μ which may occur in practice in the same bearing under varying conditions, the same experimenter found, in the case of a cast iron bearing on a steel shaft that μ varied between .14 from a state of rest to .005 at high speeds under moderately heavy loads; that is, in the proportion of 28:1. In the case of a white metal bearing the corresponding figures were .12 and .001, or as 114:1. These lower values of μ are exceptional, and only to be expected under the most favorable conditions, where all the factors are favorable. The importance of the most careful and minute attention to

both the design and execution of bearings and the lubricating means is, however, clearly indicated.

Friction Clutches.

By T. Hyler White, A. M. I. M. E.

In one respect the automobile industry is remarkable in that it has grown up by a system of "trial and error" rather than on accepted principles of design. Of late there have been indications that this haphazard method is being replaced by a more scientific and exact system.

One of the principal components of the modern gasoline automobile is the friction clutch, and it is in this part that some of the worst design formerly was evident. Even today it is not uncommon to find clutches far too small for the work they have to do, consequently they have to be fitted with springs of great power to obviate slipping. When such a clutch is used, wear is accentuated, especially when starting the car from rest. A large clutch means economy all around. Apparently the fundamental principles of clutch design are not yet universally appreciated, as we find all kinds of devices in use intended to increase the frictional surfaces with a minimum of space, when, as a matter of fact, this has no influence on the power that the clutch will transmit. The sole advantage gained by increasing the area of the surfaces engaged is to delay wear and tear. This in itself is an admirable point, but it is not everything. The only factors governing the power transmitting capacity of a clutch are the diameter, speed in revolutions per minute, the co-efficient of friction of the materials employed and the pressure with which the two parts of the clutch are held in engagement. In the case of conical clutches there is one other factor which depends upon the angle of the cone. Modern design tends toward clutches with all the frictional surfaces of metal, and the problem is complicated by the uncertain value to be given to the co-efficient of friction owing to the more or less perfect lubrication employed. In such cases it is advisable to give the smallest value to this factor, in order that we may be certain of the clutch doing its work under the most adverse conditions.

For automobile work quite a large amount of initial slipping is necessary if the clutch is to start the car without shock, hence the wearing surfaces should be large and the pressure per square inch as little as possible. A clutch of large diameter will take up its load and transmit the required power better and with less pressure than a small one, hence the diameter should always be as large as can conveniently be allowed. Whatever design of clutch is adopted, the frictional surfaces should always be brought into contact evenly all over. A cone clutch out of alignment will always slip unless inordinately large for the power to be transmitted. Formulæ for clutch design are few in number, but the following will be found reliable in practice and convenient in use with ordinary trigonometrical tables.

Fig. 1 illustrates the action of a cone clutch. A force P is applied in an axial direction, usually by means of a helical spring, tending to force the two cones into contact. The axial pressure reacts upon the cone surface and in a direction at right angles thereto with a force F. This force is applied equally all around the circumference of the clutch.

In the diagram A B represents the mean diameter of the clutch cone. The value of the force F may be stated as

$$F = \frac{P \times \sin. C A B}{\sin. A C B} \quad \ldots\ldots\ldots\ldots (1)$$

The angle A C B, and hence the angle C A B, will depend upon the materials used in the construction of the clutch, and upon the condition of the frictional surfaces. The co-efficient of friction is the tangent of the angle of repose for the material used, and for damp leather on dry cast iron may be as high as 0.8, while for greasy leather or greasy cast iron it may be as small as 0.15. A fair

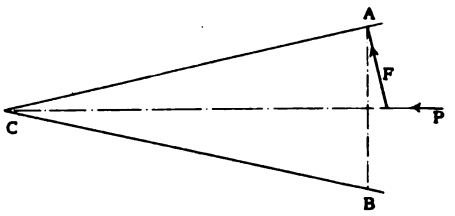


Fig. 1.

average value for automobile clutches will be 0.25, corresponding to an angle of 14° nearly. Taking the angle A C B as 14°, the angles C A B and A B C will together be equal to 180° — 14°, that is 166°, and as they are equal, C A B will be 83°. From a table of trigonometrical ratios we have sin. 83° = 0.9925, and sin. 14° = 0.2419, and substituting these values in Formula 1, we get $F = \frac{P \times 0.9925}{0.2419}$

$\therefore F = P \times 4.1$ nearly.

The power to be transmitted by the clutch may be stated as a turning moment by

$$M = \frac{H \times 33000}{R \times 2\pi} = \frac{5250 \times H}{R} \quad \ldots\ldots\ldots\ldots (2)$$

in which M = the turning moment in foot pounds, H = the horse power to be transmitted, and R = the revolutions per minute.

It will be evident that F must at least be equal to M if the clutch is to be effective. Taking S as the torsional resistance, or friction on the clutch surface due to the force F, we have

$$S = c \times F \text{ or } S = c \times 4.1 \times P \quad \ldots\ldots\ldots\ldots (3)$$

where c = the co-efficient of friction and the other factors are as above. Now S multiplied by the circumference of the clutch in feet, and by the revolutions per minute, gives us the power the clutch will transmit in foot pounds per minute, and dividing this by 33,000 we get the horse power.

Clutch diameters are usually stated in inches, therefore we have

$$H = \frac{S \times C \times R}{12} \quad \ldots\ldots\ldots\ldots (4)$$

where H = the power in foot pounds per minute, C the circumference in feet, S as in Formula 3, and R the revolutions per minute. Transposing terms we arrive at

$$D = \frac{H \times 12}{S \times \pi \times R} \quad \ldots\ldots\ldots\ldots (5)$$

To illustrate the formula we will take as an example: What diameter of clutch is necessary to transmit 10 horse power at 1,000 revolutions per minute, assuming a spring pressure of 75 pounds? Substituting these values in Formula 5, and multiplying the horse power by 33,000, to reduce it to foot pounds, we have

$D = \frac{10 \times 33000 \times 12}{S \times \pi \times R}$, and substituting the value of S from Formula 3, taking the co-efficient of friction c as 0.25, this expression becomes

$$D = \frac{10 \times 33000 \times 12}{(0.25 \times 4.1 \times 75) \times 3.1416 \times 1000} = \frac{3960}{231.5}$$

= 17 inches full.

Probably such a diameter would be inconvenient on an automobile, and we could materially reduce this by employing a stronger spring.

We have still to consider the width of the surface of the cone to resist wear. Theoretically the clutch would transmit the power if the frictional surface were only ⅛ inch wide, but the pressure per square inch of surface would be excessive. The allowable pressure depends in a great measure upon the materials employed. For metal to metal surfaces it may be as high as 20 pounds per square inch, but for leather and metal 6 pounds will be ample allowance. We therefore have for the width of cone surface

$$W = \frac{F}{r \times 2\pi \times x} \quad \ldots\ldots\ldots\ldots (6)$$

in which W = the width of the cone in inches, F as in Formula 1, r the mean radius of the cone in inches, and x the intensity of pressure in pounds per square inch allowed.

Hence for the clutch in our example, allowing a pressure of 6 pounds per square inch, we shall have, by substituting known values in Formula 6,

$$W = \frac{(75 \times 4.1)}{8.5 \times 6.283 \times 6} = \frac{20.5}{21.36}, \text{ say 1 inch.}$$

Clutches of the expanding ring type, in which the ring is expanded by a screw or screws, are designed on practically the same methods as cone clutches, but the arrangement and action of the levers and screws must be taken into consideration. We may ascertain the pressure and total amount of frictional resistance necessary by the above formulæ. As a rule two screws are employed at opposite

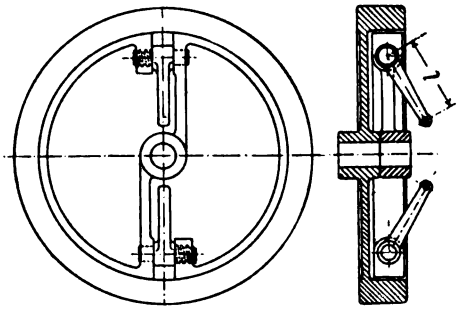


FIG. 2.

points, and these are either each a single screw of the same hand, or the two screws may each consist of a double handed thread. The mechanical advantage from single screws and levers arranged as in Fig. 2 may be calculated from

$$A = \frac{l 2 \pi}{S} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (7)$$

where A = the mechanical advantage, l = the effective length of the lever in inches, and S the pitch of the screw in inches. Where each screw consists of a double screw of equal and opposite pitch, as in Fig. 3, the expression 7 should be halved, and thus becomes

$$A = \frac{l \pi}{S} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (8)$$

To avoid shock due to sudden gripping of the clutch, quite an appreciable amount of slipping is usually necessary when starting an automobile. The early designs of Phoenix Panhard automobiles had a duplex clutch, as shown by Fig. 4. In this design the smaller inner clutch cone comes into engagement with the corresponding cone formed in the flywheel and takes up a proportion of the load. This suffices to start the car, after which the outer cone comes into action and takes the full load without any slip. At first sight it would appear that this arrangement provides two clutches, but in reality the inner cone tends to reduce the axial pressure on the larger clutch by the pressure exerted by the four helical springs *a*, used to keep the inner clutch in advance of the outer. Though perhaps an expensive design to construct, its efficiency was undoubted.

The writer tested the starting of one of these early type machines both with and without the inner clutch. With the complete double clutch starting was easy and without shock, even though the cones were allowed to engage quite suddenly. Without the inner clutch it was impossible to prevent the car kicking, however carefully it was manipulated. Lately simple flat steel springs are interposed between the leather and its metallic support, so that the leather is raised in places which come into contact with the other member of the clutch before the whole surface is engaged. It is doubtful if this practice is advisable on account of the unequal wear.

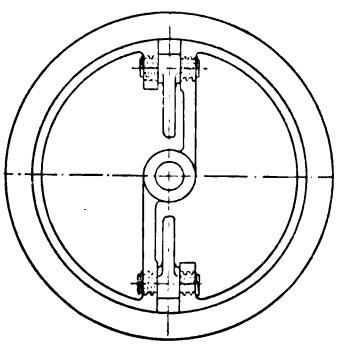


FIG. 3.

Metal to metal clutches are dependent upon lubrication for the initial slip when starting. When in full engagement there is still a certain amount of lubricant present between the friction surfaces, and the influence of this on the design is difficult to estimate; it would always be a variable quantity, and the value of the co-efficient of friction will depend on it. British and Continental designers are introducing dashpots which prevent the sudden engagement of the clutch, even though the pedal is released without care. The improvement in the starting effort and when changing speeds is most marked.

It is essential that when leather is used for the frictional surface of a clutch member that it be kept in good condition. Periodical dressing with good castor oil will keep the leather in first class order, and such remedies as resin to prevent slipping will not be required. Excessive greasiness should be cured by taking the clutch apart, wiping or scraping away the excess of oil. As a temporary cure fuller's earth, or powdered chalk, will generally enable the clutch to resume work, but this should be removed at the earliest opportunity owing to the tendency it has for "glazing" and clogging the pores of the leather.

All things considered, it is doubtful if there is any better clutch for automobile purposes than the leather faced cone type, provided it be correctly designed for the work it has to do. Compared to the metal to metal clutch it is cheaper, and in most cases considerably lighter. Repairs and renewals are also more readily effected. Its worst feature, end thrust, can be effectively and efficiently dealt with; in the majority of designs the thrust is self contained when the clutch is in engagement. When out of gear the end thrust is not of so much importance, and a simple ball bearing is ample provision for it. As will be gathered from Formula 1 the axial end thrust, acting in a reverse direction to P in Fig. 1, will be less as the cone angle is flattened. The limit for this angle A C B will be in the neighborhood of 12°. If flatter than this there is a risk of the clutch jamming, and a 12° clutch will require considerable power to start it out of engagement. On the other hand, a flat face clutch of the type seen in some planetary gears will require a maximum of axial pressure, unless advantage is taken of the leverage given by "dogs."

Coil spring clutches are apt to be very "fierce" in action except when copiously lubricated. Those experimented upon by the writer proved to be somewhat erratic, at one time gripping suddenly and with great power, while at others they would not drive at all. At the present time the writer has no reliable formula to offer for the design of this type.

Very little use seems to have been made of a simple planetary gear as a main clutch. Such an arrangement would appear to offer decided advantages. Not only would the load be taken up very gradually and smoothly, but the motor speed would be reduced, allowing the use of larger wheels for the spur gear and axle bevel wheels. Thus by eliminating small spur gears (sometimes

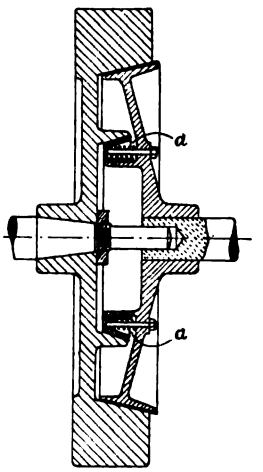


FIG. 4.

extremely small) the mechanical efficiency and strength of the speed gears would be materially improved.

The Qualities of Cast Iron.

Gray cast iron is so important a material in the manufacture of engine cylinders, and it varies so enormously in quality, that special interest attaches to the articles which appeared some little time ago in *Stahl und Eisen*, by Dr. H. Nathusius, on microscopic sections of this material. The researches have been mainly directed to establishing the magnetic qualities, that is to say, the suitability of certain kinds of cast iron for dynamo construction. The extent, however, to which the material varies in homogeneity, particularly in the equable distribution of the graphite, which is so important a constituent of gray iron, according to its composition (percentage of silicon), is so striking, that the series of papers and discussion on them, published in our German contemporary, cannot fail to be of considerable interest to automobile constructors generally.

Tires.

By Chas. E. Duryea.

The common forms of tires today are the iron tire used on most vehicles, the solid rubber tire in a variety of forms and the pneumatic tire, likewise considerably diversified. The iron tire simply ties together the wooden parts of the wheel and protects them from damage by contact with the road surface. It is generally admitted that a perfectly true iron tire running on a metal rail is about as near perfection in the tire line as can be attained. Unfortunately our common roads are not steel rails and the conditions best suited to an iron tire are not found on our common road surfaces. The most carefully laid asphalt, smooth to the eye, is quite rough to a true wheel, especially if driven at high speed, and it is to absorb this roughness that the better grade of vehicles, particularly for passenger or pleasure use, are fitted with rubber tires in addition to the iron tire which binds the wheel together. These rubber tires serve to smooth the road. They yield and swallow little obstacles and fill in small depressions without the jar and noise found with a solid iron tire.

The most common form of solid rubber tire is a D shaped strip of rubber, sometimes made endless, but commonly made in great lengths and cut to fit the size of the wheel, after which it is fastened thereto by two or more wires. Two of these are sometimes used on a single wheel. Short sections of rubber are sometimes used. The strip of rubber may have an arch under it or a hole through it, or grooves along its side, or other modification intended to secure some advantage not secured by the plain strip of rubber commonly used. For automobile work the iron tire is faulty, in that it slips on every street car rail or sidewalk crossing, or bit of ice, and bounces badly from every pebble, which permits the wheel to revolve without driving as well as transmitting a destructive vibration to the driving mechanism. The rubber tire largely overcomes these objections.

THE PNEUMATIC TIRE.

Since, however, it is of decided importance that these objections be overcome to the fullest extent, the air tire, larger, lighter, more flexible and more elastic than the rubber tire is used, particularly by those who want high speed. This tire is composed of fabric and rubber, which are used to tie or confine a volume of compressed air, and are arranged in combination with some form of rim to hold this air in position on the wheel. Since fabric and rubber have but a limited amount of strength, it is self evident that the quantity exposed to a given service or used to carry a given load should be quite large as compared with the size of an iron tire for the same purpose. Rubber is peculiarly able to resist wear if not overloaded, and it is to this fact that the success of both the solid rubber and the air tire is due, while on the other hand most of the troubles arise with these tires because of improper size, resulting in an overload. Since the resilient tire is used for the purpose of smoothing the road, it stands to reason that the rough road, more than any other, needs the most resilient tire, while smooth roads or prairie districts get along nicely with solid rubber tires. This is just the reverse of many people's opinions who imagine that the pneumatic tire ought to be avoided in bad roads and used only on good. A little observation, however, will show cities having asphalt streets also having a great proportion of solid tired vehicles, while in the cobblestone paved cities the pneumatic is most satisfactory.

We must, therefore, consider the pneumatic tire with reference to rough roads, and this makes plain why the air cushion is so desirable, for air is more elastic than rubber or springs, and, unlike a spring, its elasticity is not limited. If the tire is of proper size and construction it may swallow a stone of nearly equal diameter with very little jolt to the vehicle. Most tires, however, are not so well constructed as to permit this, but it is quite a common experience in striking a small stone at speed to feel it bump the rim without noticing any perceptible lift of the wheel, thus clearly proving that the tire did practically swallow the stone and smooth the road to that extent.

In an air tire the first essential is an air container, and this is made of pure rubber of good quality, elastic, non-porous and without openings, excepting the valve tube. Since it has no great thickness it has no great strength, so the duty of the fabric is to provide the strength necessary to confine the air. In tying up anything it is quite evident that the strongest tie is the shortest way around, so in confining a volume of air for tire purposes the first thought is that the threads should run around the tire in the shortest direction and not around the wheel. This arrangement forms what is known as

THE "THREAD" TIRE,

and has been used on cycles to a considerable extent, having been patented by sveral different people in different forms. Such a construction, combined with elastic rubber, permits a pebble to be swallowed by the tire, while much of the tire maintains its usual bearing on the ground, thus carrying the load without throwing the strain on the fabric at any one point and without lifting the load to the top of the pebble, as would be done with a solid tire. Since, however, the threads are likely to separate and puncture easily, followed by tearing of the rubber, it is necessary to provide against undue thread movement lengthwise of the tire. Further, much movement of the rubber wears it out, so the tire maker seeks a golden mean between much movement and much resiliency on one hand, little movement and little resiliency on the other hand. This mean position is usually secured by the use of woven fabric, in which the threads cross each other more or less nearly at right angle. In order that such fabrics may accommodate themselves to the curve of the wheel rim, it is necessary to cut them on the bias, for it is quite evident that a square woven fabric, like a fire hose, will not bend around a wheel without wrinkling on the inner side. This comparison makes plain also that the outer threads of such a tire would be under great strain longitudinally, a thing to be avoided. It will therefore be seen that the threads of the tire fabric should run more or less nearly crosswise the tire, but meshing with or crossing each other enough to give strength to the fabric. If we suppose such a tire to be made up as a single tube it will be found that inflation tends to elongate the tire, so that it will not fit the wheel. It is not constrictive. In order to produce a constrictive tire that will grip the rim and hold itself in place the threads must lie in more nearly lengthwise the tire. Present automobile tires vary between these two extremes. The single tube tire held on by cement only must be very strongly constrictive. It is ordinarily built up by cutting the fabric on the bias and stretching each strip, so as to throw the threads into a longitudinal position.

Mechanically attached tires do not need assistance from the fabric to hold themselves to the rims, for they are maintained in position by clamps or wires. They can, therefore, be built with the threads in any desired position, and will usually be found more resilient and easy riding, although possibly shorter lived than the constrictive form. Since, however, the maker of the mechanically fastened tire is not forced to place the threads in any particular position, for the sake of holding the tire on the rim, he can put them into that position which combines to the greatest degree resiliency and long life. It seems more than likely that the true mechanically attached tire will be the surviving form.

There are a number of tires which are semi-mechanically attached, in that they are held against the rim by their constrictive fabric, but are prevented from opening at the base by hooks or flanges on the sides of the rim, which, while not offering sufficient fastening to hold a non-constrictive tire, serve the purpose well enough with constrictive fabric to permit the base to be left open for the insertion of the air tube. Such tires are rather intermediate affairs, being neither the best nor the worst, give excellent satisfaction and are used in large numbers. Improve-

ment, however, must be sought in the line of a more perfect fastening and less nearly constrictive fabric.

Since the fabric must contain air under considerable pressure, the designer must decide not only the best position of the fabric but the proper thickness, in order to give the requisite strength and the proper size of tire and wheel. It is quite evident that a thin wall will bend more times than a thick one, so tires should be as thin as possible on the sides, that they may bend many times without breaking or wearing out. They should have plenty of rubber on the tread. A thick tread gives material to resist wear and puncture where it is needed.

WHEEL DIAMETERS SHOULD BE LARGE,

for a large wheel revolves less times than a small one and bends the tire less times per mile. The tire of a large wheel gives a longer contact on the ground and strikes fewer tacks and destructive points than a wide tire, as is usually fitted to small wheels. On the other hand, the tire diameter must be great enough to absorb the pebbles, and it is quite evident that a brick 2 inches thick cannot be absorbed by a 2 inch tire. The same argument, however, applies to the wheel sizes, for a little wheel rolls against the obstacle and subjects the tire to a heavy blow, while the large wheel rolls over the obstacle and lifts the load with very little increase in strain on the tire. Wheel and tire sizes have been slowly increasing on all first class vehicles, until the cycle sizes, suitable only for toy wagons, are now seldom seen, but there is rising from many quarters a call for still larger wheels, and 40 inches diameter with 3 to 4 inch tires will doubtless be seen in the future.

The experience of horse vehicle users is well worth considering. Many people have tried the "bike buggy," with its small wheels and pneumatic tires, only to return, with great satisfaction, to the old reliable standard size buggy wheel, 3½ to 4 feet in diameter, with solid rubber tires. Wheel sizes have been experimented with for centuries, and it will doubtless be found that the sizes longest continued in use are most nearly right. Certainly it is folly to suppose that 28 inch cycle wheels are right for an automobile weighing a ton.

Of the mechanically fastened tires there is a rapidly increasing variety from which to choose. One of the best known forms is the Dunlop, on which the patent has recently expired in England. This has its edges provided with endless wires, and is fitted to a rim having one side removable. It may, therefore, be removed or placed in position quickly and easily, and when in position cannot come off until the removable part of the rim is detached. Several modifications of this are now offered and are finding ready buyers. Since the original patent expires in the near future, it is quite likely that this form of tire will be a most prominent one hereafter.

SINGLE AND DOUBLE TUBE.

The single tube tire won out on cycles because it was cheap to build, and, therefore, permitted the manufacturer to save a little money in the construction of his product. The public believes it buys what it wants, but it does not. It buys what is offered it, and so bought single tube tires. The difficulty of making a repair, together with the inadequate sizes first used on autos, brought this form of tire into a disrepute from which it may never recover, but ample evidence exists to show that on proper size wheels it was a satisfactory and reliable, although not a very resilient tire. It undoubtedly deserves a much more prominent place in the future than seems probable at present.

The double tube tire mechanically attached is in favor today, and seems likely to continue so, but there may be forms cheaper to build and more easily repaired than the present double tube, and a short consideration of one of these forms will not be amiss here. This is the tubeless tire heretofore exploited to some extent and with a fair degree of success. It is in reality only the shoe or casing of the double tube tire lined with rubber so that it may hold air, or, in other words, it is a sort of combination of the single and double tube ideas. It is made in one piece, like a single tube, but must have its edges clamped tightly to the rim or to each other, so as to make an air tight joint. Ordinarily a little water is injected to make a more perfect joint. There is no inner tube to creep, no valve to cut off, and if punctured the patch may be put on the inside instead of on the outside, as in repairing the air tube, or instead of pushing it through from the outside as in repairing a single tube. For cheapness of construction, for ease of repair, and for combination of good features this form of tire seems likely to have a large future.

THE ULTIMATE TIRE.

No one form of tire will supersede all others. People are different, roads and conditions in different parts of the country are different, and what pleases one man will not please another. The increase in speed made possible by the motor vehicle, the necessity for propulsion and the desire for greater comfort will increase the use of the resilient tire of one kind or another. Further, it will probably be found cheaper to equip the vehicle wheels with rubber, which is road making rather than road destroying, instead of as now trying to make the roads hard enough to resist destruction and then fitting our horses with shoes kept sharp shod that the horse may not slip, but on the contrary may get a footing by digging a dozen chisels into the road surface continuously as he travels.

The tire maker makes the tire and it is to be presumed that he makes it as good as he knows how. There are offered, however, many devices said to improve or save the tire, generally called

TIRE PROTECTORS.

These devices are not to be recommended. It should be evident to anyone that a double wall will not bend easily, and that if it does bend the inner part is compressed and the outer part stretched. Compression of rubber or fabric breaks it and wears it out quickly, so tire protectors are quite likely to destroy the tire. This destruction is frequently explained by saying that the protector does not let out the heat. More truthfully it increases the difficulty of bending and causes an increased amount of heat to be generated. Most observers know that the constant movement of the tire in running heats it, just as bending a piece of wire will heat it. In some cases however, tire protectors are valuable, and a good protector over a tire so old and worn as to be useless may enable much service to be had from the tire before throwing it away.

VALVES.

Inseparably connected with tires is a nuisance that has no reason for its existence except a picayune desire on the part of the tire makers to save a few cents in the first cost at the expense of dollars' worth of replacements. Practically all tires are fitted with valves that are slightly larger than the "made-to-sell" affairs used on cycle tires. These valves require from 10 to 50 pounds pressure to get air through them in the first place, are likely to swell and close the passage entirely, are choked by the least bit of dirt, must be removed in order to deflate the tire quickly, and would be removed for inflation purposes if it were at all possible. If any doubter wishes to know the difference between a present day valve and a theoretically good one, let him remove the valve part and pump the tire with a good pump without, then replace the part and pump the tire with it in. This will quickly convince him that the present valve requires as much work to pump through it as it requires to properly inflate the tire; or, in other words, because of poor valves, tire pumping is doubly hard. This means that it is frequently neglected, and tires frequently damaged. Second, no valve present in use can be relied upon to hold the air, but a miserly little cap filled with a flimsy soft rubber washer, arranged to bear against a circular knife edge, is depended upon to do this duty. It will hold it once or twice quite well, but the records of the New York-Boston [illegible] showed that about 50 per cent. of the troubles were due to the valves, and when one has a slow leak it is quite hard to look in the valve for it. A proper valve would have a free passage unimpeded by springs or spring actuated checks, and, above all, the passage would be closed by screwing a plug into

opening against a gasket that cannot be roughened up or pushed out of place, as does the soft rubber at present used when forced against the narrow edges with which it contacts.

While not necessarily a part of the tire, a number of fixtures are fitted to tires for the purpose of increasing their efficiency. One of these consists in corrugations projecting slightly above the surface of the tire, which enable the tire to better grip the road surface, and thus propel the vehicle without slipping. Another form has depressions in the tire surface, which permit it to bite. A third has short rubber studs projecting above the surface. Any of these devices are good, but cost the tire maker something, and are, therefore, not provided unless called for. Detachable grips or fastenings are also provided, and the chain form seems to meet quite well the need for something to assist propulsion in icy weather and with little, if any, damage to the tire.

MAKE THE VEHICLE FIT THE TIRE.

Having shown some of the good features, it may be well before closing to point out a serious defect in the tire today. On every hand is heard the call for better tires, but fabric is fabric and rubber is rubber, and the way toward better results is to fit the vehicle to the tire, since it is quite evident that the strength of the tire cannot be continuously increased to meet the weight of the vehicle. Lighter vehicles, larger wheels, or more wheels, are the factors which will aid in the solution.

Power tire pumps are mostly purchased to relieve the operator of the bother of hand pumping, but their chief value lies in the fact that the tires of a car thus equipped will be kept better inflated, and thus be protected against rim cutting.

Foundry Methods and Productions.

By W. E. D.

In most stationary and transit work lightness, high speed of delicate parts, and pounding and jarring effects as a combination have not had to be considered so seriously as is necessary in the construction of the automobile. The metals used and the manner of obtaining the greatest strength from the smallest amount are in this case most important factors.

Unfortunately much foundry work is done by guess or approximation. Many foundries, however, regularly employ chemists to purify and apportion the ingredients used. Frequent tests and experiments are also made to raise the standard of this product.

CYLINDER CASTING.

A great deal has been said about the superiority of foreign cylinders over those cast in this country. It has been asserted that a superior grade of iron is used. Our foundrymen, however, claim that this is not true, but that the difference is due to design, the manner of handling the metal, the temperature at which it is poured, the purity of the molding sand used, and the amount of labor put upon the cylinder in finishing. The distribution of the metal is a most important feature. The walls should be of equal thickness, and the water jacket and valve attachments so placed as to influence thermal changes the least possible amount.

The two cycle cylinder is much the simpler to cast because of the absence of the valve seats, guides, openings thereto and attachments of the four cycle type, all of which are replaced by ports. The cores for these ports are usually very simple in design and easy to support.

The air cooled, two cycle may be most easily cast. The flanges, which are concentric and diminishing in size to the apex of the cylinder, with scarcely any irregularities, are frequently cast integral with the cylinder with very little difficulty. These conditions also admit of the radiating members being made wider and thinner. Furthermore, there being no irregular masses of iron, the cylinder does not distort so much in cooling or present hard and soft spots. These irregularities are more depreciating than is usually thought. In boring where they exist different densities of metal can be observed. If a cylinder is then carefully micrometered and set aside for a few days and then measured again, a surprising change will usually be found, due to the influence of these masses. For this reason it is advisable to delay the final grinding until some days after the reaming has been done.

These factors materially influence the results, and should be carefully observed in order to produce a dense, homogeneous cylinder whose walls will take a high glaze and offer the least frictional resistance.

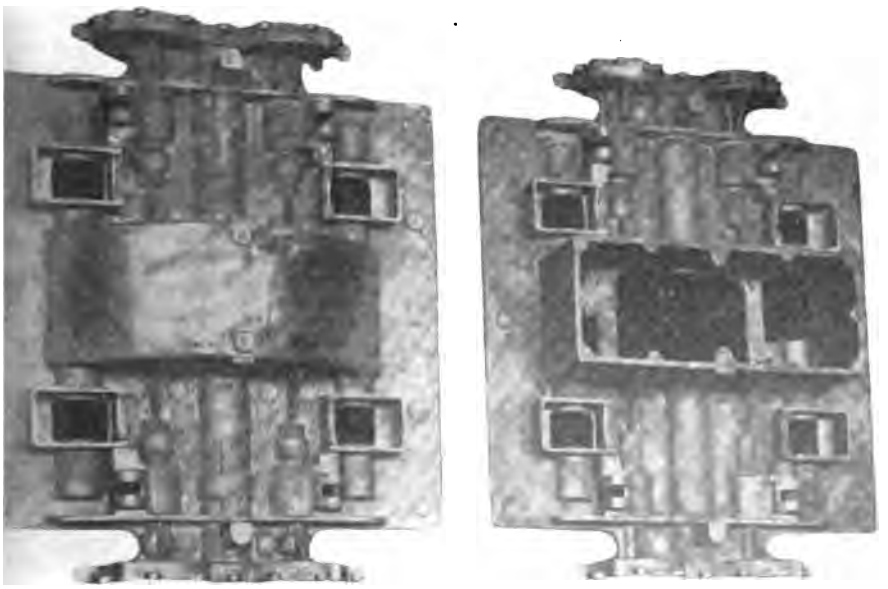
Aluminum to the amount of a quarter inch cube to thirty pounds of iron is sometimes added just before pouring. Thus the iron flows more freely, and is said to fill in the pores. It also seems to have a purifying effect. If a ladle of molten iron is skimmed perfectly clean and the aluminum then added, a disturbance in the mass takes place, and impurities in the form of black particles come to the surface and can be skimmed off. Cylinders cast of this alloy, especially the air cooled type, are said to burn out more rapidly, as the fusing point is slightly lower than that of pure iron.

The majority of cylinders are cast of pure gray iron of the best quality obtainable. This may be made so that it has a tensile strength of upward of 30,000 pounds per square inch.

In order to obtain very wide, thin flanges on air cooled cylinders, cores between the flanges are built up in the mold or the flanges are cast first, then placed in the mold and the cylinder poured around them. When this is done the mold containing the flanges must be heated almost to the melting point of the flanges or they will cool the cylinder metal, preventing its running and joining perfectly with them. This also applies to copper flanges placed in the mold.

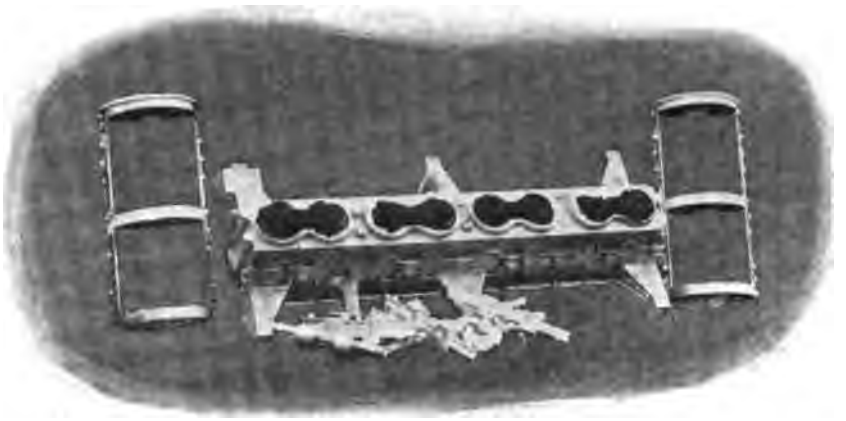
ALUMINUM CASTINGS.

The use of aluminum castings for automobile work has been greatly increased by the introduction of ingredients which have given the metal much greater strength. The lightness of aluminum and the absence of perceptible oxidization make it attractive. The alloys used at present are also valuable because of their toughness or elasticity, which enable them to withstand hard and sharp blows better than cast iron without fracturing. Crank case explosions have occurred where the aluminum cases tore and bent. If cast iron had been used, it probably would have given way, and more serious damage been done. Aluminum



A Typical Shape for Aluminum Casting.

A PART COMMONLY MADE OF ALUMINUM.



THE CRANK CASE OF AN EIGHT CYLINDER MOTOR—AN EXCEPTIONALLY LARGE ALUMINUM CASTING.

chines much like iron. It holds a thread fairly well, but cannot be used for wearing surfaces. It is used for upper and lower parts of crank cases, gear cases, differential cases, carburetors, intake pipes, steering wheels, fans, blower cases, covers, brackets and fittings.

For casting it is principally alloyed with zinc, brass, copper, nickel and manganese. Most of the ingots sold for casting contain 15 per cent. zinc to 85 per cent. aluminum. Some castings are made with 5 to 7 per cent. copper. Pure aluminum shows a tensile strength of about 12,000 pounds per square inch. Some alloys test 17,000 pounds per square inch. One 7 per cent. alloy has shown a tensile strength of 27,000 pounds per square inch. It is frequently guaranteed to test 25,000, which is practically the same as cast iron.

METHODS OF MELTING ALUMINUM.

The composition of the alloy is only one of several things that very materially affect the ultimate results. Great care must be taken not to overheat aluminum, as it burns very readily. This is its most annoying feature, and to avoid it some foundries are installing crude oil furnaces in place of the well-known floor furnaces where coal and coke are used. With the latter sulphur fumes are also liable to attack the aluminum and injure it. With the former the heat can be controlled by reducing the fuel supply to avoid burning and to adjust the proper temperature in the preparation of the molds. Furthermore, from the pressure on the oil and air supplies the proper pouring temperature can be closely regulated. The oil furnace is quicker, reducing the time required for melting by one-half or more. To be perfectly accurate, the pyrometer should be used. Aluminum fuses at 1,200° Fahr., and this point is only slightly raised by alloying.

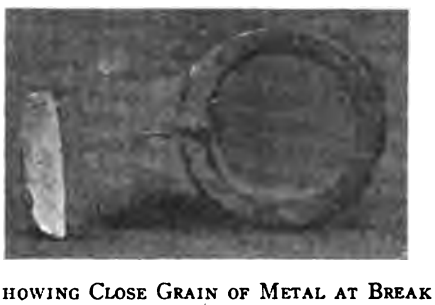
The excessive

SHRINKAGE OF ALUMINUM

is another annoying feature which must be combated with. It shrinks about 3-16 inch to the foot. There are three factors employed to overcome the difficulty.

First, due allowance for shrinkage is made in constructing the pattern. Only experience with each design will teach the proper amount of allowance. For this reason foundries sometimes prefer to construct the pattern from drawings. Invariably new patterns have to be more or less made over.

Second, risers are used wherever possible. If a thin portion of the pattern ap-



SHOWING CLOSE GRAIN OF METAL AT BREAK IN STEEL CASTING.

proximates a much larger mass, generous risers are constructed in the mold opening to the latter. These should be of sufficient size to remain molten until the casting has solidified. When the casting is cold the drawn-in heads of the risers will show that they have fed the casting, and that most of the shrinkage has taken place in these masses that are to be cut off. These risers must also be used to feed any thick part isolated from the main body by a thinner section.

Third, chilling the small and thi parts prevents their being drawn ou shape. This is sometimes done by u an iron rod instead of a dry-sand c On flat work a sheet of steel ⅛ inch t is placed underneath the pattern in mold—never on top, which would c porosity.

A test bar chilled on three sides sh a tensile strength of more than double of the same mixture unchilled.

STEEL AND NICKEL STEEL CASTINGS.

Steel castings are rapidly becoming po lar in the industry. It has been dem strated that they can be used with adv tage in hubs, bearing boxes, gear c steering knuckles, levers, universal jo lamp and canopy top brackets, connect rods, crank shafts, dies for drop forg and other minor parts.

Improvement in the production of st castings has been very rapid the past years, the automobile trade having m to do with the perfecting of alloys methods to produce small castings wh great strength is required. Steel cast are cheaper than drop forgings, except very simple designs, chiefly because wooden pattern is used in place of the e pensive forging dies which may be so discarded because of changes in desig Steel castings require about the sa amount of machinery as forgings. C steel is easy to cut, resembling in this r spect machinery steel. It can be case ha dened in the usual manner, and admits forging and welding.

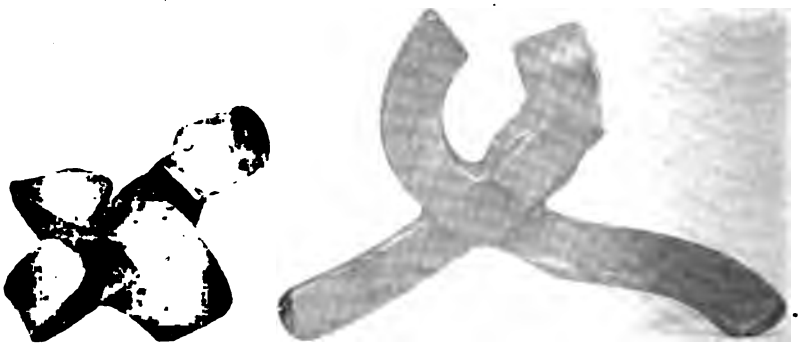
The following are the general specifica tions of a part of the product of a we known steel foundry:

Tensile strength ....70,000 lbs. per sq. in.
Elastic limit.....35,000 lbs. per sq. in
Elongation in 2 in.....25 per cen
Reduction of area.....40 per cen

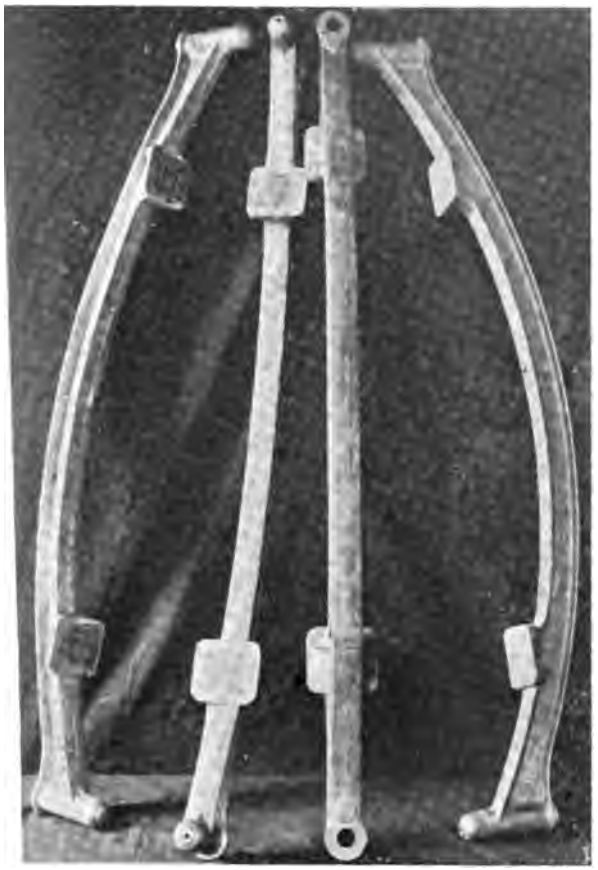
Nickel steel castings possess still greate advantages. Out of six consecutive tes of this alloy the mean averages were as follows:

Tensile strength....82,260 lbs. per sq. in
Elastic limit.....54,764 lbs. per sq. in
while the guaranteed specifications offere by the foundry are as follows:

Tensile strength....78,000 lbs. per sq. in
Elastic limit.....50,000 lbs. per sq. in



A DEMONSTRATION OF THE TENACITY OF NICKEL STEEL CASTINGS.



FRONT AXLES CAST OF BRONZE.

Elongation in 2 in.....20 per cent.
Reduction of area.....30 per cent.

The very high elastic limit means that nickel steel can be subjected to very severe strains and shocks before it begins to bend or give away, and even then does not fracture readily, as evidenced by the high percentage of elongation and reduction in area. It will stand considerable cold bending without injury. The nickel steel casting is hardened by simply heating to the usual red and immersing in water. The property of the nickel makes this simple process possible. Gears cut from this metal and hardened are said to be very tough and durable. It can be welded without difficulty. A freshly fractured piece shows a very close metal of exceedingly fine molecular construction and of the shade known as silver gray. It fractures very even and smooth, as compared with malleable iron or the ordinary steel casting.

Both steel and nickel steel must be handled much hotter and quicker than iron. Very thin, delicate patterns can be made of both these metals. Blow holes and imperfections, which were at first annoying, have been mostly overcome, and a large percentage of castings now come out quite perfect. The spew should be cut, not broken off, as the toughness of the metal is liable to bend the casting. Distortion from breaking the spew is sometimes mistaken for warping.

Manganese bronze can be cast into all sorts of cases and housings, motor frames, front axles, steering wheels, lamp brackets, blanks from which gears are cut, and many other parts. The hub and hollow spokes of a wheel have been made in one casting of this metal. It gives a tensile strength of 65,000 pounds per square inch and an elastic limit of 30,000 pounds per square inch, about the same as cast steel. It machines a little easier than cast steel, and at present has the advantage of being more easily obtainable. It costs almost twice as much as cast steel. Its fusing point is about 1,400° Fahr., and is believed to be better handled in the oil furnace, similar to that used for aluminum. In casting, the shrinkage is about the same as in aluminum. The instructions above regarding pattern allowance, risers and chills must be carefully adhered to.

In melting this bronze it should be heated until it flares zinc fumes freely, then removed from the furnace and skimmed thoroughly until the flaring ceases. It should again flare zinc fumes as it runs into the mold. In remelting in crucibles the amount of zinc volatilized in the previous melting must be restored by the addition of 1½ pounds of zinc to each hundredweight of bronze. In some bronzes a small amount of aluminum is introduced and thoroughly stirred just before pouring. This helps to make the metal flow easily, also to toughen it.

BUSHING CASTINGS.

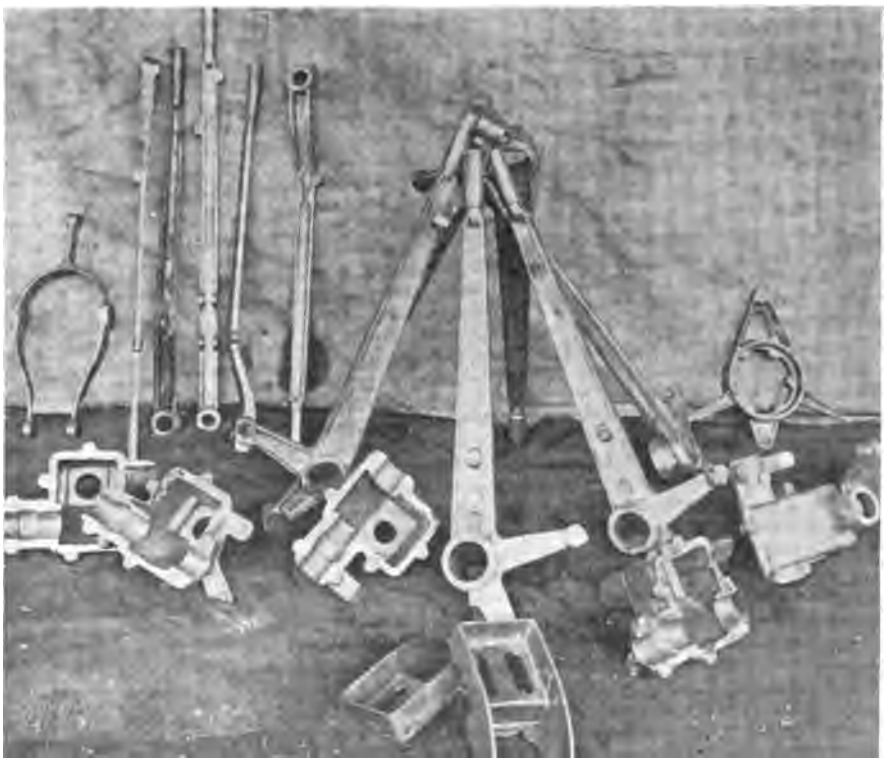
Phosphor bronze is much used for bearings. Phosphorus is used as the physic to enable about 9 per cent. of lead to be mixed with the bronze. Lead, being a natural lubricant, greatly enhances the value of the alloy for bearing surfaces. Plastic bronze may contain as high as 30 per cent. lead. In compounding this alloy 1 per cent. of nickel is used as the physic instead of phosphorus.

Velvet bronze contains a large amount of plumbago introduced in the melted metal. This gives it a bright lead color when freshly cut, but immediately discolors to a reddish copper. It makes an excellent bearing for high speed work. A very common fault of bushing castings is that they are too thin, and when cut the edges pinch the shaft. When cast with ribs or ears extending to the cut surfaces they retain their shapes better.

BABBITTS.

In compounding babbitt metals it is sometimes advisable that the metals should be melted under a layer of charcoal, to prevent oxidization. The charcoal is separated as the alloys are introduced, the mass remaining at an even heat during the pouring into ingots.

Original babbitt metal for bearings contained only tin, copper and antimony. Many of the cheaper products are at present mostly alloys of lead. This latter metal is a natural lubricant, and valuable as such, but



will not withstand much heat, and is also very malleable. Overheated bearings fuse it, and the constant jar of uneven road surfaces is apt to hammer it out of true. Bearings made of this babbitt especially should be very thin. In fact, all babbitt bearings should not be over one-eighth inch thick. Failure from distortion frequently occurs because the babbitt is too thick, where the same composition in a thin bearing is a success, the small amount of the soft metal being backed by the hard box. The best results are obtained by using bearing boxes provided with ribs.

The metal should be melted in a crucible, poured next to iron; then thoroughly hammered all over before boring. The hammering assures consolidation and closing of the pores of the metal, and also serves the purpose of expanding and tightening the babbitt between the ribs of the box. This composition melts at 1,200° Fahr. It can be used repeatedly if thoroughly mixed at each melting, thoroughly fused and yet not burnt. After a time it takes on a very hard glaze. On small bearings and high speed work it is advisable to allow a clearance of one one-thousandth of an inch per inch of diameter.

Insufficient lubrication is as often the cause of difficulty as the composition of the bearings. In other fields, where proper lubrication is maintained, bearings frequently run years without being disturbed.

PATTERNS.

The pattern is a most important thing with foundrymen. Wood is mostly used. Where a large number of castings are to be made, mahogany is sometimes used. If there are delicate parts or the pattern is liable to severe usage, brass is used. Aluminum is rapidly becoming popular, as its lightness enables the workman to feel it draw from the mold. It also casts smoother than brass. At first it does not work so well, but after being used a short time a slight oxide covers the surface, and it then draws from the sand freely.

Too much stress cannot be laid on the construction of patterns. They must have the larger masses on top and be arranged for the gates to lead to these parts. Due allowance for shrinkage must be made, as the large masses draw together.

TABLES OF COMPARISON.

The following table is compiled from the specifications of guaranteed tensile strength of some of the leading foundries:

	Pounds Per Square Inch.
Drop forging	125,000
Cast nickel steel	78,000
Cast steel	70,000
Cast manganese bronze	65,000
Cast aluminum	25,000
Cast iron	24,000

	Weight Per Cubic Foot. Pounds.
Brass	495
Cast iron	400
Cast aluminum	160
Mahogany	51

An Epoch in Engineering.

By E. J. Stoddard.

Say what we may about the administration of our patent laws, the fact remains that they have been the potent cause of advance in the applied sciences. It is thought that he who wields a hammer should do it constructively as well as destructively.

It seems obvious that nine or ten courts of appeal, each with limited territorial jurisdiction, presented an evil to be remedied. The tremendous cost of maintaining eighteen or twenty suits upon a single patent has commended itself to many as a means of intimidation, and it is possibly a cause for the apparently lessening relative efficiency of our inventors and manufacturers.

The automobile art has presented a notable example of the attempt to manipulate patents, and our patent system, for commercial advantages. It would seem, therefore, of especial interest to this art that attempts are being made to establish a single court of patent appeals, which shall take all appellate patent litigations and decide it once for all for the whole country. It is not only the cost involved in the present numerous courts of appeal that is objectionable, but it is also the uncertainty of results. The committee of the American Bar Association in their report say that positive opinions cannot be given; the chances of getting opposing decisions in so many courts, especially where the courts are not specialists in this particular line, are so great.

The desirability of the single court seems not to be questioned. The only point for discussion is how it is to be constituted. In 1903 the American Bar Association recommended that such a court be established, and a bill to that effect was presented to Congress under their patronage.

The same association has again recommended the establishing of such a court, and has recommended enlarging the scope of the bill previously presented so that the judges of such a court would be selected from the justices of the courts of appeal, now established, and also from the Federal circuit and district judges.

A second bill has been presented not limiting the class from which the judges might be selected.

In Judge Simeon E. Baldwin's recent book on the "American Judiciary," the desirability of such a court is pointed out in unqualified language (pages 145-146).

Recently the *Iron Trade Review*, of Cleveland, has been taking a sort of plebiscite, especially as to the question whether or not it would be desirable to have scientific men, and men of practical experience in the applied sciences, attached to the court. The manufacturers and engineers seem unanimous that such is desirable; the attorneys seem unanimous that it is not desirable. The Supreme Court as early as 1877 strongly suggested the desirability of such an adjunct to the court in patent cases.

Professor Perry, writing from England, speaks of the conditions that obtain there in the following language:

"In England our lawyers and judges almost without exception are quite ignorant of the most elementary facts of physical science. In a patent case the court has to be educated in these matters at a terrible expense, and at the end of ten days or twenty days one sees that the judge is nearly as ignorant as at the beginning. He thinks he knows, but really he has only some fixed impressions given him by that lawyer who has been most successful in studying his idiosyncrasy. Our system of education is altogether bad, and I am not sure that yours in America is any better than ours."

The English and American systems of jurisprudence and people are very closely allied.

The committee of the American Bar Association, in their report, accepted without debate by the association, are most emphatic that it is not desirable to select the judges from the patent lawyers.

The desirability of a greater degree of scientific knowledge on the part of the judges is almost universally admitted, and yet the patent attorneys do not wish an engineer of eminence put on the court for fear his influence will be narrowing.

It is immaterial to the welfare of the individual member how useful a profession is as a matter of fact; but it is all important to him in what estimate his profession is held by the public.

The Constitution gave power to Congress to promote the progress of the useful sciences by enacting proper laws.

Can the engineering professions neglect to see that this power is wisely and effectively exercised, without dimming their fair fame and growing reputation?

The progress of the useful arts is a matter that public opinion is liable to hold the engineers responsible for. Responsibility as to the proper conducting of the subject matter of a profession cannot properly be delegated by members of such profession without, at least, exercising due viglance.

The Roads Improvement Association (of Great Britain) has appointed a special sub-committee to co-operate with the special sub-committee which was recently appointed by the Automobile Mutual Protection Association in conducting experiments with dustless paving in Kent. The County Council of Kent has placed a stretch of road near Maidstone at the disposal of the joint committee so constituted, and Douglas Mackenzie will act as secretary and have personal charge of the experiments in question. It is interesting to note that no material will be tried which is not capable of withstanding the heaviest motor wagon and traction engine traffic, and this point has great practical significance, especially when so many other counties are paying heed to the dust question without considering whether the systems adopted are capable of resisting anything but the lighter traffic.—*Commercial Motor.*

Detail.

By John A. Seaverns.

But a few years ago it was a rare car that would go fifty miles without getting out of "fix." To-day runs of a thousand miles are common, with but little trouble. We often hear the remark, "The motor car is a great invention!" But is this true? Invention and discovery have had very little to do with the results. It is more a matter of development, and development is a matter of detail. It was stated many years ago, by Lord Bacon, that "Success is wholly a matter of Detail," and this has not yet been disproved, for, while there are many patents bearing on the motor car, very few of them are basic. The results have been obtained by refining and improving the details of design and construction.

It will be admitted by all that the successful cars of to-day are the ones that are the most carefully built, rather than those that are different in principle, and that it is by simplifying and making better what we have rather than by inventing something new that success is to be looked for in the future. Not that there is no chance for the inventor—far from it. He can do much, and no doubt will, but if he does nothing, and we have to go on with just what we have, we shall be able to make a really good and practical car by using care and closely watching details.

Who of all who have driven motor cars has not been held up on the road because of some little thing that, when found, was due to a lack of care on the part of some one who should have known better? It is my intent to point out some of the things that, if corrected, will make the work of caring for and inspecting less and the cars more reliable.

FAULTS IN SOME 1906 MODELS.

First of all, accessibility is of the greatest importance, but there are cars of 1906 model of which the body must be taken off in order to get at the transmission. That this should not be necessary is shown by the fact that in many designs the whole power plant may be taken out without disturbing the body. In many 1906 cars the rod that controls the sliding gears is placed in such a manner that it extends out of the case below the line of the oil level, and oil leaks out around it. In some cases the gear case is divided below the oil level, which also causes a leak. All joints below the oil level are apt to leak, and are to be avoided if possible. Splash oiling is good, but the frame of the car and the road do not need it.

The castellated nut was used by the makers of mowing machines 20 years ago, but was not seen in motor cars until recently. Many break-downs have been caused by bolts working loose, even when held by check-nuts, that the use of castellated nuts would have prevented, and there is no valid reason for not using them. The use of the Woodruff key has been abused, and much trouble caused. It is only in places where a long key is called for that the Woodruff has any advantage, and even that is small, but they have been used to hold gears from sliding on their shaft, which no key will do.

In many designs the weight of the entire car rests on eight ⅜-inch bolts, that form the joints of the springs, where there is much wear and no way of oiling. Often these bolts are put through the rough hole made by rolling the end of the spring up to make an eye; sometimes they are hardened, more often not. All that keeps wheels of some cars on are cast-iron washers which, when dry, cut off and let the wheels go where they please. Again, some wheels are held by 7-16-inch bolts threaded into the axle, with 5-16-inch bolts through them. It would seem wise in all axle work to use a steel washer, sliding on a key, kept in place by a cottered nut. This is just as cheap, and is positive.

The writer does not believe in luck, and thinks that most of the failures can be traced to carelessness, and that the carelessness is chargeable to the designer. Of all the disabled cars inspected by the writer during the last year, in all but three the cause was found in some little thing that was not carefully thought out in the designing room.

RIVETING

is the best way to hold pieces of metal in place when they are to remain together, but it is a mistake to put the rivets in places where it is necessary to take off something in order to get at the heads. It is, of course, necessary to do this in some cases, but then the rivets should be large enough to hold against all strains and not require re-heading. It is a common practice to head up the end of a bolt after the nut is set to make sure that it will not work loose, but this is not good practice, as if the part held by the bolt is to come off, it should do so easily, and if not, a rivet is better and cheaper.

The catching of fan belts and pump chains in engine gears has been the source of much trouble, and what the excuse is for not casing gears, or for using belts or chains, remains for the designer to say.

It will be said by some that it is an easy matter to find fault, but the things pointed out are so easy to avoid that if they exist it is evident that due care has not been used. The writer has seen so many cars fail because of some little thing that a careful man would have avoided that he is sure that more care in designing will do more than invention in making the car of the future.

The lack of knowledge in designing the

ELECTRICAL EQUIPMENT

is most manifest. Here is where a large part of the causes of delays on the road are found, and in looking for spark trouble other things are disturbed, and what was at first a small thing soon becomes a large one. Timers that waste battery power are the rule, and very few are properly grounded, so that it takes a high primary voltage to get a satisfactory spark. Bearings are not good, have no take-up for wear, and are weak in construction. There is no excuse for this, as it is a simple matter to make them right. If a maker of coils who knows how tries to sell his coils and timers, he finds the prices he must ask are too high, as cost is the principal consideration.

The public have had so much trouble with the primary battery that they call for the storage cell, and it is difficult to prove to them that with the right coil and timer the dry cell will give good results. That this is so can be proved, but the coil and timer cost more than those usually used and must be used with more care. With conditions right, eight dry cells will spark a four cylinder engine for two to three thousand miles, and the cost will be less than with storage cells.

Many cases of missing are due to poor connections in the timer. Oil is a good insulator, and is used in high-tension transformers as such, and it is the theory of lubrication that a film of oil is present between the shaft and the bearing. If the oiling is good the grounding must be poor, and there is not one timer in a thousand that has a ground wire. If graphite is used in place of or with oil a better contact is secured, but it is not certain. High tension distributers are good in theory but weak in practice, and will be so until better built and designed. Magnetos are capable but expensive, and every moving part adds another chance for trouble.

OILING SYSTEMS

are great trouble breeders, it being the rule to use too small pipes, poor unions and too many bends. It is a good rule to avoid springs if possible, but some oilers have them by the dozen. Most of the oil used is wasted in one way or another, and it is safe to say that less than one-half the oil used, if put where it is wanted, would be more than enough.

On all cars there are many places subject to wear that are not provided with oil holes. Some have oil holes, but no way of letting the air out, and the oil that is put in the hole never reaches the place for which it is needed. Graphite bushings are made that will stand quite a strain, and these could be used in many cases. In others, babbitt could be used, with a slot and a wick, that would last for a long time.

Any one who has designed machinery has a method of his own, but it is the rule in all large work to avoid all small fractions in dimensions, to use standard sizes, and to make all parts as simple as possible. It is good practice to so assemble that any part can be put on or be taken off without disturbing the rest. This is not always possible, but it does not seem as if the motor-car designer ever gave it a thought.

CAST IRON.

Cast iron is good material for cylinders and pistons—in fact, it is about the only

one that will give good service for these parts—but its use elsewhere, except in the malleable form, is almost criminal. Even in cylinders it is the cause of much trouble, and the inventor who will give us something else will be thanked. Water jackets are better made of copper, and can be made tight, which is the only objection the writer has ever heard to their use, and with them it is possible to secure better cylinder castings.

In some places cast iron is good for bearings, but its use in the motor car should be restricted, to say the least. It is good for window weights, road rollers, and in all places where weight is wanted, but not where strength is important, together with lightness. The buyer would do well to pass by the car with much cast iron in it, as it shows that the maker is not a careful man, excepting of his own expense account.

GRINDING.

We hear much of grinding nowadays, and it is certain that hardened steel can be made true to size and shape in no other way. But is all grinding good? Emery is the common abrasive, and the products of iron are ground, and in the process both become magnetic, making it very difficult to free the ground surface from the emery after the operation. The old steam engine men, while few of them knew the reason, kept emery away from all bearing surfaces. If any grinding was to be done, they used sand, glass or pumice, which could be washed out with oil or water. These non-magnetic substances will not cut fast enough for the modern workman and emery is used, the practice of the older men being laughed at as not up to date. There has been little said against grinding, but if emery is used there will be some of it left to do harm, and the fits so carefully made will soon be worse than if the parts were not ground.

Carborundum may be used without fear, as it is non-magnetic; it costs more, but cuts quicker, but it is as yet little used. There are no pores in any product of iron so fine that magnetism will not hold some emery in them, and its use is not wise. It is not necessary to take this for granted —try a magnet in a little emery, then in a little carborundum. Then take any piece of iron that has been worked in a lathe, clean it well and examine under a glass, and, being sure no bits of iron adhere to it, dip it in some of the dust found under an emery wheel. It will be found that the little particles will stick, and be hard to shake, rub or wash out.

STANDARD OF RATINGS.

Much is to be done in standardizing the rating of engines, as the claims of some of the makers go to prove. If the speed at which the horse-power claimed is developed was stated, it would help. So would the test. At present it is left to the buyer's judgment, as the same size cylinders are ated differently.

It would seem fair to all if a standard piston speed was used, and all motors rated at that speed. A rating of 25 brake horsepower at 900 piston feet would mean something, and could be proven or disproven without difficulty.

A Plea for the Automobile Engineer.

By D. M. L.

The title "automobile engineer" is evidently lacking in definite meaning in the United States.

Before entering into a discussion as to what has brought about this regrettable condition it is necessary to first define the meaning of this name or title. It must be assumed that the title "engineer," with its subdivisions of M. E., C. E., E. E., etc., indicates a man who is not only a graduate of a technical college but one who has been graduated from such an institution with honors. The automobile industry, which involves much that is a distinct branch of engineering, is too young, and has not been developed systematically enough to produce standards and laws or fixed rules which could form the basis of logically built up lectures for college courses, and today we find no theoretical matter of this character propounded from any university chair. The automobile engineer is, therefore, today to a certain extent "self made," which fact should make him more acceptable to the American manufacturer, who very often considers the draughtsman or designing engineer only as an unavoidable nuisance.

FEW IN THIS COUNTRY.

If we hold to the statement that an engineer's title is due only to a college graduate, and consider that even in the case of a man with such a mental training it necessarily takes several years of theoretical and practical automobile work before he can justly claim the title automobile engineer, it will be readily understood that there are not many full fledged automobile engineers in this country today. Another reason for this lies in the fact that at the time when the automobile began to be a commercial factor it was usually taken up in a small experimental or rather imitating manner, and was in ninety-nine out of 100 cases worked out by practical mechanics who were successful with the firm before the automobile was taken up, or were considered more suitable for such work than the "impractical theorist." The trained engineer had, therefore, only a few opportunities to study an industry which has today become a commercial factor of decided importance, and the magnitude of which was, up to a short time ago, due only to the unparalleled American ability of creating and improving a business founded on the brain work of foreign engineers.

THE SAME THING OVER AGAIN.

It is with this industry as it has been with many others in this country. The theoretically trained man has not, up to a recent period, been looked upon with favor, and foreign competition alone has forced him to the foreground. In a country which coined the now world famed expression, "Time is money," the man who ventures his money in an enterprise wants to see quick results. If he bases his expected returns upon the perfection of a certain technical problem, the man who promises the marketable article within the shortest period of time is certainly the man he wants. The manufacturer usually being a business man who forces the commercial possibilities, but has to rely on his technical man in technical questions, very often makes a miscalculation just at this period of the enterprise which costs him dearly afterward.

The theoretical and practical engineer is naturally a rather high priced commodity, and a new enterprise naturally tries to keep down expenses, especially if they come under the heading "non-productive," and although the success of the whole enterprise may depend on such "non-productive" labor. And it is just at the time when the foundation for a business is laid that the best brains and greatest technical foresight should be employed. It is a fact that a theoretically trained mind has more calculative, analytic and far-seeing qualities than a mind that has to train laboriously itself from problem to problem, the same natural ingenuity being assumed for each. It is well to mention here that "theory is nothing else than the classified knowledge of nearly all practical experience the world over, and the knowledge of laws as logical resultants of facts. It is correct to say that perfect theory and perfect practice are one and the same thing."

THE PRACTICAL MECHANIC

without theoretical training usually starts right in to build a model. Most of the parts are crude, "just to do the trick. It is only a model." After it has been run it has to be changed a little. It runs some more and there is a longer rod to be put in here and a few minor details to be changed there. It is made to run fairly well, and the model is manufactured in quantities. During or after the first season's output it is found wanting in a larger or smaller number of details by the user. Then comes the bitter time for the manufacturer. He has to "make good" or lose his reputation, and usually his quick success was shortlived. He has to experiment while he produces, and if he compiles the cost of patterns, scrap and useless labor, he may find his only consolation when perusing his balance sheets in that these items do not appear as "unproductive" labor.

The desire for quick returns and the employment of cheap help in important creative positions, as well as a misconception of the practical efficiency of the theoretical engineer, can be found in a large percentage of failures. Similar conditions existed and still exist in many automobile enterprises, and have be-

among the chief reasons why the American automobile industry was up to a recent date simply an imitator—and not always a good one. Is it a pleasing fact that we thereby acknowledge the superiority of foreign brains and their product? We usually do not like to make such acknowledgment, and if certain indications are correct the turning point has been reached. Let us hope the declaration of independence in the automobile kingdom may soon be signed. There is enough gray matter of good quality in this country to enable us to take the lead in this industry as we did before in others.

THE TASK OF THE ENGINEER.

This year's shows on the Continent still have a decided influence in shaping the home product for 1907, even if they have not shown any radical improvements in automobile design, but the native shows bid fair to be of more interest to the studying American engineer. Are these conditions indications of the approach to standard forms and materials? It may look like it to the layman—not so to the engineer. Let us analyze and characterize the difficult position in which the automobile engineer finds himself when the work on the "new model" has to be started. Each single component of the new car has to be carefully studied from different points of view. First, it must be capable of performing the functions for which it is built, it must work in harmony with the neighboring parts, it must embody all the best features in present practice, and, if possible, must be improved and altered according to special conditions, and finally it must not interfere with existing patent rights. The last two points especially involve an amount of labor that is hardly conceivable, and only possible to be done for every part of the new car if the best of assistance is at the engineer's call, and a systematic classification of the statistics comprising domestic and foreign practice made use of.

Having reached a satisfactory solution from a purely technical point of view, it is necessary to consider if certain changes may not be looked upon as freakish, if the public demand will be in harmony with the new creation a year hence, and if the engineer is not exceeding the cost limit fixed by the management—for it is ever the temptation for the true engineer to strive after perfection, which is seldom embodied in a cheap article.

The automobile engineer, if placed in the responsible position where he should be, must be a man of thorough theoretical and practical training not only as a mechanical and electrical engineer with a thorough knowledge of the details of automobile designing and construction, but must have wide, general knowledge, be of artistic taste to determine a pleasing appearance of a car, and an untiring worker, loyal to the interest of his employer. It would be for the best interests of a firm securing the services of such an engineer to so shape his position that he might reasonably expect to have the opportunity of refining the product of his brain work during more than one season, because he alone knows the character and possibilities and every weak point of his creation, and where gradual improvement may finally place the stamp of perfection upon the finished product.

A well known authority in automobile matters recently asked: "Is it right to spend $10,000 for advertising and $1,000 for the engineering department?"

British Speedmeter and Lamp Trials.

In connection with the tire trials, to be held during February next, the Automobile Club of Great Britain and Ireland will simultaneously conduct two subsidiary trials for speedometers and lamps. The speedometers will be required to run during the whole of the tire trials, or for such short distance as the club may determine, and no adjustment will be permitted, except in the depot, either before or after a day's run. The speedometers used must also be fitted with a mileage recorder. Entries must be received not later than January 31, and the fee is to be £25 per instrument, of which amount £15 will be placed to a common fund, to be distributed among the tire entrants as a contribution towards the cost of running the cars. The performances of the speedometers will be officially observed, and they will be calibrated both before and after the trials. Among the points which will be taken into consideration in making the awards are the following: (a) accuracy, (b) durability, (c) the effect of reversing the car on the subsequent accuracy of the instrument, (d) price, (e) the rapidity of response to the variations of speed, (f) simplicity of construction and attachment, and (g) steadiness of reading. The club's gold medal will be awarded to the most meritorious instrument, provided there are at least three entries, while the second best, if there are more than six entries, will receive a silver medal.

Similar conditions will prevail concerning the entry of lamps for the trial, but the fees range from £25 to £3, according to the type of lamp employed. There will be seven classes for lamps using acetylene or other gas, and three classes for oil lamps, according to the price. The points under which awards will be made are too numerous to specify, but the more important concern the number of cubic feet of gas generated from one charge at the normal rate of supply, and also the amount per pound weight of the generator, and the amount per cubic foot of the bulk of the generator; steadiness of generation; ease of cleaning, recharging and renewing filters; quality of construction; the time taken in charging and recharging, etc.; smell and other defects, with special reference to burning in high winds and when jolted; absence of leakage, etc. These conditions relate to Class A, but in Class B the lamps will be judged according to the candle power of the central beam per cubic foot of gas consumed per hour; the distribution of light over an angle of 35 degrees in a horizontal plane, and various other points, all relating to the illumination itself. It may be noted that the ideal distribution of light is defined as that giving a uniform intensity of illumination along the hedges bordering a 20 foot road, from a point 10 yards in front of the lamp to the maximum distance of effective illumination. Class C will combine all the points enumerated in Classes A and B. Among the points on which the oil lamps will be judged is one as to the means afforded to the driver for ascertaining if the tail lamp be alight, while another relates to the adaptability to the purpose of illuminating the number plate without unduly projecting behind it. As lamps are one of the least satisfactory items in motor car equipment, considerable good should accrue from this official definition of the numerous points which go to make a perfect lamp.

Carriage Work at the Paris Show.

Writing on the tendencies developed at the late Paris Salon, a writer in the *Pall Mall Gazette* (London) remarks that the coming year, in Paris at any rate, is to be the year of the limousine. Not only do limousine bodies monopolize the show, he continues, but even in the streets three and often four of every five cars which pass one have this heavy, covered in type of body. "For those who like to travel en famille the limousine is, of course, useful, but I cannot but think that the more popular body in England, the laudaulet, is far more satisfactory from every point of view. It is certainly a more economical body so far as tires are concerned, and it is adaptable for either summer heat or winter cold. I notice, too, that many of the Paris bodies overhang the back of the car so that the weight thrown upon the tires is altogether excessive. Perhaps the body which attracts most attention at Paris is a three seated landaulet exhibited on the C. G. V. stand. The interior bulges in front so as to absorb half the front seat and allow room for an extra seat inside. In the French press the innovation has been received with enthusiasm, and laudatory epithets have been showered upon the Parisian carriage builders in consequence. In point of fact, although the carriage is shown with no name on the usual brass footboard plates, the body is an English one by Mulliner."

Show stand attendants will please remember that to call a car foolproof is not paying a compliment to the intending purchaser.

What the Shows Offer.

69th Regiment Armory Show.

GASOLINE CARS.

$500.

Ford Runabout, 15 h. p.; four cylinder vertical motor in front, 3¾x3¼; planetary transmission; two speeds forward and reverse; bevel gear drive; pressed steel frame; 78 inch wheel base; 700 pounds; seats two.

$750.

Mitchell Runabout, 9-10 h. p.; two cylinder vertical motor in front, 4x4½; sliding gear transmission; three speeds forward and reverse; chain drive, pressed steel frame; 76 inch wheelbase; 1,250 pounds; seats two.

$780.

Maxwell Runabout, 10 h. p.; two cylinder horizontal motor in front, 4x4; planetary transmission; two speeds forward and reverse; bevel gear drive; pressed steel frame; 72 inch wheelbase; 980 pounds; seats two.

$800.

Queen Runabout, 14 h. p.; two cylinder horizontal opposed motor under body, 4½x4½; planetary transmission; two speeds forward and reverse; chain drive; angle iron frame; 78 inch wheelbase; 1,300 pounds; seats two.

$800.

Maxwell Gentleman's Speedster, 10 h. p.; two cylinder horizontal motor in front, 4x4; planetary transmission; two speeds forward and reverse; bevel gear drive; pressed steel frame; 72 inch wheelbase; 800 pounds; seats two.

$900.

Logan Runabout, 10 h. p.; two cylinder horizontal opposed motor in front, 4 1-16x 4 1-16; sliding gear transmission; two speeds forward and reverse; chain drive; angle steel frame; 90 inch wheelbase; 850 pounds; seats two.

$800.

Wayne Runabout, 12 h. p.; two cylinder horizontal opposed motor in front 4½x4; planetary transmission; two speeds forward and reverse; bevel gear drive; angle steel frame; 84 inch wheel base; 1,000 pounds; seats two.

$1,000.

Ford Touring Car, 12 h. p.; two cylinder horizontal opposed motor under body, 4½x4; planetary transmission; two speeds forward and reverse; chain drive; angle iron frame; 84 inch wheelbase; 1,400 pounds; seats five.

$1,000.

Moline Touring Runabout, 16 h. p.; two cylinder horizontal opposed motor under body, 4¾x5; planetary spur gear transmission; two speeds forward and one reverse; chain drive; 86 inch wheelbase; detachable tonneau.

$1,000.

Mitchell Runabout, 14-18 h. p.; four cylinder vertical motor in front, 3½x4; sliding gear transmission; three speeds forward and reverse; bevel gear drive; pressed steel frame; 86 inch wheelbase; 1,450 pounds; seats two.

$1,100.

American Peugeot Touring Car, 50-60 h. p.; four cylinder vertical motor in front, 150x138 mm.; sliding gear transmission; four speeds forward and re verse; chain drive; pressed steel frame; 122 inch wheel base; 2,800 pounds.

$1,100.

Queen Touring Car, 18 h. p.; two cylinder horizontal opposed motor under body, 5x5; planetary transmission; two speeds forward and reverse; chain drive; angle iron frame; 84 inch wheelbase; 1,600 pounds; detachable tonneau; seats five.

$1,250.

Stoddard-Dayton Runabout, 15-18 h. p.; four cylinder vertical motor in front, 3¾x3¾; sliding gear transmission; three speeds forward and reverse; bevel gear drive; pressed steel frame; 84 inch wheelbase; 1,200 pounds; seats two.

$1,250.

Wayne Touring Car, 20 h. p.; two cylinder horizontal opposed motor in front, 5¼x5; planetary transmission; two speeds forward and reverse; chain drive; pressed steel frame; 90 inch wheel base; 1,600 pounds; seats five.

$1,300.

Maxwell Runabout, 16-20 h. p.; two cylinder horizontal motor in front, 5x5; sliding gear transmission; three speeds forward and reverse; bevel gear drive; pressed steel 'frame; 85 inch wheelbase; 1,650 pounds; seats two.

$1,400.

Compound Doctor's Stanhope, 16 h. p.; three compound cylinder motor in front, 4x7x4; sliding gear transmission; double chain drive; three speeds forward and reverse; pressed steel frame; 82 inch wheelbase; 1,400 pounds; seats two.

$1,425.

Premier Doctor's Special, 16 h. p.; four cylinder vertical motor in front, 3¾x4¼; planetary transmission; two speeds forward and reverse; angle steel frame; 90 inch wheel base; 1,450 pounds; seats two.

$1,450.

Maxwell Touring Car, 16-20 h. p.; two cylinder horizontal motor in front, 5x5; sliding gear transmission; three speeds forward and reverse; bevel gear drive; pressed steel frame; 85 inch wheelbase; 1,800 pounds; seats five.

$1,500.

Mitchell Touring Car, 18-20 h. p.; four cylinder vertical motor in front, 4x4½; sliding gear transmission; three speeds forward and reverse; bevel gear drive; pressed steel frame; 90 inch wheelbase; 1,800 pounds; seats four.

$1,500.

Premier Touring Car, 16 h. p.; four cylinder vertical motor in front, 4¾x4¼; planetary transmission; two speeds forward and reverse; double chain drive; angle steel frame; 96 inch wheel base; 1,600 pounds; seats four.

$1,500.

Marion Touring Car, 16 h. p.; four cylinder crosswise motor in front, 4x4; planetary transmission; two speeds forward and reverse; double side chain drive; 96 inch wheelbase; 1,700 pounds; detachable tonneau; seats five.

$1,500.

Duryea Folding Rear Phaeton, 12-15 h. p.; three cylinder vertical motor under seat, 4½x4½; planetary transmission; two speeds forward and reverse; chain drive; armored bent wood frame; 78 inch wheelbase; 1,150 pounds; seats five.

$1,700.

Compound Royal Victoria, 16 h. p.; three compound cylinder motor in front, 4 and 7x4; sliding gear transmission; double chain drive; three speeds forward and reverse; pressed steel frame; 96½ inch wheelbase; 1,750 pounds.

$1,750.

Rambler Touring Car, 20-25 h. p.; four cylinder vertical motor longitudinally under hood, 4x4½; sliding gear transmission; two speeds forward and reverse; bevel gear drive; pressed steel frame; 106 inch wheelbase; 2,200 pounds; seats five.

$1,750.

Moline Touring Car, 18-20 h. p.; four cylinder vertical motor in front, 3¾x4½; sliding gear transmission; three speeds forward and reverse; pressed steel frame; bevel gear drive; 100 inch wheelbase.

$1,800.

Corbin Runabout, 24 h. p.; four cylinder lengthways motor, 4¼x4¼; sliding gear transmission; three speeds forward and reverse; double universal shaft drive; pressed steel frame; 93 inch wheelbase; 1,650 pounds; seats two.

$1,800.

Mitchell Touring Car, 24-30 h. p.; four cylinder vertical motor in front, 4¼x5, sliding gear transmission; three speeds forward and reverse; bevel gear drive. pressed steel frame; 100 inch wheelbase; 2,100 pounds; seats five.

$1,800.

Dolson Touring Car, 28-32 h. p.; four cylinder vertical motor in front, 4¼x4¼, sliding gear transmission; three speeds forward and reverse; double gear drive. pressed steel frame; 108 inch wheelbase. seats five.

$1,800.

Compound Touring Car, 16 h. p.; three compound cylinder motor in front, 4 and 7x4; sliding gear transmission; double chain drive; pressed steel frame; three speeds forward and reverse; 96½ inch wheelbase; 1,700 pounds.

$1,850.

Pungs-Finch Touring Car, 22 h. p.; four cylinder vertical engine in front, 4x4½; sliding gear transmission; three speeds forward and reverse; bevel gear drive.

pressed steel frame; 98 inch wheelbase; 1,900 pounds; seats five.

$2,000.

Corbin Touring Car, 24 h. p.; four cylinder lengthways motor, 4¼x4¼; sliding gear transmission; three speeds forward and reverse; double universal shaft drive; pressed steel frame; 100 inch wheelbase; 1,800 pounds; seats five.

$2,000.

Maxwell Limousine, 16x20 h. p.; two cylinder horizontal motor in front, 5x5; sliding gear transmission; three speeds forward and reverse; bevel gear drive; pressed steel frame; 2,000 pounds; seats five.

$2,000.

Logan Touring Car, 30 h. p.; two cylinder horizontal opposed motor under body, 5½x6; sliding gear transmission; two speeds forward and reverse; chain drive; angle steel frame; 100 inch wheelbase; 2,150 pounds; seats five.

$2,000.

Crawford Touring Car, 24-28 h. p.; four cylinder vertical motor in front, 4½x4½; sliding gear transmission; three speeds forward and reverse; bevel chain drive; pressed steel frame; 100 inch wheelbase; 2,100 pounds; seats five.

$2,000.

Pullman Touring Car, 25 h. p.; four cylinder vertical motor in front, 4½x4½; sliding gear transmission; three speeds forward and reverse; bevel gear drive; angle steel and wood frame; 96 inch wheelbase; 1,975 pounds; seats five.

$2,000.

Queen Touring Car, 26-28 h. p.; four cylinder vertical motor in front, 4¼x4¾; sliding gear transmission; three speeds forward and reverse; bevel gear drive; pressed steel frame; 100 inch wheelbase; 2,000 pounds; seats five.

$2,000.

Duryea Touring Car, 15 h. p.; three cylinder inclined motor under seat, 5x5; planetary transmission; two speeds forward and reverse; chain drive; armored bent wood frame; 96 inch wheelbase; 1,500 pounds; seats five.

$2,000.

Premier Touring Car, 20-24 h. p.; four cylinder vertical motor in front, 4¼x4¼; sliding gear transmission; three speeds forward and reverse; bevel gear drive; 106 inch wheel base; 2,000 pounds; seats five.

$2,100.

St. Louis Touring Car, 32-36 h. p.; four cylinder vertical motor in front, 4½x5; sliding gear transmission; three speeds forward and reverse; bevel gear drive; pressed steel frame; 108 inch wheelbase; 2,200 pounds; seats five.

$2,200.

Pungs-Finch Touring Car, 28x32 h. p.; four cylinder vertical engine in front, 4½ x5; sliding gear transmission; three speeds forward and reverse; bevel gear drive; pressed steel frame; 106 inch wheelbase; 1,950 pounds; seats five.

$2,200.

St. Louis Touring Car, 30-34 h. p.; four cylinder vertical motor in front, 4½x5; sliding gear transmission; three speeds forward and one reverse; bevel gear drive; angle steel frame; 102 inch wheel base; 2,150 pounds; seats five.

$2,250.

Stoddard-Dayton Touring Car, 30-35 h. p.; four cylinder vertical motor in front, 4½x5; sliding gear transmission; three speeds forward and reverse; bevel gear drive; pressed steel frame; 103 inch wheelbase; 2,100 pounds; seats five.

$2,250.

American Napier Runabout, 18-20 h. p.; four cylinder vertical engine in front; sliding gear transmission; three speeds forward and reverse; shaft drive; angle steel frame; 90 inch wheelbase; 1,500 pounds; seats three.

$2,500.

Rambler Touring Car, 35-40 h. p.; four cylinder vertical motor longitudinally under hood, 5x5½; sliding gear transmission; three speeds forward and reverse; double chain drive; pressed steel frame; 112 inch wheelbase; 2,600 pounds; seats five.

$2,500.

Iroquois Touring Car, 25-30 h. p.; four cylinder vertical motor in front, 4½x5; sliding gear transmission; three speeds forward and reverse; steel frame; shaft drive; 100 inch wheelbase; 2,400 pounds; seats five.

$2,500.

Marion Touring Car, 24-28 h. p.; four cylinder vertical motor in front, 4½x4½; sliding gear transmission; three speeds forward and reverse; double side chain drive; pressed steel frame; 108 inch wheelbase; 2,100 pounds; detachable tonneau; seats five.

$2,500.

Marmon Touring Car, 20-24 h. p.; four cylinder vertical motor in front; 4½x4; planetary transmission; two speeds forward and reverse; bevel gear drive without Cardan joints; pressed steel frame; 90 inch wheel base; 2,150 pounds; seats four.

$2,500.

Grout Touring Car, 30-35 h. p.; four cylinder vertical motor in front, 4½x5; sliding gear transmission; three speeds forward and reverse; double chain drive; armored wood frame; 100 inch wheelbase; 2,300 pounds; seats five.

$2,500.

Dorris Touring Car, 30 h. p.; four cylinder vertical motor in front, 4½x5; sliding gear transmission; three speeds forward and reverse; bevel gear drive; pressed steel frame; 101 inch wheelbase; 2,000 pounds; detachable tonneau; seats five.

$2,500.

Dolson Touring Car, 45-50 h. p.; four cylinder vertical motor in front, 5x5; sliding gear transmission; three speeds forward and reverse; bevel gear drive; pressed steel frame; 110 inch wheelbase; seats five.

$2,500.

Pullman Touring Car, 30-35 h. p.; four cylinder vertical motor in front, 4½x5; sliding gear transmission; three speeds forward and reverse; angle steel and wood frame; 96 inch wheelbase; 1,975 pounds; seats six.

$2,500.

Wayne Touring Car, 35 h. p.; four cylinder vertical motor in front, 4¾x5; sliding gear transmission; three speeds forward and reverse; bevel gear drive; pressed steel frame; 102 inch wheel base; 2,000 pounds; seats five.

$2,500.

Ford Touring Car, 40 h. p.; six cylinder vertical motor in front, 4½x4¼; planetary transmission; two speeds forward and reverse; bevel gear drive; pressed steel frame; 114 inch wheelbase; 2,000 pounds; seats five.

$2,500.

Moline Touring Car, 30-35 h. p.; four cylinder vertical motor in front, 4½x5; sliding gear transmission; three speeds forward and reverse; bevel gear drive; pressed steel frame; 110 inch wheelbase; seats five.

$2,500.

Berkshire Touring Car, 20-24 h. p.; four cylinder vertical motor in front, 4x4½; sliding gear transmission; three speeds forward and reverse; double side chain drive; pressed steel frame; 98 inch wheel base; 1,800 pounds; seats five.

$2,750.

Acme Touring Car, 30 h. p.; four cylinder vertical motor in front, 4x5; sliding gear transmission; three speeds forward and reverse; double side chain drive; nickel steel frame; 102 inch wheel base; 2,200 pounds; seats five.

$2,800.

Aerocar Touring Car, 24 h. p.; four cylinder vertical motor; sliding gear transmission; three speeds forward and reverse; bevel gear drive; pressed steel frame; 104 inch wheelbase; 2,000 pounds; seats five.

$2,800.

Cleveland Touring Car, 20 h. p.; four cylinder vertical motor in front, 3¾x4½; sliding gear transmission; four speeds forward and reverse; bevel gear drive; pressed steel frame; 98 inch wheelbase; 2,000 pounds; seats five.

$3,000.

Moon Motor Car Co., 30-35 h. p.; four cylinder vertical motor in front, 4½x5; sliding gear transmission; three speeds forward and reverse; bevel gear drive; pressed steel frame; 106 inch wheelbase; 2,400 pounds; seats five.

$3,000.

National Runabout, 35-40 h. p.; four cylinder vertical motor in front, 4½x5; sliding gear transmission; three speeds forward and reverse; bevel gear drive; pressed steel frame; 104 inch wheelbase; 2,500 pounds; seats five.

$3,000.

Marmon Touring Car, 26-30 h. p.; four cylinder vertical motor in front; 4⅝x4½;

planetary transmission; two speeds forward and reverse; bevel gear drive; without Cardan joints; pressed steel frame; 90 inch wheelbase; 2,300 pounds; seats five.

$3,000.

Frayer-Miller Touring Car, 24 h. p.; four cylinder motor in front, 4 1-16x5⅛; sliding gear transmission; four speeds forward and reverse; bevel gear drive; pressed steel frame; 100 inch wheelbase; 2,000 pounds; seats five.

$3,000.

Rambler Limousine, 35-40 h. p.; four cylinder vertical motor longitudinally under hood, 5x5½; sliding gear transmission; three speeds forward and reverse; double chain drive; pressed steel frame; 112 inch wheelbase; 2,900 pounds; seats five.

$3,000.

Berkshire Touring Car, 30-35 h. p.; four cylinder vertical motor in front, 4⅞x5½; sliding gear transmission; three speeds forward and reverse; double side chain drive; pressed steel frame; 115 inch wheel base; 2,300 pounds; seats five.

$3,250.

Stoddard-Dayton Limousine, 30-35 h. p.; four cylinder vertical motor in front; 4½x5; sliding gear transmission; three speeds forward and reverse; bevel gear drive; pressed steel frame; 103 inch wheelbase; 2,300 pounds; seats five.

$3,500.

Finch "Limited" Touring Car, 50-60 h. p.; six cylinder vertical motor in front, 4½x5; sliding gear transmission; three speeds forward and reverse; bevel gear drive; pressed steel frame; 112 inch wheelbase; 2,600 pounds; seats seven.

$3,500.

Rainier Touring Car, 22-28 h. p.; four cylinder engine in front, 4x4½; sliding gear transmission; three speeds forward and reverse; bevel gear drive; pressed steel frame; 98 inch wheelbase; 2,000 pounds; seats five.

$3,500.

Cleveland Touring Car, 30-35 h. p.; four cylinder vertical motor in front, 4½x5; sliding gear transmission; three speeds forward and reverse; bevel gear drive; steel frame; 104 inch wheelbase; 2,400 pounds; seats five.

$3,500.

Ardsley Touring Car, 35-40 h. p.; four cylinder vertical motor in front, 4⅝x5⅞; sliding gear transmission; three speeds forward and reverse; bevel gear drive; pressed steel frame; 100 inch wheel base; 2,250 pounds; seats five.

$3,500.

Acme Touring Car, 40 h. p.; four cylinder vertical motor in front, 4½x5; sliding gear transmission; four speeds forward and reverse; double side chain drive; nickel steel frame; 114 inch wheel base; 2,600 pounds; seats seven.

$3,500.

Wayne Touring Car, 50 h. p.; four cylinder vertical motor in front, 5½x5; sliding transmission; three speeds forward and reverse; bevel gear drive; pressed steel frame; 114 inch wheel base; 2,800 pounds; seats seven.

$4,000.

Rainier Touring Car, 30-35 h. p.; four cylinder engine, 4¼x5¼; sliding gear transmission; three speeds forward and one reverse; bevel gear drive; pressed steel frame; 104 inch wheelbase; 2,400 pounds; seats seven.

$4,000.

Frayer-Miller Touring Car, 36 h. p.; six cylinder motor, 4 1-16x5⅛; sliding gear transmission; four speeds forward and reverse; bevel gear drive; pressed steel frame; 120 inch wheelbase; 2,500 pounds; seats five.

$4,000.

National Touring Car, 50-60 h. p.; six cylinder vertical motor in front; 4½x5; sliding gear transmission; three speeds forward and reverse; bevel gear drive; pressed steel frame; 121 inch wheelbase; 3,000 pounds; seats seven.

$4,000.

Welch Touring Car, four cylinder vertical motor in front, 4⅝x5; individual clutch transmission; two speeds forward and reverse; bevel gear drive; pressed steel frame; 117 inch wheelbase; 3,000 pounds; seats five.

$4,250.

Welch Touring Car; four cylinder vertical motor in front, 4⅝x5; individual clutch transmission; two speeds forward and reverse; bevel gear drive; pressed steel frame; 117 inch wheelbase; 3,250 pounds; seats seven.

$4,500.

Berkshire Touring Car, 45-50 h. p.; six cylinder vertical motor in front, 4⅞x5½; sliding gear transmission; three speeds forward and reverse; double side chain drive; pressed steel frame; 130 inch wheel base; 3,000 pounds; seats seven.

$4,500.

Lozier Touring Car, 35 h. p.; four cylinder vertical motor in front, 4½x5½; sliding gear transmission; three speeds forward and reverse; double side chain drive; pressed steel frame; 117 inch wheel base; seats five.

$5,000.

Frayer-Miller Limousine Car, 36 h. p.; six cylinder motor in front, 4 1-16x5⅛; sliding gear transmission; four speeds forward and reverse; bevel gear drive; pressed steel frame; 120 inch wheelbase; 3,000 pounds; seats five.

$5,000.

Welch Limousine; four cylinder vertical motor in front, 4⅝x5; individual clutch transmission; two speeds forward and reverse; pressed steel frame; 117 inch wheelbase; 3,600 pounds; seats seven.

$5,100.

Delaunay-Belleville Touring Car, 20 h. p.; four cylinder vertical motor in front, 3¾x5; sliding gear transmission; four speeds forward and reverse; chain drive; steel frame; 116 inch wheelbase.

$5,500.

C. G. V. Touring Car, 20-25 h. p.; four cylinder vertical motor in front; sliding gear transmission; four speeds forward and reverse.

$5,500.

De Leon Touring Car, 35 h. p.; four cylinder vertical motor in front, 4⅛x5½; sliding gear transmission; four speeds forward and reverse; double chain drive; pressed nickel steel frame; 118 inch wheelbase; 2,450 pounds; seats seven.

$5,500.

Lozier Touring Car, 40 h. p.; four cylinder vertical motor in front, 4⅝x5½; sliding gear transmission; four speeds forward and reverse; double side chain drive; pressed steel frame; 117 inch wheel base; seats seven.

$6,000.

Delaunay-Belleville Touring Car, 24 h. p.; four cylinder vertical motor in front, 4x5; sliding gear transmission; four speeds forward and reverse; chain drive; pressed steel frame; 119 inch wheelbase.

$6,000.

Richard-Brasier Touring Car, 15-25 h. p.; four cylinder vertical motor in front, 90x120 mm.; sliding gear transmission; three speeds forward and reverse; bevel gear drive.

$6,000.

National Limousine, 50-60 h. p.; six cylinder vertical motor in front, 4½x5; sliding gear transmission; three speeds forward and reverse; bevel gear drive; pressed steel frame; 121 inch wheelbase; 3,100 pounds; seats seven.

$6,500.

Aster Limousine, 40 h. p.; four cylinder vertical motor in front, 4⅛x5½; sliding gear transmission; four speeds forward and reverse; chain drive; pressed steel frame; 117 inch wheelbase; 2,900 pounds; detachable limousine; seats five.

$6,500.

American Napier Touring Car, 45 h. p.; four cylinder vertical engine in front, 5x5; sliding gear transmission; three speeds forward and reverse; shaft drive; pressed nickel steel frame; 119 inch wheelbase; 2,800 pounds; seats five.

$6,500.

Hotchkiss Touring Car, 35 h. p.; four cylinder vertical motor in front, 4½x4¾; sliding gear transmission; four speeds forward and reverse; bevel gear drive, pressed nickel steel frame; 120 inch wheelbase; 2,300 pounds; seats seven.

$6,500.

American Peugeot Touring Car, 18-24 h. p.; four cylinder vertical motor in front, 105x106 mm.; sliding gear transmission; four speeds forward and reverse; chain drive; pressed steel frame; 120 inch wheel base; 2,400 pounds.

$6,800.

Mors Landaulet, 14-20 h. p.; four cylinder vertical motor in front; sliding gear transmission; four speeds forward and reverse; chain drive; pressed steel frame.

110 inch wheelbase; 2,700 pounds; seats seven.

$7,000.

C. G. V. Touring Car, 30-35 h. p.; four cylinder vertical motor in front; sliding gear transmission; four speeds forward and reverse; 2,100 pounds.

$7,500.

Martini Touring Car, 20-24 h. p.; four cylinder vertical motor in front, 100x130 mm.; sliding gear transmission; four speeds forward and reverse; chain drive; pressed steel frame; 110 inch wheelbase; 2,200 pounds; seats five.

$7,500.

American Mercedes Touring Car, 45 h. p.; four cylinder vertical motor in front, 120x150 mm.; sliding gear transmission; four speeds forward and reverse; double side chain drive; pressed steel frame; 127 inch wheelbase; 2,600 pounds; seats seven.

$7,800.

Richard-Brasier Touring Car, 25-36 h. p.; four cylinder vertical motor in front; 112x130 mm.; sliding gear transmission; chain drive.

$7,800.

Delaunay-Belleville Touring Car, 40 h. p.; four cylinder vertical motor in front, 5x5½; sliding gear transmission; four speeds forward and reverse; chain drive; pressed steel frame; 122 inch wheelbase.

$8,000.

American Napier Touring Car, 60 h. p.; six cylinder vertical motor in front, 5x5; sliding gear transmission; three speeds forward and reverse; shaft drive; pressed nickel steel frame; 119 inch wheelbase; 2,900 pounds; seats seven.

$8,500.

C. G. V. Touring Car, 50 h. p.; four cylinder vertical motor in front; sliding gear transmission; four speeds forward and reverse; 2,300 pounds.

$9,000.

Mors Limousine, 24-32 h. p.; four cylinder vertical motor in front; sliding gear transmission; four speeds forward and reverse; chain drive; pressed steel frame; 116 inch wheelbase; 3,000 pounds; seats six.

$9,000.

American Peugeot Touring Car, 30-40 h. p.; four cylinder vertical motor in front, 130x120 mm.; sliding gear transmission; four speeds forward and reverse; chain drive; pressed steel frame; 120 inch wheel base; 2,600 pounds.

$9,500.

Martini Touring Car, 30-40 h. p.; four cylinder vertical motor in front, 125x140 mm.; sliding gear transmission; four speeds forward and reverse; chain drive; pressed steel frame; 116 inch wheelbase; 2,700 pounds; seats seven.

$10,000.

C. G. V. Touring Car, 75 h. p.; four cylinder vertical motor in front; sliding gear transmission; four speeds forward and reverse; chain drive; nickel steel and pressed wood frame; 2,500 pounds.

$10,500.

Mors Touring Car, 40-52 h. p.; four cylinder vertical motor in front; sliding gear transmission; four speeds forward and reverse; chain drive; pressed steel frame; 108 inch wheelbase; 2,800 pounds; seats six.

$10,900.

Richard-Brasier Touring Car, 50-60 h. p.; four cylinder vertical motor in front, 130x140 mm.; sliding gear transmission; four speeds forward and reverse; chain drive.

STEAM CARS.

$2,250.

The Lane Steam Touring Car, 15 h. p.; two cylinder engine under front footboard, 3¼ and 5¼x3½; throttle speed adjuster; chain drive; steel frame; 97 inch wheelbase; 2,300 pounds; seats five.

$2,800

White Steam Touring Car, 15 h. p.; compound motor in front; tubular semi-float boiler; two speed gear; bevel gear drive; seats five.

$5,000.

Johnson Service Company Limousine Steam Car, 30 h. p.; four cylinder vertical engine in front, 4¾x4; throttle speed control; bevel gear drive; pressed steel frame; 112 inch wheelbase; 3,250 pounds; seats eight.

COMMERCIAL VEHICLES.

$1,400.

Maxwell Delivery Wagon, 16-20 h. p.; two cylinder horizontal opposed motor in front, 5x5; sliding gear transmission; three speeds forward and reverse; bevel gear drive; pressed steel frame; 85 inch wheelbase; weight, 1,700 pounds; capacity, 1,000 pounds.

$1,400.

Rapid Small Delivery Wagon, 18-22 h. p.; two cylinder horizontal opposed motor under body, 5x5; planetary transmission; two speeds forward and reverse; double chain drive; angular steel frame; 86 inch wheelbase; weight, 2,200 pounds; capacity, 2,000 pounds.

$1,800.

Rapid Large Delivery Wagon, 18-22 h. p.; two cylinder horizontal opposed motor under body, 5x5; planetary transmission; two speeds forward and reverse; double side chain drive; angular steel frame; 90 inch wheelbase; weight, 2,450 pounds; capacity, 3,000 pounds.

$2,000.

Logan Truck, 30 h. p.; two cylinder horizontal opposed motor under body, 5½x6; sliding gear transmission; two speeds forward and reverse; double side chain drive; angle steel frame; 100 inch wheelbase; weight, 2,500 pounds; capacity, 2 tons.

$2,200.

Rapid Sight-Seeing Vehicle, 18-22 h. p.; two cylinder horizontal opposed motor under body, 5x5; planetary transmission; two speeds forward and reverse; double side chain drive; angular steel frame; 111 inch wheelbase; weight, 2,800 pounds; capacity, 20 passengers.

$3,000.

Auto-Car Equipment Company's Hotel Electric Omnibus, 15 h. p.; two Westinghouse motors; 44 cells Exide batteries; direct drive to rear wheels; double chain; armored wood frame; 95 inch wheelbase; weight, 5,500 pounds; capacity, 16 passengers.

$3,000.

Commercial Motor Car Company's Truck, 30 h. p.; four cylinder horizontal opposed motor under footboard, 4¾x5; internally engaged gear transmission; three speeds forwards and reverse; chain drive; channel iron frame; 108 inch wheelbase; weight, 4,000 pounds; capacity, 3 tons.

$3,200.

Knox Motor Truck Company Express Wagon, 24 h. p.; two cylinder horizontal opposed motor on subframe under body, 6x7; sliding spur gear transmission; three speeds forward and reverse; spur gear drive; channel steel frame; 114 inch wheelbase; weight, 6,000 pounds.

$3,500.

Auto-Car Equipment Company Passenger Wagonette, 34 h. p.; four cylinder vertical motor in front, 4½x5; sliding gear transmission; three speeds forward and reverse; double chain drive; angle iron frame; 120 inch wheelbase; weight, 3,500 pounds; capacity, 16 persons.

$5,000.

The Iroquois Stage, 16 h. p.; four cylinder vertical motor in front, 6x6; sliding gear transmission; three speeds forward and reverse; double chain drive; 64 inch wheelbase; weight, 7,500 pounds; capacity, 17 passengers.

Madison Square Garden Show.

GASOLINE CARS.

$400.

Waltham Runabout, 4 h. p.; one cylinder vertical motor in rear, 3¼x4¼; friction transmission; double chain drive; hickory frame; 80 inch wheelbase; 525 pounds; seats two.

$650.

Northern Runabout, 7 h. p.; one cylinder horizontal under body, 4¾x6; planetary transmission; two speeds forward and reverse; chain drive; angle steel frame; 70 inch wheelbase; 1,000 pounds; seats two.

$650.

Oldsmobile Runabout, 7 h. p.; one cylinder horizontal motor in front, 5x6; planetary transmission; two speeds forward and reverse; chain drive; pressed steel frame; 66 inch wheelbase; 1,200 pounds; seats two.

$900.

Pierce Great Arrow Stanhope; one cylinder motor, 3 15-16x4 5-16; planetary transmission; two speeds forward and reverse; tubular steel frame; 70 inch wheelbase; 1,250 pounds; seats two.

$1,000.

Autocar Runabout, 12 h. p.; two cylinder horizontal opposed motor in front, 4x4; sliding gear transmission; three speeds

forward and reverse; bevel gear drive; 76 inch wheelbase; 1,300 pounds; seats two.

$1,000.

Buick Runabout, 22 h. p.; two cylinder horizontal opposed motor under body, 4½x5; planetary transmission; two speeds forward and reverse; chain drive; angle steel frame; 87 inch wheelbase; 1,400 lbs.

$900.

Pope-Tribune Touring Car, 12 h. p.; two cylinder vertical motor in front; sliding gear transmission; three speeds forward and reverse; bevel gear drive; angle steel frame; 85 inch wheel base; 1,500 pounds; seats four.

$1,250.

Buick Touring Car, 22 h. p.; two cylinder horizontal opposed under body; 4½x5; planetary transmission; two speeds forward and reverse; chain drive, angle steel frame; 87 inch wheel base; 1,800 pounds.

$1,250.

Stevens-Duryea Combination, 7 h. p.; two cylinder horizontal opposed motor; individual clutch transmission; three speeds forward and reverse; chain drive; 69 inch wheel base; 1,350 pounds; seats four.

$1,250.

Oldsmobile Two Cycle Touring Car, 20-24 h. p.; two cylinder, vertical engine in front; 5x5; sliding gear transmission; three speeds forward and reverse; bevel gear drive; pressed steel frame; 102 inch wheel base; 2,000 pounds; seats four.

$1,400.

Franklin Stanhope, 12 h. p.; four cylinder vertical motor in front; planetary transmission; two speeds forward and reverse; chain drive; wooden frame; 81 inch wheel base; 1,100 pounds; seats two.

$1,400.

Knox Runabout, 14-16 h. p.; two cylinder opposed motor under body, 5x6; planetary transmission; two speeds forward and reverse; single chain drive; angle iron frame; 81 inch wheel base; 1,600 pounds; seats two.

$1,600.

Pope-Hartford Touring Car, 18 h. p.; two cylinder horizontal opposed motor in front; sliding gear transmission; three speeds forward and reverse; bevel gear drive; armored oak frame; 88 inch wheel base; 2,000 pounds; seats five.

$1,600.

Waltham Runabout, 16 h. p.; four cylinder vertical motor in front, 3¼x4 1-3; sliding gear transmission; three speeds forward and reverse; bevel gear drive; pressed steel frame; 82 inch wheel base; 1,300 pounds; seats two.

$1,750.

Columbia Touring Car, 18 h. p.; two cylinder horizontal opposed motor in front, 5x4½; sliding gear transmission; three speeds forward and reverse; bevel gear drive; pressed steel frame; 90 inch wheel base; 1,800 pounds; seats five.

$1,800.

Autocar Touring Car, 16-20 h. p.; four nder vertical motor in front, 3½x4; ling gear transmission; three speeds forward and reverse; bevel gear drive; armored wood and steel frame; 96 inch wheel base; 1,900 pounds; seats four.

$1,800.

Franklin Touring Car, 12 h. p.; four cylinder vertical motor in front; sliding gear transmission; three speeds forward and reverse; bevel gear drive; wood sill frame; 88 inch wheel base; 1,300 pounds; seats five.

$1,800.

Northern Touring Car, 20 h. p.; two cylinder horizontal opposed motor under hood, 5½x5¼; planetary transmission; two speeds forward and reverse; bevel gear drive; angle steel frame; 106 inch wheel base; 2,000 pounds; seats five.

$1,900.

Knox Touring Car, 14-16 h. p.; two cylinder horizontal opposed motor under body, 5x6; planetary transmission; two speeds forward and reverse; single chain drive; angle iron frame; 87 inch wheel base; 1,950 pounds; seats four.

$2,000.

Waltham Touring Car, 20 h. p.; four cylinder vertical motor in front, 4x4¼; sliding gear transmission; three speeds forward and reverse; bevel gear drive; pressed steel frame; 96 inch wheel base; 1,800 pounds; seats five.

$2,250.

Oldsmobile Touring Car, 26-28 h. p.; four cylinder vertical motor in front, 4¼x4¾; sliding gear transmission; three speeds forward and reverse; bevel gear drive; pressed steel frame; 106 inch wheel base; 2,300 pounds; seats five.

$2,250.

Haynes Touring Car, 30 h. p.; four cylinder vertical motor in front, 4¼x5; sliding gear transmission; three speeds forward and reverse; bevel gear drive; pressed steel frame; 97 inch wheel base; 2,250 pounds; seats five.

$2,250.

Waltham Touring Car, 20 h. p.; four cylinder vertical motor in front, 4x4¼; sliding gear transmission; three speeds forward and reverse; bevel gear drive; pressed steel frame; 96 inch wheel base; 1,850 pounds; seats five.

$2,500.

Winton Touring Car, 30 h. p.; four cylinder vertical motor in front, 4¾x5; individual clutch transmission; two speeds forward and reverse; bevel gear drive; channel section pressed steel frame; 102 inch wheel base; seats five.

$2,500.

Cadillac Touring Car, 30 h. p.; four cylinder vertical motor in front; 4⅜x5; planetary transmission; three speeds forward and reverse; bevel gear drive; pressed steel frame; 98 inch wheel base; 2,400 pounds; seats five.

$2,500.

Buick Touring Car, 30-35 h. p.; four cylinder vertical motor in front, 4¼x4½; sliding gear transmission; three speeds forward and reverse; bevel gear drive; rolled pressed steel frame; 100 inch wheel base; 2,000 pounds; seats five.

$2,500.

Pope-Hartford Touring Car, 20-25 h. p.; four cylinder vertical motor in front; sliding gear transmission; three speeds forward and reverse; bevel gear drive; armored oak frame; 98 inch wheel base; 2,250 pounds; seats five.

$2,500.

Stevens-Duryea Touring Car, 20 h. p.; four cylinder vertical motor in front; sliding gear transmission; three speeds forward and reverse; bevel gear drive; pressed steel frame; 90 inch wheel base; 1,700 pounds; seats five.

$2,500.

Cadillac Touring Car, 30 h. p.; four cylinder vertical motor in front, 4⅜x5; planetary transmission; three speeds forward and reverse; bevel gear drive; 100 inch wheel base; 2,400 pounds; seats five.

$2,500.

Reo Touring Car, 24 h. p.; four cylinder vertical motor in front, 4½x4¾; sliding gear transmission; three speeds forward and reverse; bevel gear drive; pressed steel frame; 100 inch wheel base; 2,000 pounds; seats five.

$2,600.

Autocar Touring Car, 24 h. p.; four cylinder vertical motor in front, 4x4½; sliding gear transmission; three speeds forward and reverse; bevel gear drive; armored wood and steel frame; 100 inch wheel base; 2,475 pounds; seats five.

$2,800.

Franklin Touring Car, 12 h. p.; four cylinder vertical motor in front; sliding gear transmission; three speeds forward and reverse; bevel gear drive; 100 inch wheel base; wood sill frame; 1,800 pounds; seats five.

$3,000.

Columbia Touring Car, 24-28 h. p.; four cylinder vertical motor in front, 4x4½; sliding gear transmission; three speeds forward and reverse; bevel gear drive; pressed steel frame; 98 inch wheel base; 2,100 pounds; seats five.

$3,000.

Locomobile Touring Car, 15-20 h. p.; four cylinder vertical motor in front, 3¾x4½; sliding gear transmission; three speeds forward and reverse; double side chain drive; pressed steel frame; 93 inch wheel base; 2,000 pounds; seats five.

$3,000.

Northern Touring Car, 30 h. p.; four cylinder vertical motor in front, 4½x5; sliding gear transmission; three speeds forward and reverse; bevel gear drive; angle steel frame; 112 inch wheel base; 2,250 pounds; seats five.

$3,300.

Stevens-Duryea Limousine, 20 h. p.; four cylinder vertical motor in front; sliding gear transmission; three speeds forward and reverse; bevel gear drive; seats four.

$3,500.

Haynes Touring Car, 50 h. p.; four cylinder vertical motor in front, 5⅛x6; sliding gear transmission; three speeds forward and reverse; bevel gear drive;

pressed steel frame; 108 inch wheel base; 2,750 pounds; seats seven.

$3,500.

Royal Touring Car, 40 h. p.; four cylinder vertical motor in front, 5x5½; sliding gear transmission; three speeds forward and reverse; bevel gear drive; pressed steel frame; 110 inch wheel base; 2,700 pounds; seats five.

$3,500.

Thomas Touring Car, 50 h. p.; four cylinder vertical motor in front, 5½x5½; sliding gear transmission; four speeds forward and reverse; chain drive; pressed steel frame; 117 inch wheel base; 3,100 pounds; seats seven.

$3,700.

Decauville Touring Car, 12-16 h. p.; four cylinder vertical motor in front, 90x105 mm.; sliding gear transmission; three speeds forward and reverse; bevel gear drive; pressed steel frame; 96 inch wheel base; body extra.

$3,750.

Cadillac Touring Car, 40 h. p.; four cylinder vertical motor in front, 5x5; planetary transmission; three speeds forward and reverse; bevel gear drive; pressed steel frame; 110 inch wheel base; 3,000 pounds; seats five.

$3,750.

Peerless Touring Car, 30 h. p.; four cylinder vertical motor in front; 4½x5; sliding gear transmission; four speeds forward and reverse; bevel gear drive; pressed steel frame; 107 inch wheel base; 2,600 pounds; seats five.

$3,750.

Cadillac Touring Car, 40 h. p.; four cylinder vertical motor in front, 5x5; planetary transmission; three speeds forward and reverse; bevel gear drive; 110 inch wheel base; 3,000 pounds; seats five; body extra.

$4,000.

Pierce Great Arrow Touring Car, 28-32 h. p.; four cylinder vertical engine in front, 4¼x4¾; sliding gear transmission; three speeds forward and reverse; bevel gear drive; pressed steel frame; 107 inch wheel base; 2,700 pounds.

$4,000.

Packard Touring Car, 24 h. p.; four cylinder vertical motor in front, 4½x5½; sliding gear transmission; three speeds forward and reverse; bevel gear drive; pressed steel frame; 119 inch wheel base; 2,800 pounds; seats five.

$4,000.

Knox Touring Car, 35-40 h. p.; four cylinder vertical motor in front, 4¾x5½; sliding gear transmission; four speeds forward and reverse; bevel gear to two side chains drive; pressed steel frame; 112 inch wheel base; seats seven. With limousine body, $5,000; seats six.

$4,000.

Franklin Touring Car, 30 h. p.; six cylinder vertical motor in front; sliding gear transmission; three speeds forward and reverse; bevel gear drive; wooden frame; 119 inch wheel base; 2,400 pounds; seats five.

$4,000.

Thomas Semi-Limousine, 50 h. p.; four cylinder vertical motor in front, 5½x5½; sliding gear transmission; four speeds forward and reverse; chain drives; pressed steel frame; 117 inch wheel base; 3,300 pounds; seats seven.

$4,000.

Walter Side Entrance Phaeton, 40 h. p.; four cylinder vertical motor in front, 5x5½; double sliding gear transmission; three speeds forward and reverse; bevel gear drive; pressed steel frame; 3,000 pounds; seats seven.

$4,250.

Stearns Touring Car, 40-45 h. p.; four cylinder vertical motor in front; sliding gear transmission; four speeds forward and reverse; side chain drive; pressed steel frame; 118 inch wheel base; 3,000 pounds; seats five.

$4,400.

Decauville Touring Car, 16-20 h. p.; four cylinder vertical motor in front, 98x105 mm.; sliding gear transmission; three speeds forward and reverse; bevel gear drive; pressed steel frame; 106 inch wheel base; body extra.

$4,500.

Thomas Limousine, 50 h. p.; four cylinder motor in front, 5½x5½; sliding gear transmission; four speeds forward and reverse; chain drive; pressed steel frame; 117 inch wheel base; 3,400 pounds; seats seven.

$4,500.

Apperson Touring Car, 40-45 h. p.; four cylinder vertical motor in front, 5x5; sliding gear transmission; four speeds forward and reverse; double chain drive; pressed steel frame; 114 inch wheel base; 2,800 pounds; seats seven.

$4,500.

Columbia Touring Car, 40-45 h. p.; four cylinder vertical motor in front, 5x5; sliding gear transmission; four speeds forward and reverse; double chain drive; pressed steel frame; 108 inch wheel base; 3,000 pounds; seats five.

$4,600.

Thomas Landaulet, 50 h. p.; four cylinder vertical motor in front, 5½x5½; sliding gear transmission; four speeds forward and reverse; chain drive; pressed steel frame; 117 inch wheel base; 3,300 pounds; seats seven.

$4,700.

Walter Limousine, 40 h. p.; four cylinder vertical motor in front, 5x5½; double sliding gear transmission; three speeds forward and reverse; bevel gear drive; pressed steel frame; 3,500 pounds; seats seven.

$5,000.

Walter Touring Car, 50 h. p.; four cylinder vertical motor in front, 5½x6; double sliding gear transmission; three speeds forward and reverse; bevel gear drive; pressed steel frame; 2,800 pounds.

$5,000.

Royal Limousine, 40 h. p.; four cylinder vertical motor in front, 5x5½; sliding gear transmission; three speeds forward and reverse; bevel gear drive; pressed steel frame; 110 inch wheel base; 2,900 pounds; seats seven.

$5,000.

Royal Landaulet, 40 h. p.; four cylinder vertical motor in front, 5x5½; sliding gear transmission; three speeds forward and reverse; bevel gear drive; pressed steel frame; 110 inch wheel base; 2,900 pounds; seats seven.

$5,000.

Locomobile Touring Car, 30-35 h. p.; four cylinder vertical motor in front, 4½x5½; sliding gear transmission; three speeds forward and reverse; double side chain drive; pressed steel frame; 106 inch wheel base; 2,900 pounds; seats seven.

$5,000.

Smith & Mabley's Simplex Touring Car, 30 h. p.; four cylinder vertical motor in front; sliding gear transmission; four speeds forward and reverse; double chain drive; pressed steel frame; 112 inch wheel base; 2,100 pounds; body extra.

$5,000.

Pierce Great Arrow Victoria, 40-45 h. p.; four cylinder vertical engine in front; sliding gear transmission; three speeds forward and reverse; bevel gear drive; pressed steel frame; 109 inch wheel base; 3,100 pounds.

$5,000.

Peerless Touring Car, 45 h. p.; four cylinder vertical motor in front, 5¼x5¾; sliding gear transmission; four speeds forward and reverse; bevel gear drive; pressed steel frame; 113 inch wheel base; 2,900 pounds; seats five.

$5,400.

Renault Touring Car, 20-30 h. p.; four cylinder vertical motor in front; sliding gear transmission; double chain drive; pressed steel frame; body extra.

$5,750.

Clement-Bayard Touring Car, 24 h. p.; four cylinder vertical motor in front; sliding gear transmission; four speeds forward and reverse; bevel gear drive; pressed steel frame; 110 inch wheel base; body extra; seats five.

$5,850.

Decauville Touring Car, 24-28 h. p.; four cylinder vertical motor in front, 115x115 mm.; sliding gear transmission; three speeds forward and reverse; bevel gear drive; steel frame; 110 inch wheel base; body extra.

$5,900.

Leon Bollee Touring Car, 25 h. p.; four cylinder vertical motor in front; sliding gear transmission; five speeds forward and reverse; double side chain drive; 120 inch wheel base; 2,400 pounds; body extra.

$6,000.

Darracq Double Phaeton, 20-32 h. p.; four cylinder vertical motor in front; 112x120 mm.; sliding gear transmission;

three speeds forward and reverse; bevel gear drive; pressed steel frame; 120 inch wheel base; 2,300 pounds; seats five.

$6,000.

Matheson Touring Car, 40-45 h. p.; four cylinder vertical motor in front, 5x6; sliding gear transmission; three speeds forward and reverse; two chain drive; pressed nickel steel frame; 112 inch wheel base; 2,960 pounds; seats seven.

$6,750.

Decauville Touring Car, 30-35 h. p.; four cylinder vertical motor in front, 128x130 mm.; sliding gear transmission; four speeds forward and reverse; side chain drive; 125 inch wheel base; body extra.

$7,000.

Fiat Touring Car, 20 h. p.; four cylinder vertical motor in front, 105x130 mm.; sliding gear transmission; four speeds forward and reverse; bevel gear drive; pressed steel frame; 129 inch wheel base; 2,300 pounds; seats five.

$7,250.

Clement-Bayard Touring Car, 30 h. p.; four cylinder vertical motor in front; sliding gear transmission; four speeds forward and reverse; chain drive; pressed steel frame; 110 inch wheel base; seats five.

$7,500.

Matheson Touring Car, 60-65 h. p.; four cylinder vertical motor in front, 6x6; sliding gear transmission; three speeds forward and reverse; two chain drive; pressed nickel steel frame; 118 inch wheel base; 3,160 pounds; seats seven.

$7,500.

Rochet-Schneider, 18-22 h. p.; four cylinder vertical motor in front, 100x140 mm.; sliding gear transmission; three speeds forward and reverse; Cardan drive; pressed steel frame; 110 inch wheel base; 1,800 pounds; seats seven.

$7,800.

Panhard Touring Car, 35 h. p.; four cylinder vertical motor in front; sliding gear transmission; double chain drive; four speeds forward and reverse; armored wood and steel reinforced frame; body extra.

$8,000.

Darracq Double Phaeton, 40-60 h. p.; four cylinder vertical motor in front, 130x130 mm.; sliding gear transmission; three speeds forward and reverse; bevel gear drive; pressed steel frame; 125 inch wheel base; 2,650 pounds; seats five.

$8,000.

English Daimler Touring Car, 28-36 h. p.; four cylinder vertical motor in front, 110x150 mm.; sliding gear transmission; four speeds forward and reverse; double chain drive; pressed steel frame; 104 inch wheel base; 2,550 pounds, seats five.

$8,400.

Mercedes Touring Car, 35 h. p.; four cylinder vertical motor in front; sliding gear transmission; four speeds forward and reverse; double chain drive; pressed steel frame; 133 inch wheel base; 2,300 pounds; body extra.

$8,750.

Clement-Bayard Touring Car, 45 h. p.; four cylinder vertical motor in front; sliding gear transmission; four speeds forward and reverse; chain drive; 120 inch wheel base; seats seven.

$8,800.

Leon Bollee Touring Car, 45 h. p.; four cylinder vertical motor in front; sliding gear transmission; five speeds forward and reverse; double side chain drives; 120 inch wheel base; 9,200 pounds; body extra.

$9,000.

Rochet-Schneider Touring Car, 30-35 h. p.; four cylinder vertical motor in front, 120x120 mm.; four speeds forward and reverse; chain drive; pressed steel frame; 116 inch wheel base; 2,200 pounds; seats seven.

$9,000.

Fiat Touring Car, 35 h. p.; four cylinder vertical motor in front, 125x150 mm.; sliding gear transmission; four speeds forward and reverse; double chain drive; pressed steel frame; 131 inch wheel base; 2,570 pounds; seats seven.

$11,000.

Rochet-Schneider Touring Car, 40-50 h. p.; four cylinder vertical motor in front, 140x140 mm.; sliding gear transmission; four speeds forward and reverse; chain drives; pressed steel frame; 121 inch wheel base; 2,400 pounds; seats seven.

$12,000.

Fiat Touring Car, 50 h. p.; four cylinder vertical motor in front, 145x160 mm.; sliding gear transmission; four speeds forward and reverse; double chain drive; pressed steel frame; 134 inch wheelbase; 2,966 pounds; seats nine.

ELECTRIC PLEASURE VEHICLES.

$900.

Electric Vehicle Company's Runabout; motor on rear axle; twenty cell Exide battery.

$1,350.

Electric Vehicle Company's Phaeton; motor on rear wheel; twenty-four cells; seats two.

$3,200.

Cantano Electric Tractor Company Extension Straight Brougham; two motors; forty-four cell Exide battery; four speeds forward and reverse; 3,000 pounds; seats four.

$3,500.

Vehicle Equipment Company's Victoria; double motor on rear axle; four speeds forward and two reverse; gear drive; 93¾ inch wheel base; seats three.

$3,600.

Vehicle Equipment Co.'s Brougham; double motor on rear axle; four speeds forward and two reverse; gear drive; 64½ inch wheel base; seats four.

$3,700.

Vehicle Equipment Company's Landaulet; double motor on rear axle; four speeds forward and two reverse; gear drive; 84½ inch wheel base; seats four.

$4,000.

Electric Vehicle Company's Brougham; double motor on rear axle; five speeds forward and three reverse; gear drive; 86 inch wheel base; seats four.

$5,000.

Gallia Brougham; eight speeds forward and reverse; gear drive; 4,000 pounds; seats four.

COMMERCIAL VEHICLES.

$2,100.

Oldsmobile Delivery Wagon, 16 h. p.; two cylinder vertical motor under seat, 5x5; planetary transmission; two speeds forward and reverse; pressed steel frame; 83 inch wheel base; weight, 3,000 pounds; capacity, 2,000 pounds.

$2,100 to $5,000.

Vehicle Equipment Company Delivery Wagons and Trucks, varying in size and capacity.

$2,250 to $4,000.

Electric Vehicle Company Delivery Wagons and Trucks, varying in size and capacity.

$2,300.

Oldsmobile Passenger Vehicle, 16 h. p.; two cylinder vertical motor under seat, 5x5; planetary transmission; two speeds forward and reverse; pressed steel frame; 83 inch wheel base; weight 3,000 pounds; carries twelve passengers.

American Automobiles in France.

United States Consul Goldschmid, of Nantes, is of the opinion that "in a country like France there is an excellent field for the sale of American built automobiles, particularly of the smaller variety, such as 'runabouts' or small 'tonneaus.' The reason for this is that the French manufacturer does not produce machines that will compare with American machines in their general handiness, price, lightness and elegance. I say elegance advisedly, although some idea prevails in certain quarters that the French machines excel all others in this respect. This is probably true of the high priced machines. The French manufacturer has expended most of his efforts in producing the speediest, strongest and most powerful machines, and has in this way neglected the smaller machines, such as our manufacturers produce in many different styles. The machine for the middle class, the business men, or for the man of moderate means or income has been neglected by the French manufacturer, who has catered to the rich to the practical exclusion of the less fortunate but more numerous man of smaller fortune. It is in his line of trade that the American manufacturer may reap a harvest in France if he goes about it in an intelligent way."

The consul believes that the most practical way for American manufacturers to secure a market in France is for a number of them to join hands and establish agencies in all the principal cities.

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American Peugeot Automobile Company.

Messrs. England, Dubois, Bannister and Reynolds.

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Brennan Manufacturing Company.

P. H. Brennan, J. E. Lighton.

Briscoe Manufacturing Company.

William N. Conant, Burt S. Morley, C. J. Iven, Paul McKenny, John Stern.

Carpenter Steel Company.

R. E. Jennings, W. B. Kunhardt, J. E. Sullivan, J. S. Pendleton, F. A. Bigelow, E. E. Guntere, W. B. Sullivan, N. E. Parish, G. B. Narcross, Dr. G. W. Sargeant.

Albert Champion Company.

Albert Champion, Spencer U. Stranahan.

Consolidated Manufacturing Company.

Edward Buffum, F. C. Cornish.

Cooper-Hewitt Electric Company.

A. F. Hubbard, N. C. Hubbard, J. O'Shea, W. A. D. Evens.

Duff Manufacturing Company.

I. A. McGinley, J. R. McGinley, George A. Edgin, C. A. Foster.

The English & Merseck Company.

William Bryan, W. H. Ritter, W. H. Evans, Gordon Williams, F. T. Bradley, C. W. Johnson.

Horace E. Fine.

William Held, Lester Martindell, Horace E. Fine.

H. H. Franklin Manufacturing Company.

C. A. Benjamin, F. R. Bump, A. G. Williams, S. C. Crane, A. M. Chase, C. E. Wheeler, Foreman Wilkinson, H. K. Chadwick, H. E. Gage.

A. H. Funke.

A. H. Funke, Henry Muck, Stephen Loughman, Herbert Funke.

Gas Engine and Whistle Company.

Albert H. Hayer, William R. Johnson.

C. T. Ham Manufacturing Company.

James Bammy, C. H. Hoagland, T. Hoffman, W. H. Graham.

Hatch & Brittin.

L. H. Brittin, Charles Steinhauser, Robert Fulton, John W. Britton, Charles Jensen.

Heinze Electric Company.

Messrs. Heinze, Moseley, Legare and Girdwood.

Henry Hooker & Co.

Charles M. Harrison, Frederick Dayton.

Holley Bros. Company.

G. M. Holley, Earl Holley, G. R. Welch, E. S. Huff.

Hydraulic Oil Storage and Distributing Company.

E. C. Van Husan.

Imperial Brass Manufacturing Company.

Edward Davidson, S. C. Lyon.

Jones Speedometer.

J. W. Jones, Geo. L. Holmes, A. B. Hance, E. A. Steele, Wm. C. Boone.

Julius King Optical Company.

George E. LaVietes, William Commer, Edward Atzert.

Phineas Jones & Co.

H. Percy Jones, Henry P. Jones, Phineas Jones, William Burchell.

Lackawanna Leather Company.

R. C. Good, Fred C. Fabel.

The Lunkenheimer Company.

A. J. Jutt, C. G. Harcourt, W. A. Reynolds, A. L. Aull, W. W. Schmidt, F. L. Moyer and D. C. Jones.

Manhattan Storage Company.

A. Morris, D. Grinberg, Sam Van Rooyen, Charles Gomprecht, A. V. Webb, D. Donnelly.

A. R. Mosler & Co.

A. R. Mosler, Wm. Liebling.

Manufacturers' Foundry Company.

E. W. Beach, F. C. Fromm, L. M. Perrault, W. W. Mannville.

H. & F. Mesinger Manufacturing Company.

H. Mesinger, F. Mesinger, A. Erb, B. Sudo, B. Brown, Charles T. Zenker.

Midgley Manufacturing Company.

F. W. Flamers, Thomas Midgley, T. J. Cull.

Motor Car Specialty Company.

E. S. Lea, W. S. Jones.

Motsinger Device Company.

Russell Howland, P. J. Dassey.

L. J. Mutty Company.

L. J. Mutty.

National Battery Company.

J. R. H. Richmond, Ralph Kimberly, P. V. Hoyt, James De Mallie.

National Sales Corporation.

F. C. Wilcox, P. F. Hensel, D. L. Lawton, E. B. Wilcox, B. C. Rogers, C. A. Metzger, H. Gernsbach, S. H. Stern, E. J. Kuegeman, N. E. Konigslow, M. C. Krarup, S. E. Baldwin.

New York Carriage Top Company.

F. E. Ferris, E. R. Childs, Geo. Bullwinkle, S. B. Hunter.

New York Sporting Goods Company.

P. R. Robinson, J. E. Murray, R. F. Murray, Palen Nelson, C. J. Downing, Jas. G. Grace, Wm. Bailey, C. Michaud, Milton Crook, Thos. Barnes, Fred De Witt, Edw. Knight, Miss Dillon, Miss Hicks, Jas. McNiff.

The Noera Manufacturing Company.

F. P. Noera, H. G. Pinney.

Oliver Manufacturing Company.

R. J. Mackinnion.

Pantasote Company.
H. M. Grier, D. E. Bonner.

Patterson, Gottfried & Hunter.
H. S. Neats, A. Maretzek.

Penn. Rubber Company.
F. A. Wilcox, A. M. Joralemon, W. T. Walker, W. McCulloh.

Pittsfield Spark Coil Company.
Edward J. Jacobson, John E. Wood, W. S. Moore, Wm. P. Wood, Howard Norton.

Rose Manufacturing Company.
E. M. Rosenbluth, R. D. Aldrich, D. Norman Longaker.

Leon Rubay.
Leon Rubay, C. C. Boynton, H. H. Hinley.

Samson Leather Tire Company.
L. G. Duquet, H. Leroux, E. Sampson, F. Thompson, F. J. Kelly, H. W. Beach, A. E. Gallien.

Shelby Steel Tube Company.
Harry O. Ramsay, P. F. Piercy.

Rose Manufacturing Company.
H. C. Rosenbluth, W. A. Schott, H. D. Van Brunt, Edward L. Peters.

Schwarz Wheel Company.
Chas. L. Schwarz, L. S. Bowers, Charles Le Fevre.

Sibley & Pitman.
L. L. Halle, F. W. L. Fullerton, H. B. Yates, H. Seabrook.

Edward Smith & Co.
B. B. Pinkham, C. L. Wyatt, J. F. McBride.

Springfield Auto Top and Upholstering Company.
Fred Keufer, Jr.; William E. Shinks, Clara E. Keunzel.

St. John Rubber Tire Company.
E. W. Morrow, H. N. St. John, J. Jackson, B. Moore, E. V. Morrow.

Swinehart Clincher and Rubber Company.
J. A. Swinehart, C. B. Swinehart, E. O. Hoopengarner, E. S. Sker, R. A. Brine.

Uncas Specialty Company.
B. F. Leavitt, E. W. Williams, F. W. Browning.

The Utility Company.
E. C. Conklin, F. S. Larkin, Geo. D. Holmes, Chas. V. Bierne.

Vacuum Oil Company.
F. B. Killian, H. A. Marshall.

Valentine & Co.
W. B. Long, W. J. Harding, L. H. Kronfeld, C. Hatfield.

Way Muffler Company.
A. Warren Way, Sam W. Patterson.

Weed Chain and Tire Grip Company.
Harry D. Weed, W. B. Lashar, F. D. Baker, T. B. Lashar, F. H. Wheeler, E. J. Edmund, F. H. Wheeler.

Whitlock Coil Pipe Company.
J. E. Lewis, R. D. Bobson.

Wray Pump and Register Company.
Geo. W. Kellogg, William F. Ray, Chas. F. Ray, Miss S. J. Dengler, G. G. Brandenburg, J. J. Brandenburg.

At Both Shows.

American Ball Bearing Company.
F. Philip Dorn, Frank H. Teagle.

Aurora Automatic Machine Company.
R. S. Cooper, J. I. Brandenburg, G. G. Brandenburg.

Baldwin Chain and Manufacturing Co.
W. M. Gates, H. A. Hause, S. G. Whittaker, K. Franklin Peterson.

Brown-Lipe Gear Company.
H. W. Chapin, A. T. Brown, W. C. Lipe, Thomas J. Wetzel, K. Franklin Peterson.

Byrne, Kingston & Co.
George Kingston, Charles T. Byrne, J. P. Grace, J. W. Johnson, W. H. Diehl, Marion Black.

Continental Caoutchouc Company.
Emil Grossman, Joseph Grossman, C. H. Loomis, F. E. Moskovics, D. T. Keenan, E. T. Horsey, J. S. Smith, Hugo Hoffstaeder.

The William Cramp & Sons Ship and Engine Building Company.
Richard Thompson, Courtland D. Cramp.

Dac Auto Supply House.
E. S. Griffing, J. G. Craig, Hall L. Snutsel, H. G. Jackson, Charles Dunham, I. J. Reynaud, F. M. Pose, C. V. Tuttill.

Dayton Electrical Manufacturing Company.
V. G. Apple, R. L. Hubler, H. F. Apple, O. D. Apple, E. J. Allen, A. A. Allen, L. F. Ross, W. D. Brown, P. C. Ewing.

Diamond Chain and Manufacturing Co.
L. M. Wainwright, E. C. Dunmeyer, L. D. Bolton, W. P. Culver.

Diamond Rubber Company.
W. B. Miller, A. H. Marks, O. J. Woodward, John F. Lanier, Harvey J. Woodard, J. W. Hobbs, D. W. Miller, C. T. Wilson, B. W. Snowman, T. Appleton, W. T. Helfer, W. P. Cronin, E. H. Fitch, G. A. Davidson, N. E. Oliver, George J. Bradley, W. M. Perrett, O. S. Tweedy.

R. E. Dietz & Co.
Theodore E. Getz, James Soriano, George A. Allen.

Eastern Carbon Works.
E. J. Wilson, George W. Mills, O. L. Turgeon.

Edmunds & Jones Manufacturing Company.
George E. Edmunds, R. W. Booth, Charles E. Bradley, W. T. Jones.

Firestone Tire and Rubber Company.
H. S. Firestone, Will Christie, L. E. Sisler, J. M. Gilbert, S. E. Carkheff, Burk Partridge, E. E. McMaster, W. P. Berrien, W. A. Wells, H. A. Palmer, James Gibney, John Gibney, A. J. Green, R. J. Firestone.

Fiske Rubber Company.
H. T. Dunn, E. H. Broadwell, F. C. Riggs, H. G. Fiske, A. M. Mayo, B. Parker, A. L. Beards, J. C. Cole, William Jameson, E. H. Brandt, J. W. Bowman, J. W. Mixell, J. H. Cody, William Lambe, E. A. Hoffman, M. L. Brown, George A. Campbell, A. M. Ayres, Morris Penrose, F. C. VanDerhoff, B. H. Pratt,

Gray & Davis.
William Gray, J. Albert Davis, F. E. Castle, W. A. Murphy, F. S. Collins, E. E. Taylor.

G & J Tire Company.
Herbert A. Givens, A. E. Vinton, D. P. Price, H. L. Johnson, V. M. Scroggs, M. G. Whitlock, Howard B. Smith, R. L. Ijens, A. T. Smith, Harold Oldsmith, C. L. Pepper, Charles H. Semple.

Gabriel Horn Manufacturing Company.
C. H. Foster, C. S. Britton, J. F. Gibler, W. D. Strong, A. E. R. Blomquist.

The Gilbert Manufacturing Company.
Fredson E. Bowers, Thomas G. Bowers, J. Howard Marlin.

The Goodyear Tire and Rubber Company.
G. M. Stadelman, K. B. Harwood, William T. Teagan, A. F. Osterloh, O. L. Weaver, W. B. Fewull, M. M. Norton, H. G. Fitler, C. M. Cordell, H. M. Snyder.

R. E. Hardy Company.
R. E. Hardy, G. J. Schultz, F. J. Watt.

A. W. Harris Oil Company.
George L. Monroe, Benjamin S. Terry, Walter H. Gladding, Fred T. Bailey.

Hartford Rubber Works Company.
J. D. Anderson, Thomas Midgley, J. W. Gilson, H. Plow, E. S. Benson, E. S. Roe, E. R. Benson, F. Kesser, George Ostendorf, H. E. Field, S. E. Gillard, H. Snyder, A. D. Cruden, A. W. Kirk, W. R. Barnes, E. J. Davern, W. H. Reed.

Hartford Suspension Company.
E. V. Hartford, A. G. Hoffman, J. H. Hartford, L. C. Burnett, C. L. Stevens.

Herz & Co.
G. L. Herz, C. Schoenstein, Harr. Weber, Louis Klar.

Hess-Bright Manufacturing Company.
Henry Hess, F. E. Bright, R. D. Mac-Donald, C. L. McCalla, A. Hegardt, A. Nairn, N. Hahn.

Hyatt Roller Bearing Company.
P. S. Steenstrup, H. A. Brown, Jr., C. A. Sloan.

International A & V Tire Company.
J. C. Matlack, F. W. Libby, H. C. Young, N. D. Crawford, R. E. Glass, W. H. Dougherty.

Judson & Downing Company.
J. G. Judson, F. J. Dansingburg.

Light Manufacturing and Foundry Co.
E. S. Fretz, W. J. Grubb, E. R. Cassel.

McGiehan Manufacturing Company.
C. W. McGiehan, F. E. McGiehan, M. Mulvanay, John S. Cercess, F. H. McGinn, C. H. McGinn, J. W. Scott.

McCord & Co.
E. B. Fleisch, J. M. Hibbard, L. H. Hamlin, James Williamson.

Morgan & Wright.
C. J. Butler, Arthur I. Philip, C. S. Shargard, T. R. Burton, W. C. Marion, A. Measure, R. G. Kennedy, J. C. West, G. M. Seewald, J. J. Alexander, C. Mc-, E. F. Jackson, I. J. Cooper, George Burnham, E. M. Greene.

F. W. Ofeldt & Sons.
E. G. Ofeldt, H. V. Eaton.

Parish & Bingham.
George W. Morse, James H. Foster, W. Blackman.

ew York and New Jersey Lubricant Co.
T. A. Matthews, W. F. Kimball, J. H.
:nnis, J. D. Kelvie, F. J. Barnes, William
igelman.

Prest-o-Lite Company.

Carl G. Fischer, J. A. Allison, T. C.
very, Frank M. Moore, Paul R. Rippien,
dwin Adams, F. L. C. Martin.

Railway Appliances Company.

C. H. Holbrook, George T. Briggs, F.
. Batcheller, P. R. Brooks, George H.
eargent.

Rands Manufacturing Company.

W. C. Rands, C. J. Iven, C. W. Strenger.

Remy Electric Company.

W. R. Poland, C. E. Carr, Frank Remy,
. P. Remy.

Spicer Universal Joint and Manufacturing Company.

C. W. Spicer, K. F. Peterson, Asa F.
Randolph, Thomas J. Wetzel, J. P. Thompson.

Sprague Umbrella Company.

C. J. H. Sprague, H. B. Conklin, F. A. Dillingham, F. G. Laffery, H. G. Breckenridge, A. Hirman, C. M. Ballard, G. W. Mackey.

Springfield Metal Body Company.

H. M. Billings, F. B. Reed, H. Smith, A. P. Smith, J. B. Richards, G. Page, C. A. Guffrin.

Standard Roller Bearing Company.

Samuel S. Eveland, Robert H. Grant, Frank Beemer, L. J. Hoover, Thomas J. Heller, F. M. Germane.

Standard Welding Company.

W. H. Pirrong, E. A. Heinsohn, Burk Quayle, W. S. Gorton, L. D. Rockwell, H. W. Davis.

Steel Ball Company.

William D. Tilden, H. J. Carle, W. B. Post, A. S. Krotz, E. C. Babcock, Jr.

Timken Roller Bearing Axle Company.

W. R. Timken, A. R. Demory, W. H. Timken, W. T. Walker, E. W. Louis, Mr. Preston.

Veeder Manufacturing Company.

D. J. Post, R. S. Drake, E. G. Biddle.

Warner Gear Company.

A. L. Johnson, R. P. Johnson, T. W. Warner, H. L. Warner, N. N. Warner, Harriet Johnson.

Warner Instrument Company.

E. P. Warner, C. H. Warner, S. A. Bean, A. J. Inderrieden, D. W. Dunn, O. C. Foster.

Whitney Manufacturing Company.

C. E. Whitney, C. S. Woodward, W. W. Totman.

Witherbee Igniter Company.

Thomas S. Witherbee, William H. Reid, A. J. Stone, A. J. Fiske, George P. Moore, Fred J. Roth, Joseph Hooton.

E. J. Willis Company.

E. J. Willis, W. E. Baker, E. L. Devere, A. E. Griffith, H. Simmonds, A. Balzer, R. Jarman, C. Dyde, M. C. Hopkins.

The Webb Company.

Edward H. Webb, H. W. Webb, C. J. Appelbee, Chas. Vincent, Lester L. Brewster, A. C. Hampson, J. L. Myers,

Commercial Vehicle Section of the Paris Show.

By Joseph Tracy.

GASOLINE VEHICLES.

Steel frames are used almost exclusively on the commercial vehicles of all sizes. Many of the omnibus chassis have the usual pressed steel frame, only deeper and of thicker metal than the frames used on pleasure cars. Front axles are usually solid forgings and of square section. A few of the light delivery wagons, however, have I section front axles. The steering heads are, almost without exception, of the Elliott type.

Double chain drive is seen on most of the vehicles, although there are a few having propeller shaft drive and a live rear axle. The combined solid and live rear axle seems to be coming into favor. In this type of axle the rear wheel runs on the axle ends, which are hollow. The middle of the solid axle (the part between the springs) is offset either backward or downward, in order to make room for the live axle, the driving shafts of which extend through the hollow wheel stubs and drive the wheels by jaw clutches on the outside of the hubs.

There is another type of rear axle construction which is used by Panhard and also by the Daimler Company. In this type there is a differential shaft supported by a wood frame a little distance forward from the carrying axle, which, in this case, is solid. There are spur pinions on the ends of the differential shaft. These pinions mesh in an internal gear, which is bolted on the inside of the rear wheels.

Wooden wheels are used on nearly all of the cars. There are a few, however, which have steel wheels, some spoked, others of the disc type. Metal wheels are used only on the heaviest vehicles.

The small delivery wagons, which are, in many cases, touring car chassis carrying a delivery wagon body, are usually mounted on ordinary pneumatic tires. In the medium sized vehicles solid rubber tires are used on both the front and rear wheels. The latter wheels usually have two tires on the same rim. On the heavier cars steel tires are used on the back and front wheels almost without exception.

The semi-elliptic type of spring is seen on the largest numbers of cars. A few of the lightest delivery wagons have platform springs in the rear. Transmissions are practically the same as those which are used on touring cars, the only difference being that they are made much heavier in all their parts, and are very often made with cast bronze gear boxes. There is one machine shown which has a disc friction drive.

The motors on the gasoline cars are usually enlarged models of touring car motors with steel castings substituted in some places for forgings. The crank cases are usually cast from bronze. Clutches are nearly all of the metallic type on the heavier cars and leather covered on the lighter cars.

For cooling the coiled pipe type of radiator seems to find most favor, although several of the omnibuses are fitted with honeycomb coolers. The lubrication is supplied by mechanically driven pumps in practically all cases. For ignition, the high and low tension systems are used to about the same extent. Accumulators are used on one or two of the very light delivery wagons.

The steering gear is almost without exception of the worm and sector type, having the steering post vertical in some of the heavier cars, and at a slight angle in the lighter cars. The brakes seen on the commercial vehicles are in most cases designed along the same lines as touring car brakes. Band brakes on the rear wheels of the large cars are usually applied by means of a hand wheel, actuating a bolt and nut mechanism. Shoes acting on the tires like railroad car brakes are seen on several of the heavy vehicles. The gasoline feed is by gravity on almost all the machines.

STEAM MACHINES.

Steam cars are shown by Thorneycroft, Purrey, Turgan, Serpollet (whose car is attached to the Renard train) and Chaboche. All these machines, except the Serpollet, are of the heavy, platform, or lorry type, and designed to burn coke or coal. There does not seem to be any noteworthy development in heavy steam cars during the past year. There are a few narrow gauge tram cars, both steam and gasoline.

There is an electric searchlight, which is used by the French army, on exhibition in a tent outside the building known as the "Serres." The searchlight is mounted on its own truck, which is drawn by an ordinary Krieger "combination" car, having a Richard-Brasier gasoline motor under the bonnet, which drives a dynamo placed underneath the footboard. The rear wheels are driven by electric motors, which are supplied by current from the dynamo. When it is desired to operate the searchlight the motor circuit is opened and the searchlight connected.

There is also on exhibition a chassis carrying a fire pump. The pump can be connected or disconnected by means of jaw clutches. When the pump is disconnected the car can be driven in the usual way.

In the moving machinery section may be seen in action the motors of all the leading makers, driving dynamos, pumping water or driving machine tools. There is also a very fine exhibit of gas engines running on producer gas. Machine tools of every description used in motor building are also shown in the machinery hall, in operation. Cylinders are being bored, crank shafts turned, pistons ground and gears cut, in a dozen different ways, each exhibitor claiming peculiar advantages of his own.

Commercial vehicles will be found at both New York shows, those at the "Garden" Show being mostly in the basement.

MINOR MENTION



The Flint Auto Brass and Aluminum Company, Detroit, will increase their stock to $75,000 and enlarge their factory.

The Lackawanna Leather Company, Hackettstown, N. J., are now making chrome tanned morocco leather automobile work.

The Dudley Auto School and Garage Company of Boston, Mass., have opened a branch office on Main street, Springfield, Mass.

Announcement has been made that railroads operating west of Chicago will reduce their rates on rubber tires, the reduction to go into effect February 1.

The Pitton Novelty Company, Ltd., Detroit, Mich., manufacturers of automobile parts, have changed their name to the Home Novelty Company.

W. C. Temple, Pittsburg, Pa., chairman of the racing committee of the A. A. A., has been named as a candidate for the presidency of that organization.

We have just issued a lithographed calendar for 1906, which we will be pleased to send to any of our subscribers or advertisers who has not received one.

The H. T. Hearsey Vehicle Company, Indianapolis, Ind., are building an addition to their store, which will be known as the Hearsey Annex and used as a garage.

The Premier Motor Car Company, Indianapolis, have bought the block of ground adjoining their present factory, on which they contemplate building an addition to their plant.

The coroner's records of Allegheny County, Pa., show that while there are 1,200 machines in use in the county, there were but ten deaths during the year of 1905 due to automobiles.

A meeting of the board of directors of the Standard Automobile Company of New York will be held on January 18, to take action toward increasing the capital of the company from $75,000 to $1,250,000.

F. I. Tone, former assistant manager of the Marion Motor Car Company, Indianapolis, has resigned his position, and has assumed the management of the American Motor Car Company of the same city.

J. S. Conwell has been appointed general manager of the Marion Motor Car Company, Indianapolis, to succeed H. M. Byfield. Mr. Conwell was formerly the manager of the Pope-Waverley factory at Indianapolis.

The Auto Improvement Company, New York city, will shortly place on the market an automobile detector, a device for detecting any movement of the machine after it has been put up for the night. They will also bring out an automobile tank filler which will contain an automatic gauge and a new acetylene gas tank.

Hartman & Ridgaway are erecting a buggy and automobile top factory at the corner of Pennsylvania avenue and George street, Baltimore, Md.

Isaac G. Johnson & Co., Spuyten Duyvil, N. Y., have just built a large addition to their plant, which will be devoted to the production of steel and nickel steel castings.

The Hoffman Hinge and Foundry Company, Hubbard and Porter streets, Cleveland, have changed their name to the Ferro Machine and Foundry Company, and have increased their capital to $250,000. They make gray iron castings.

The Royal Motor Car Company, Cleveland, have prepared and issued a booklet containing photographs and drawings of the various parts of their cars, each having been given a number so that it may be readily ordered by mail or telegraph.

The American Automobile Association will hold meetings as follows: Racing board on January 15, board of directors on January 16, and an open convention for all members on January 17. All meetings will be held at the Sixty-ninth Regiment Armory.

The Waverley branch of the Pope Motor Car Company of Indianapolis are building an additional story to one of their buildings, which gives them about 7,000 extra feet of floor space. Two floors of this building will be devoted exclusively to the manufacture of electric trucks.

New Incorporations.

The Bradford Motor Company, Wilmington, Del.—To manufacture automobiles. Capital, $60,000.

Northwest Motor Company, Seattle, Wash.—Capital, $15,000. Incorporators, H. B. Rector and F. W. Caldwell.

Ansonia Automobile Company, New York City.—Capital, $5,000. Directors, E. G. Potter, G. R. Kelso, F. W. White.

The Evansville Battery and Electrical Company, Evansville, Ind.—To manufacture storage batteries. Capital, $100,000.

Denver Auto Goods Company, Denver, Col.—Capital, $10,000. Incorporators, H. O. Cartwright, Smith McKay, J. W. Foster.

Carlson Automobile Company, Brooklyn, N. Y.—Capital, $15,000. Directors, C. A. Carlson, Chalmers Dale, Jr., and C. W. McKelvey.

Krueger Automobile Company, Milwaukee, Wis.—Capital, $10,000. Incorporators, Edward Krueger, W. H. Hathaway and Geo. J. Besnah.

Boston Auto School, Boston, Mass.—To maintain an automobile school. Capital, $5,000. President, W. E. Cooper; treasurer, E. F. Edwards.

Twentieth Century Motor Car Company, Chicago.—To manufacture motor vehicles. Incorporators, Lewis F. Haupt, Geo. C. Marsh and Edward F. Heywood, Jr.

The Windsor Motor Car Company, Evansville, Ind.—To manufacture automobiles. Directors, J. C. Zutt, president; J. A. Windsor, vice president and general manager, and W. M. Copeland, secretary and treasurer.

The New Roadway Motor Company, Oklahoma City, Okla.—Capital, $150,000. Directors, Theo. A. Johnson, Richard G. Strobhard and E. Ashbrook.

The White Automobile Company, Columbus, O.—Capital, $10,000. Incorporators, C. M. Taylor, Henry S. Kruger, W. P. English, C. E. Yoder, J. B. McGaughy.

Imperial Automobile Company, Boston.—To deal in automobiles. Capital, $30,000. Directors, J. A. Seaverns, president; D. J. O'Connell, treasurer; C. W. Webber, clerk.

Chadwick Motor Car Company, New York City.—To manufacture automobiles. Capital, $50,000. Incorporators, Albert W. Pross, Clarence E. Reid, Geo. Murer, Alice M. Cox, Florence Kinstler.

The Snow-Webster Automobile Company, Portland, Me.—To deal in automobiles and motor cycles. Capital, $10,000. Incorporators, Frank S. Webster, Louis A. Webster and Nathan Clifford.

The Cooney Carriage Company, Toledo, O.—To manufacture electric automobiles. Capital, $10,000. Incorporators, James J. Cooney, John McGettigan, Chas. R. Bowman, Josephine S. Lindsay and John R. Todd.

The West Side Motor Company, Hamilton, O.—To manufacture, repair, rent and deal in automobiles. Capital, $10,000. Incorporators, John E. Schmitt, Clare E. Schmitt, Chas. E. Schmitt, Katie C. Schmitt and Clarence Murphy.

Agency and Garage Notes.

D. P. Reighard, Pittsburg, Pa., is erecting a three story garage at Ellsworth and College avenues.

A garage is to be erected at 535 and 537 South Los Angeles street by Richard P. Blaisdell, Los Angeles, Cal.

J. H. Frenier & Son, Rutland, Vt., are building a garage 40x60 feet, and have been made 1906 agents for the Rambler and Ford cars.

Eugene Meyer, Jr., will remodel the two-story stable at 347 Amsterdam avenue, New York city, and convert it into an automobile garage.

W. J. Friel will represent the Ford cars in southern Ohio and northern Kentucky during 1906, with headquarters at Portsmouth, Ohio.

The Central Automobile Company, recently formed by G. L. Seely and G. F. Ferrier, of Pittsburg, Pa., will be the local agents for the Reo and Stoddard-Dayton cars for 1906.

The Rutland Machine and Automobile Company, Rutland, Vt., and the O. S. Coolidge Cycle Company, of that city, have merged. The new concern is planning the erection of a new garage.

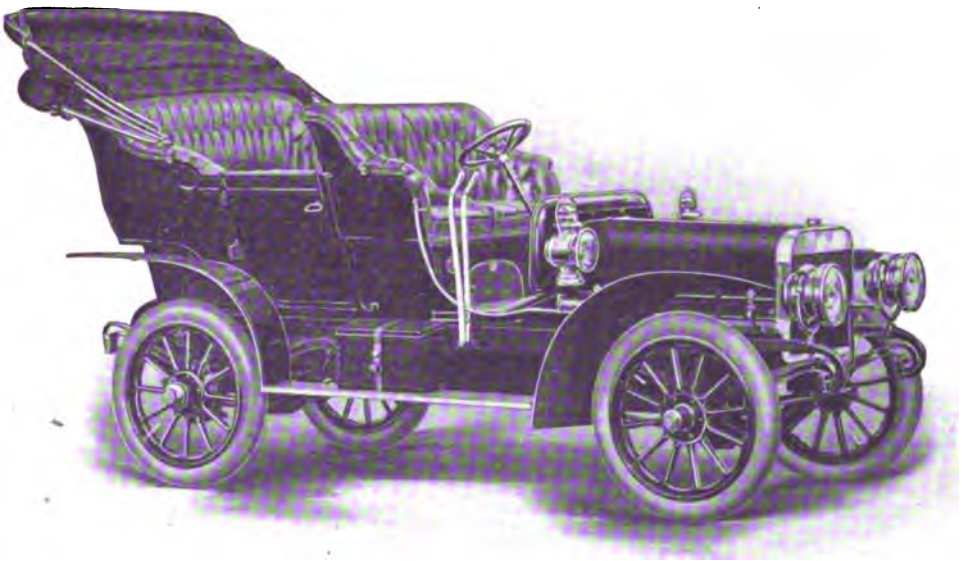
The St. Louis Motor Carriage Company notified us that the Capen Motor Car Company, of St. Louis, are not their St. Louis agents, as stated by us in a recent issue. George Neff, 4530 Delmar avenue, represents them in that city.

...THE...

Horseless Age

VOLUME 17 JANUARY 17, 1906 NUMBER 3

WINTON MODEL-K



MEASURE THE CAR'S VALUE

Motor car value can be measured in miles, at so many cents per mile.

Easy enough, you say, after you've had a car a season and kept a record of the expense involved.

Yes, and it is almost as easy before you've spent a cent.

If a car lacks the elements that mean mileage your expense per mile will be high.

If a car has the elements that mean mileage your expense per mile will be low.

To get mileage buy Strength and Simplicity; and Shun Friction as you would the plague.

Buy Strength. Because weak metals and skeleton-construction mean break-downs. Break-downs cut down mileage. (All materials used in the Winton Model K are tested for strength before use.)

Buy Simplicity. Because each added complication means an added chance of a repair-shop job. That means increased expense and decreased mileage. (The Winton Model K is the simplest car on the market. We can't tell you why in this space, but we can show you why upon examination.)

Avoid Friction. Because Friction cuts down power, ruins working parts, devours gasoline and oil, and means less mileage per dollar expended. (The Winton Model K has ground cylinders, pistons and bearings. Grinding is expensive work, but it is the only known method of eliminating friction.)

Buy an automobile as you would a piece of real estate—demanding the greatest value, per dollar spent, to be obtained in a competitive market. (The Winton Model K sells at $2,500. Its value is not equalled in the competitive automobile market for $3,500. We have demonstrated that fact to hundreds of inquirers, and we shall take pleasure in giving you the evidence any time you ask for it.)

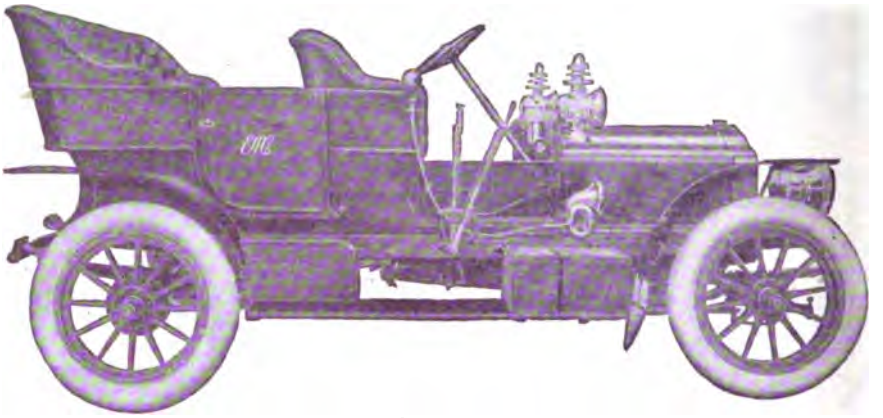
Volume 1 of "The Motor Car Dissected" gives an array of "inside information" on automobiles. Limited edition, but copy free upon request.

The Winton Motor Carriage Co.

CLEVELAND, O., U. S. A.

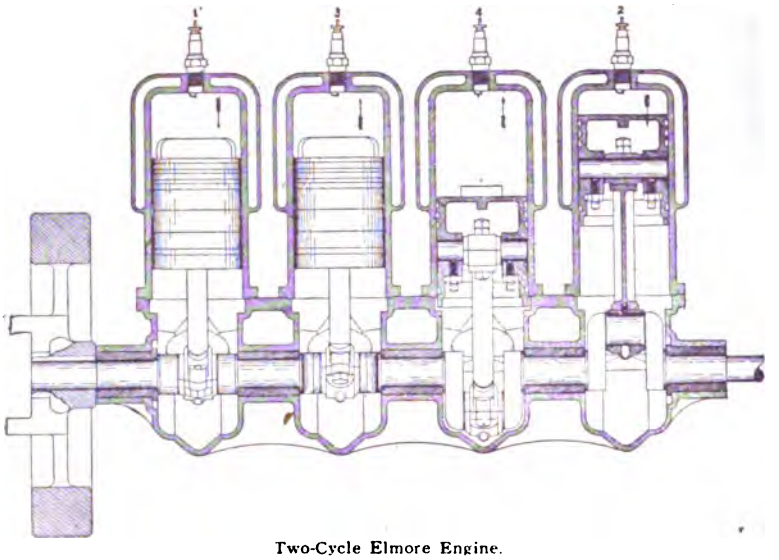
The Two-Cycle Principle Made Plain.

EVERYBODY should understand the two-cycle principle, which has given the **Elmore Car** motor prominence.



MODEL 15
1906 Four-Cylinder, Two-Cycle Elmore.

A two-cycle engine means a constant, steady application of power, with no interval between the impulse. The expansive force of one explosion is only half-way through when another begins.



Two-Cycle Elmore Engine.

Look at cylinder No. 1. The piston of this cylinder is only half-way down, the force of the explosion is still acting upon it, at the same time that the piston of cylinder No. 2 is just starting down from another explosion, and before the force of the explosion of this piston is exhausted the third cylinder will come into action, then the fourth, and so on as long as gas is fed into the cylinder and there is a spark to fire it.

Simple, isn't it? But listen to this:

All the inlet and exhaust valves have been eliminated and actually from 18 to 20 parts on each cylinder have been done away with.

When actually fifty per cent. of the moving parts have been eliminated it is only natural that the cost of operation and up-keep is reduced fully fifty per cent.

The constant, unbroken application of power, only to be equaled in the four-cycle by the use of 8 cylinders and 16 valves, and the small cost of up-keep have made the **Two-Cycle Elmore** the sensation of the moment.

You cannot fully understand the broad meaning of these points of superiority until you have seen the car. Send for catalog describing the **Four-Cylinder, Two-Cycle Elmore at $2,500** and the **Three-Cylinder, Two-Cycle Elmore at $1,500.** *Will exhibit in New York at Madison Square Garden only. Show in Chicago at Coliseum.*

ELMORE MANUFACTURING COMPANY

1004 Amanda Street, Clyde, Ohio.

Members Association Licensed Automobile Manufacturers.

The Sixth Annual Madison Square Garden Show.

Opening of the Show.

With Madison Square Garden decorated h a lavishness that even that wonderful ucture had never before experienced, :h thousands of electric lights flashing, :h the band playing and the aisles nmed with thousands of handsomely :ssed men and women who admired the ished products of the automobile indus-, the Sixth National Automobile Show der the auspices of the Association of :ensed Automobile Manufacturers opened Saturday evening. Dazzling to the eye, istic and beautiful, the huge building had :n transformed into a veritable fairy pal-:, in which King Auto ruled supreme. palace of blue and white and gold, with lliant electric lights and wonderful deco-:ions, blended harmoniously with the dis-.y of wealth that met the eye on every e. There was nothing garish about the namentation of the Garden. Despite the lossal task that had been undertaken, the .ng had not been overdone, and there is nothing that was not pleasing to the eye and harmonious throughout. It was whispered that $40,000 had been lavished on these decorations, but there were those who hesitated to believe that even this large sum could have wrought the wonderful transformation.

Even before the visitor attempted to force his way through the crowded aisles and inspect the autos, he must needs stop and admire the beauty of the scene that met his eye. The entrance to the Garden is through an archway formed of evergreens, a perfect bower leading to the beauties further on. At the entrance on either side stand two life sized figures, one of a man and the other of a woman, both dressed in full automobile regalia. Facing each other, they point the way into the Garden and to the wonders there displayed.

As the visitor steps through the main door the scene opens up in its full beauty. Facing him is a heroic sized figure holding aloft an automobile, the Goddess of the Machine, welcoming the public. At her feet plays a fountain, the waters of which are radiant with the light of varied hued electric globes. Behind the statue to the rear of the hall run the columns which divide the exhibits, the adjacent columns being connected by pretty arches surmounted by a cap studded with electric lights. The girders of the huge building are hidden from end to end of the structure, and the ceiling has been transformed into a sea of blue, colored as an Italian sky, through which the dim gleam of hidden electric lights may be discerned, giving the effect of a clear night sky. Thousands of yards of cloth were used to gain this effect, which is an extremely beautiful one. The same color scheme has been followed in the decoration of the balconies, and here and there banners of white and gold are interspersed among stately pilasters and columns. At either end of the hall the boxes are completely hidden by specially painted scenery, giving the effect of doorways of marble forming huge arches. These old Roman pillars, with large urns at their bases and masses of evergreens and potted plants, give the effect of an Italian garden.

There is a uniformity in the display signs above the various exhibits that harmonizes



perfectly with the general decorative idea. The name of the machine or the company making the exhibit (as the case may be) appears in large gold letters on a background of white. No other advertising appears, and as a result there is a continuous harmony that is most pleasing to the eye. The appearance of the whole Garden was a great contrast to last year, and the kaleidoscope of various colors and designs without apparent arrangement was pleasingly missing. S. R. Ball, who had charge of the decorations, had the interesting information to give that it took 5,000 yards of specially woven thickly padded carpet to secure the bronze effect on the floor, 12,000 yards of celestial blue cloth and 27,000 gold stars to complete that wonderful Italian sky effect, and thousands of yards of silkaline for the other decorations. Add to this the weeks of work for sculptors and painters and decorators, thousands of trees and miles of smilax, and one can gain some idea of the task of decorating Madison Square Garden and transforming it into a fitting palace for the reception of the admirers of the Auto Queen.

But enough for the decorations, and now for the Show. Down the centre of the great hall and on both sides are the automobiles and such machines as the pioneers of but six years ago never dared to dream of as even a possibility. From the tiny runabout to the monstrous limousine and palace Pullman there are autos of every design and of every price, suiting alike the demands of the small merchant and the king of finance. Automobiles that need not take the dust of express trains and automobiles that will jog along at a moderate speed and get you there. All of them are shown, and all of them shine and glisten as the electric lights flash on polished brass and magnificently finished varnishes. The eye is dazzled and the mind bewildered, and the visitor feels that it is hardly possible to make a selection among all of these desirable and beautiful types, and for the moment wishes that he could buy a duplicate of each and every one of them.

The opening night crowd as usual was a curious crowd, a catalogue and souvenir collecting and a question asking crowd. They swarmed through the Garden, climbed into the various cars, played the gear and brake levers, tried steering wheels, spooked under bonnets and into the mysteries of the working parts, as shown in the handsomely polished chassis shown; asked prices, talked carburetor, spark coil, gears and transmissions like old time veterans, and withal were happy and contented.

It was not a buying attendance in any sense of the word; but it was a surprising revelation to hear young girls, and at times their younger brothers, talking automobile and using the proper names for the various parts. There was none of the pointing of other years with the query, "What is that thing?" but everyone seemed to have learned more or less about the mystery of the auto and all were anxious to display that knowledge. It was only another indication of the great public interest in horseless vehicles.

One hundred and twenty pleasure vehicles of forty-eight different makes represented the Garden Show, and, remarkable as it may seem, there was not a freak among them. The automobile manufacturers seemed as a unit to have drifted away from the experimental lines and had settled down to turn out honest, sensible cars. Side by side with the best products of the foreign markets stood the American cars, and, taken point for point, in design, machinery and body finish, or any other detail, they stood the comparison well. Refinement throughout was the tone of the show, and the handsomely polished and finished chassis of the American car was not a whit behind that of its foreign brother. The Americans at last had achieved that beautiful finish that the French and other foreign manufacturers had so long prided themselves upon. It was evident that they had at last awakened to the fact that money spent on labor, on details and finish work was money well spent.

It was indeed a wonderful exhibition, and although the changes in general design and body design were not so radical as in the past, there was a plainly evident tendency toward better and more careful work.

Of the thousands who will crowd into the Show during the week there is no doubt but that hundreds will be buyers, and that 1907 will not only witness the most magnificent and lavish of automobile exhibitions, but the greatest year in point of sales that the automobile industry has ever known.

Complete Car Exhibits.

KNOX AUTOMOBILE COMPANY.

The chief attraction at the Knox stand is the chassis of their new 40 horse power four cylinder car. The main features of this car, outside of the engine, are practically duplicates of various parts of well known European cars. Thus the transmission is similar to the 1906 Mercedes; the oiling system is of the De Dion type; the clutch, of the inverted cone type, is peculiar to American cars in that the surfaces are metal to metal, and fully enclosed. The Napier clutch is similar, but is not entirely enclosed, as is the Knox. A new model two cylinder opposed type runabout is also shown. The motor is of 14 actual horse power, and as the weight is only 1,850 pounds, the car can go some, 45 miles per hour being claimed its limit. The Knox Company did not depend on the railroads this year to convey their cars to the Show, but loaded them on their own motor trucks, and ran them from Springfield to New York in short order, and then used these same trucks as their commercial car exhibit. Of commercial cars, four are shown, two 3 ton stake trucks, recently brought out by the Knox Company, and two 2,500 pound deliveries, standard Knox types. The stake trucks have the well known 16-18 horse power double opposed Knox engine, with single chain drive to countershaft, and side chains as the final drive. A planetary gear is still used on all the Knox commercial cars. On the new four cylinder car a slight change is seen in the cylinder construction. Instead of depending on the threaded pins alone, small flanges are formed on the cylinders, and



KNOX WATERLESS TRUCKS LOADED WITH TOURING CARS, ON THEIR WAY TO THE SHOW.

pins are just half as long as formerly. : flanges serve the double purpose of sting in cooling, at the same time stiff- ıg the cylinder walls.

ANTANO ELECTRIC TRACTOR COMPANY.

f you have a fine carriage that you uld like to have converted into an elec- : automobile, you can have it done by : Cantano Company. They take your ·riage, remove the front wheels, put in :ir electric tractor, and you have an up date electric carriage. This tractor can removed in thirty minutes, and put another body if desired, so that with e tractor and several bodies, one could ve a number of different vehicles. The ıctor, of course, is front wheel driven rough a motor on each wheel. This con- ruction makes any vehicle equipped ith the tractor easy to drive, and it can : turned in its own length. An Exide ıttery of forty-four cells is used, placed :neath the seat. Forty to fifty miles on ıe charge is claimed. The tractor has heel steering, four brakes, and four for- ard speeds and two reverse. A handsome ›nverted carriage and bus are shown.

COLUMBUS BUGGY COMPANY.

The electric vehicle has been very care- ılly worked out by the Columbus Buggy ompany, and they show a vehicle with ıany features not found on the usual elec- ·ic runabout. They use a pressed steel rame, and the mechanism is not connected › this frame, the motor, reduction and ack shaft being carried on an aluminum rame under the seat. Double side chains ransmit the power from the jack shaft to he rear wheels. The rear brakes are of he expanding type, and a neat and com- ıact construction is secured by placing the sprocket wheel directly over the brake lrum. The weight is very evenly dis- ·ributed by placing some of the batteries ınder the hood in front, and the rest in :he rear of the body. Four forward and reverse speeds are secured, with 20 miles per hour as the maximum speed. One charge will drive the car 75 miles, it is claimed. Two cars are shown, a stan- hope and a victoria, both very finely fin- ished.

POPE MOTOR CAR COMPANY.

The Pope Motor Car Company, at their stand on the main floor, show a very handsome line of pleasure cars of different types and prices. The Pope-Toledo is shown in several styles of body, and a fin- ished chassis is also to be seen. The Pope- Toledo engine this year has the cylinder heads cast in pairs, but the cylinders sep- arately, thus giving fewer parts and greater rigidity. Space is also provided for a mag-



PEERLESS MODEL 14.

PEERLESS MOTOR CAR COMPANY.

A swell runabout in gray and red, with torpedo back, is offered by the Peerless Company, and this car is of distinctly new type. There is evidently a demand for these high powered, high class runabouts, for several of the old American firms are this year offering them to the public. Some- thing new in cylinder design is seen in the Peerless water jacket, which tapers toward the bottom of the cylinder. The purpose is twofold; it gives a more uni- form cooling action, as the bottom of the cylinder evidently does not get as hot as the top; secondly, it gives a greater thick- ness of cooling water around the valves where it is most needed. This seems to be only a slight detail, but then it is the little things that count, especially in the modern automobile, when all are striving for re- finement of details. Besides the runabout, a finished chassis, a touring car and a limousine are exhibited, and by their clean cut lines, fine workmanship and beauty are exciting the admiration of all who view them.

POPE MANUFACTURING COMPANY.

The Pope Manufacturing Company have something new this year in the shape of a 2 ton gasoline truck having a speed of 10- 12 miles per hour. A two cylinder, hori- zontal opposed, water cooled engine is placed under the front seat. The special feature of the car is the transmission, which is hung from the centre of the chassis. It has three speeds forward and one reverse, and each speed is controlled which lever is simply an electric switch, magnetizing each clutch as the current to that clutch is thrown on by the switch. No damage can be done by throwing in the wrong speed, for the clutches, with their enormous attraction, can handle any load, and if the load should become too great the clutch would simply slip, with- out damage. This truck was designed so that any ordinary driver could manage it, without any knowledge of the mechanism whatever. The Pope Company also show a large electric stake truck, an electric closed top delivery wagon, and a small open delivery wagon. The Pope-Hartford is this year shown in two models, a new four cylinder touring car, and the double opposed under the hood car, which is prac- tically the same as last year's model. The Pope-Tribune car, with two vertical cyl- inders, is shown in the runabout type, also in the tonneau style.

SMITH & MABLEY MANUFACTURING COMPANY.

A new type of closed car is shown by Smith & Mabley; it is a hansom, with Quinby body, having large drop side and rear windows, so that when the doors are opened and the windows down, the vehicle is very open, yet it can be closed in a mo- ment in case of inclement weather. The car is finished in blue and black, with red running gear and upholstery. Power is furnished by the regular 30 horse power Smith & Mabley simplex engine. The car is strikingly handsome in appearance, and should prove to be very convenient for shopping or driving around

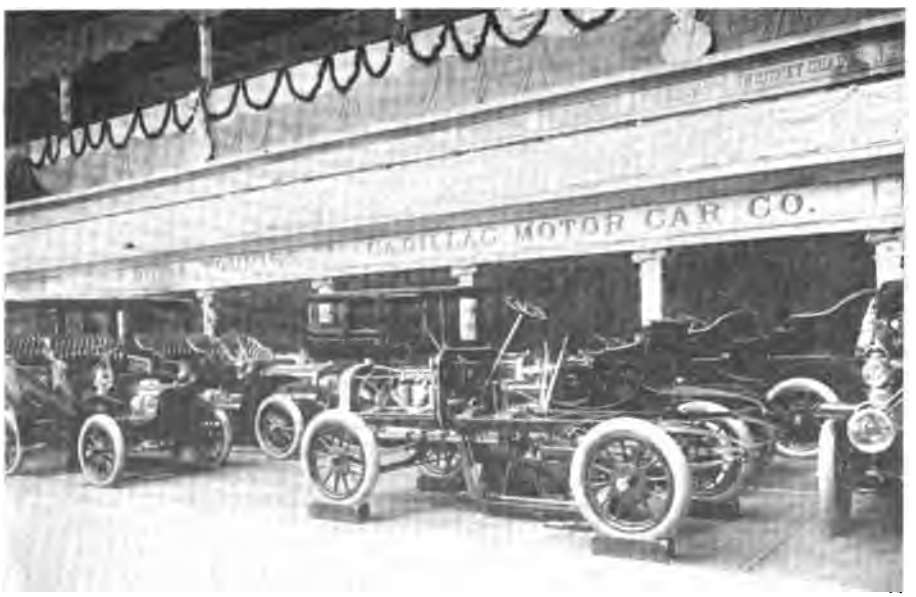


POPE-HARTFORD GASOLINE TRUCK.

foreign practice throughout, using forgings everywhere and chrome steel shafts and gears where there is any wear whatever.

GALLIA ELECTRIC CARRIAGE COMPANY.

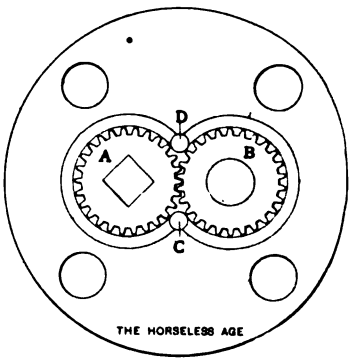
An inside driven electric cab, with beautifully finished body, and a runabout with basket work body attracted a good deal of attention at the Gallia stand in the Exhibition Hall. These electric cars are all imported, complete, with bodies and tops made by the foremost European body makers. The Gallia cars have a number of exclusive mechanical features which deserve mention. The control follows gasoline practice throughout. The cars start off easily, without a jar, due to an electric clutch employed. Steering is by wheel, with sectors on top having levers which give all the motor speeds forward and reverse. Two pedals, which control the two systems of brakes, are placed very close together at the right of the steering column, so that it is possible to apply both brakes at the same time with one foot. The motor is hung directly beneath the dash, and is connected to the rear axle by shaft. Twenty-four cells are carried, twelve in front underneath the bonnet, and twelve in the rear of the body, thus giving a more even distribution of weight. With one charge of the batteries a 50-60 mile run can be made, it is claimed.



CADILLAC STAND, SHOWING NEW FOUR CYLINDER CHASSIS.

HEWITT MOTOR COMPANY.

A "foolproof" automatic and perfect accessible automobile is what the Hewitt Motor Company claim to have. Four entirely different models are shown. The single cylinder runabout and light delivery have practically the same chassis. The engine is horizontal, being lengthwise the car about the centre. Nothing but the best imported chrome steels are used, it is claimed. A planetary transmission is employed with no internal gears. The speeds are all controlled by a set of interlocking pedals, so arranged that when one speed is put in the other is taken out automatically, and either speed is taken out automatically when the brake is put on. An entirely new automatic carburetor is used, and two systems of ignition—jump spark and wipe spark. The four cylinder touring car has sliding gear transmissions, shaft drive and an open crank case. There is really no crank case at all, as the engine is built on the marine steam engine principle. This makes the main crank bearings very easy



HEWITT OILING DEVICE.

of adjustment and examination. A large four cylinder truck of 25 horse power, weight between 5,000 and 5,500 pounds, carrying capacity 3 tons, is shown in the basement. This truck has the open crank case and planetary interlocking gears just described. Double tires are used on the rear wheels. The illustration shows the oiling system of the Hewitt cars in cross section. The small gear A is driven direct from the engine, and meshes with gear B. Oil from the reservoir enters at C, and the gears turning clockwise the oil enters the spurs, and thus is carried around to D, which leads to the bearing to be lubricated. This is a simple, positive and reliable system, and automatic as well, for the greater the engine speed the greater number of revolutions the small spurs make, and consequently the faster the flow of oil.

THE CADILLAC MOTOR CAR COMPANY

exhibit two light cars on the single cylinder chassis, one a runabout, the other a light touring car with a body of graceful, curved lines. The single cylinder horizontal engine is practically the same as that of the last three years, 5x5 inches, rated 10 horse power. The transmission

s their patented two speed and reverse lanetary, and may be removed without isturbing the crank shaft of the engine. A afety device to prevent back kicks is pro-ided. It obstructs the end of the crank haft so the starting handle cannot be used ntil the spark lever is retarded. Ignition s on the jump spark system, using the Cadillac double plug, no high tension wires being grounded on the engine. Spark and throttle levers are on the post below the wheel. A side lever operates the high speed and reverse, and a foot pedal the low speed. The gasoline tank has an upper compartment, which is kept as a reserve, and when a very steep hill is encountered this is used, as its height above the carburetor ensures a supply of gasoline. Two large cars are shown, one with a 30 horse power, four cylinder vertical engine of 4⅜ inch bore and 5 inch stroke; three speeds forward and reverse planetary transmission; bevel gear drive; 98 inch wheel base. This chassis attracted much attention, as it was raised and run by an electric motor. The hand hole plates extending the whole length of the crank case were removed and replaced by glass. Electric lights were placed inside the engine case so that the parts could be seen in operation under, as nearly as possible, working conditions. The 40 horse power, 5x5, car differs only with respect to horse power and size, its wheel base being 110 inches and its weight 3,000 pounds. The rear springs are of the platform type. The enormous hubs of last year have shrunk to the common size, and there have been but few other changes. The governor now used is of the rotating ring marine type. This ring is placed on a gear driven vertical shaft and is encased in aluminum; the upper end of the shaft carries the roller contact timer. The gear driven water pump has a by-pass around it with a shut-off in it, so that if the pump should fail to work this by-pass can be opened and thermal circulation will be set up. The oiling is peculiar. A McCord oiler driven by a rod from a valve lifting rod on the engine forces oil to a sight feed on the dash. Oil is supplied to the rear division of the crank case, is splashed into troughs on the sides and runs by gravity into the next forward division of the case, and so on until it reaches the part where it empties in the same way into a reservoir formed by the front part of the crank case. From here it is led by gravity through a pipe back to the rear again, and the operation is repeated. The splash takes care of the cylinders and cam shift. Very large steel tubes running lengthwise of the frame and supported by cross members form the subframe on which the engine and transmission are supported.

WINTON MOTOR CARRIAGE COMPANY.

The Winton car for 1906 has been so thoroughly exploited before the American



CADILLAC MODEL H.

polished chassis, showing very plainly the well-known Winton air governor, also the "velvety" transmission. A little detail on the radiator caught the eye of the writer. The entire radiator in the rear had a cone-like housing, the apex of the cone being the fan, which therefore produced a suction of air over the entire surface of the radiator instead of only the space directly in front of the fan, which would be the case without a housing. Besides a touring car and a limousine, a four-cylinder Winton runabout in maroon is shown, which makes a very rich appearance. That there is a demand for high powered runabouts is very evident, as the Winton Company is only one of the large American firms which show this type of car.

THE H. H. FRANKLIN MANUFACTURING COMPANY

show the following air cooled models: Model E is a continuation of the original 12 horse power four cylinder runabout, seats two people, has a two speed and reverse planetary transmission, single chain drive, and 81 inch wheel base, and weighs 1,100 pounds. Model G is a 12 horse power four cylinder car with a three speed and reverse sliding gear transmission, bevel gear drive, and 88 inch wheel base; it has a side entrance tonneau and seats five persons; weight, 1,300 pounds. Model D, 20 horse power, is just the same as the other, except in size of posts. The wheel base is 100 inches. This chassis is finished with





FRANKLIN, TYPE D.

either a touring or limousine body. The large six cylinder, 4¾x5½ inches, 30 horse power car is similar in general respects to the others, with the exception that it has a pressed steel frame and four speeds forward; it has a 112 inch wheel base and seats seven persons. The general features of the Franklin cars are all retained. Both valves are mechanical and in the head. The auxiliary exhaust is a poppet valve operated upon by the main cam shaft. The single cam shaft has twelve cams, three for each cylinder. These auxiliary exhaust valves at the bottom of the stroke quickly relieve the cylinder pressure and temperature. The pipe from the auxiliary exhaust is run to the muffler, but the pipe from the regular exhaust valves is carried to the rear and exhausts directly into the air. The engines are ball governed. Jump spark ignition is used, with a Pittsfield coil and new timer. A McCord force feed oiler is located on the dash and operated by a coiled steel belt from the cam shaft. This oiler has four feeds, one to each end crank shaft bearing and one into each of the crank case compartments. Two sets of brakes are supplied. A fabric faced contracting band operated by foot lever acts on the propeller shaft (which is square), and a similar emergency brake acts on the rear wheels, being operated by a side ratchet lever. All brakes are independent of the clutch. The clutch is of the bronze and steel multiple disc type, and runs in an oil bath inside of the flywheel hub. The rim of the flywheel is connected to the hub by fan blade spokes forming an exhaust fan. The throttle lever in the steering wheel connects to the carburetor by a novel connecting arrangement; it rotates a sleeve with square helical spots in it, this moving a collar up or down and communicating motion to the linkage leading to the carburetor. The mixture can be regulated by a finger lever on the dash. The fan on the six cylinder car is driven by inclosed bevel gears, a friction clutch being interposed to relieve the mechanism of any strain due to sudden starting. The readily removable, smooth, one piece hood, hinged at the front, which is a distinctive Franklin feature, has been retained.

THE J. STEVENS ARMS AND TOOL COMPANY

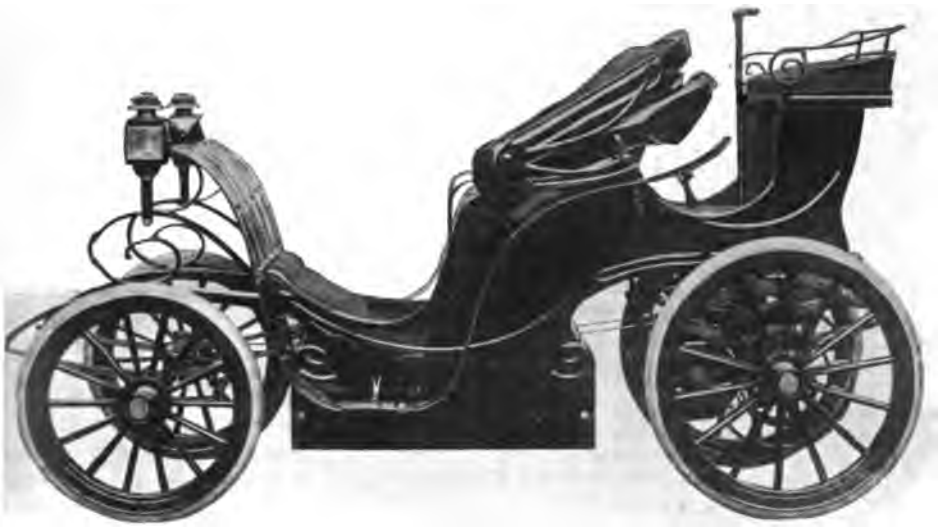
show both their four cylinder car and a new six cylinder model. The first has been improved in details, notably by the enclosing of the universal joint just back of the change gear box. This part is now made somewhat larger and is contained in a spherical housing. Hess-Bright bearings are now used throughout. In general sign the six cylinder engine is very si to their four, the valves being all on side. The carburetor is moved in, but th are two aspiration pipes running from float chamber to a cast fitting which is b ed to all of the inlet ports. Each ha separate jet and one is larger than other. When the motor is running slow with the throttle nearly closed only smaller pipe is in use. As the throttl opened beyond a certain point the sec and longer pipe comes into action, and cause of its greater capacity the speed the air past the jet is maintained at proper point to keep the mixture const The three point suspension, in which motor clutch housing and change gear b are all bolted together, is used. The ge box gives three speeds with a direct dr on the high. An enclosed propeller sh drive is used, and the rear axle is of floating type. The car has a wheel base 122 inches.

HAYNES AUTOMOBILE COMPANY.

The 1906 Haynes car has a number exclusive mechanical features, all conduci to easy running and reduced friction parts ordinarily subject to great wea Thus, in the shaft drive, instead of the dinary pinion with spur teeth, we find driving pinion, each tooth of which is roller bearing. This greatly reduces fr tion, and consequently wear; but even the course of time if it becomes necessary replace the worn pinion, it can be eas done by removing a cotter pin which hol each roller in place, and substituting a ne roller, when we have practically a new sh drive. The three speed sliding gear is the accepted type of design, with a ver important improvement. This improvem



STEVENS-DURYEA STAND.



VEHICLE EQUIPMENT COMPANY ELECTRIC VICTORIA.

consists of putting a ratchet in the high speed spur on the secondary shaft, which permits the intermediate and low speed secondary shaft spur to revolve in one direction only. In changing from high to intermediate the two shafts should revolve at the same speed as the spurs mesh; this is at best only guessed by the driver, who uses his judgment in this respect, and consequently, using bad judgment, sometimes burrs the teeth of the meshing gear. In the Haynes transmission, however, the ratchet device does the judging, inasmuch as it allows the car to coast until the speeds of the two shafts are equal, when the gears mesh gently, without a jar or clash, so common in some transmissions. Another detail noted on the car is the connection of the carburetor and timer to the levers in the steering post. Instead of the usual systems of levers, with their attendant joints, which transfer the movements of the sectors to the carburetor or timer, two small bevel gears on the lever end of the steering post transfer the movements of the sectors to the carburetor and timer respectively almost directly, as only one joint is necessary. This makes a neater appearance, prevents backlash and does away with a number of small parts. The steering arm is usually placed below the front axle, where it is always liable to strike some projecting object. In the 1906 Haynes this arm is placed over the axle—a wise provision for touring in America. The Haynes Automobile Company this year make two models, one of 50 horse power, the other of somewhat larger power. The body styles vary from a runabout to a limousine.

E. R. THOMAS MOTOR COMPANY.

A creation in white, with pale blue upholstering and striping, is found at the Thomas stand on the main floor of the Garden. Even the canvas top is snow white, and the car certainly makes a stun-Thomas stand. The Thomas people evidently appreciate the fact that the American people as a rule prefer a car which will look presentable after a run into the dust or mud. The Thomas Company fit a ratchet brake to each rear wheel. The ratchet is instantly put into operation by the driver, who pulls a small lever in his footboard. A little foreign refinement not found on American cars is a button cut-out in one of the arms of the steering wheel. This is a very convenient little thing, as it is a very quick way of stopping the engine, which is very necessary in some cases. Besides the white touring car a complete chassis, two limousines, and another touring car of a darker color are shown, all models possessing the beautiful body curves peculiar to Thomas cars.

VEHICLE EQUIPMENT COMPANY.

Down in the basement the Vehicle Equipment Company holds forth with a big line of commercial cars, all of them being comparatively large. A big brewery wagon having a capacity of 3 tons is shown filled with the "goods." These cars all have two motors, one for each rear wheel, driven by either spur gears or by chain. Full elliptic springs are employed. The wagons are all very finely finished, and a big white stake truck in particular presents a very attractive appearance. Either wheel or lever steering can be fitted, the smaller cars having lever, the heavy trucks wheel, as a general rule. Six complete vehicles are shown, a 5 ton, 3 ton, 2 ton, 3,000 pound, 2,000 pound and 1,000 pound.

THE ELMORE MANUFACTURING COMPANY,

pioneers in the use of the two cycle engine in automobile work, display two new models, a three cylinder and a four cylinder car. They have stopped building the two cylinder engine. Both of these engines are of the two cycle type, and are placed under the hood at the front. The three cylinder car has a light touring body. The wheels are 34x4 inch, and the wheel base is 104 inches. Pressed steel frames are used, also three speed and reverse sliding gear transmission and rear hub and transmission brakes. The hub brakes are bronze shoes against steel drums. The clutch is of the internal expanding band type, which gives gradual engagement. The cylinders are practically the same as the old horizontal ones, and are of the three port crank case compression type. Into the by-pass is fitted a screen to prevent crank case explosions. The crank cases are completely divided, and the bearings between



are long and lubricated by a hand screw pressure grease cup, with five tubes to the crank shaft bearings. A Hill precision oiler on the dash forces a small quantity of oil to each cylinder and into each crank case. Jump spark ignition by storage batteries is used. The timer is a Splitdorf, and is mounted on a small vertical shaft run by bevel gears from a side shaft, which carries a gear pump at the rear and a pulley for the fan belt at the front. This side shaft is run by a chain. An interlocking device is used so that the gears cannot be shifted until the clutch is released. The carburetor is of their own design and arranged to give a slightly richer mixture when throttled down. The throttle on the steering wheel operates a shield around the nozzle to cut off the communication to the engine. Just at the entrance to each crank case is a throttle which can be operated from the dash, and makes it possible not only to completely shut off one cylinder, but by the same movement, by means of a knife switch on the dash, also cuts off the spark from that cylinder. This device renders it possible to economize fuel on easy roads by running on two cylinders only, and it is also useful in testing the engine. The car, it is claimed, will nearly always start on the spark. The cranks are set at 90°.

THE ROYAL MOTOR CAR COMPANY,

of Cleveland, exhibit three models, the Royal touring car, a limousine and a landaulet, the same type of chassis being used for all. The four cylinder vertical tandem engine is 5x5½, rated at 40 horse power. The drive is by bevel gears. The wheel base is 110 inches. The cylinders are cast in pairs. The valves are on opposite sides, mechanical and interchangeable. The three speed sliding gear transmission runs on ball bearings. The gears are bolted to flanges made integral with the shafts. A slight change from last year has been made by placing the idle for the reverse at the top of a stud instead of at the bottom of the case. A new worm and segment type of steering gear, which is adjustable and has no parts keyed but all fastened by either squared ends or bolts, has been adopted. The carburetor is jacketed with hot water from the engine instead of hot air from the exhaust, as used on the 1905 cars. A very large fan which practically covers the entire radiator is used. This is driven by a triangular section broad leather belt which cannot run off and which stretches very little. The clutch is a leather faced cone, having flat springs under the leather, so that it starts the car gradually and easily. A full universal joint is placed between the clutch and transmission. The clutch pedal is arranged to operate the throttle. No governor is used. The brake on the driving shaft does not, as last year, also throw out the clutch, but is independent. On its circumference is a ratchet sprag which can be connected for use or not, at the purchaser's option. The rear axle casing takes the weight off the car, and the floating ax drives the wheels by means of a positi clutch on the hubs. The entire engine a transmission is protected by a removal aluminum pan.



PACKARD "24."

At the stand of the

PACKARD MOTOR CAR COMPANY

are displayed their usual highly finished ex hibition chassis mounted on a pedestal ar surrounded by a chain railing; a comple touring car, a touring runabout and a l mousine. The features of these cars, whic are all mounted on the same chassis, were fully described in a recent issue of THE HORSELESS AGE. An interesting detail i their ignition system is the use of knif switches, which conduct the secondary cur rent from the cable terminals to small fit tings which screw on the ends of the spark plugs.

THE WALTER AUTOMOBILE COMPANY

offer a 50 horse power and a 40 horse power, four cylinder chassis. The cylinders are cast in pairs, and the cars are fitted with sliding gear transmission of three speeds forward and one reverse, and shaft drive. The 50 horse power touring car weighs complete 2,800 pounds. The inlet and exhaust valves are both in the cylinder head, and operated by vertical push rods and rocker arms. The inlet valve spring is of the helical cone type, very broad at the base, and the upper end passed through the slotted valve stem, and is easily removable. One cam shaft with cams made integral is used. All gears are encased. The crank shaft is cut out of a solid slab of chrome-nickel steel, and is supported by three combination bronze and babbitt bearings. The oiling is by splash, the base being fed with oil by a sight feed oiler on the dash under pressure from the exhaust. The same box has a large hand grease cup in it with three leads to such parts as require only occasional oiling; for instance, the bronze centrifugal gear driven

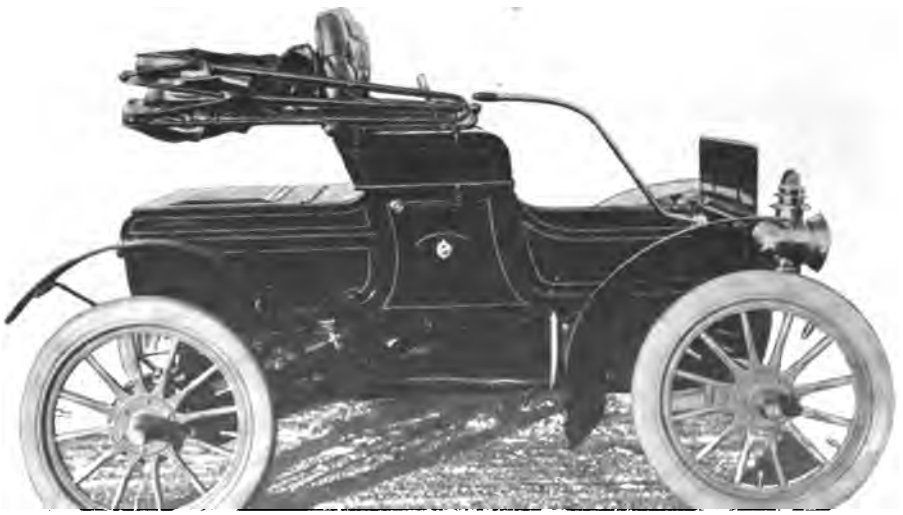


ROYAL LIMOUSINE.

pump. Two sets of spark plugs are provided, one set in the head of the cylinders being operated by a quadruple coil timer and storage batteries; the other set are screwed into the cylinder sides and are operated by a Lacoste high tension magneto driven by a chain from the main shaft. These are independent, and can be run separate or in unison. The cellular radiator is their own make, and the fan is mounted on the forward engine cylinder so as not to strain the radiator. The clutch is a large aluminum cone, faced with a special fabric which resists wear and the action of oil better than leather. Through this, at six places around the periphery, project flat spring pressed metal plates, which engage the flywheel cone gradually before the fabric comes in contact, and this gives a slipping surface and a gradual gripping. The three speed sliding gear mechanism is connected to the clutch by a universal joint, and is operated by a side lever in an H slot. By swinging this lever to the right or left out of neutral (in which position it is held normally by springs), it engages short levers which throw in the speeds. With this system it is possible to go from the neutral position into any speed directly without first passing through the other speeds. The drive is direct on high speed. The transmission runs on Hess-Bright bearings. The sliding gear shaft is fluted and not squared. The usual control is on the steering wheel, the connection for the throttle from the bottom of the column being by chain. Two sets of brakes are used, the emergency being expanding bands, fabric faced, while the foot brake acts on a drum at the rear of the gear case. This brake is a contracting band, fabric faced, and is independent of the clutch. A ratchet sprag is provided on one of the rear wheel drums.

APPERSON BROTHERS AUTOMOBILE COMPANY

exhibit their 40-45 horse power chassis





LOCOMOBILE 1906 MODEL.

fitted with different bodies. The motor is a four cylinder vertical. The car weighs complete about 2,800 pounds. The limousine is very luxurious and roomy. The rear seat accommodates there persons, two folding seats on pivots being provided. These seats face forward. The front seat is divided, the dividing arm forming a convenient carrying box. The ignition is by jump spark, with two separate sources, a storage battery and a 1906 Remy high tension magneto. Individual compression reliefs are provided on each cylinder for priming, and also relief cocks on top, all being opened from the dash, to facilitate cranking. Each cylinder water jacket has a drain cock at the bottom to ensure draining the packets completely. The water circulating pump is connected directly on to the end of the inlet cam shaft, and no gears are used. The flywheel is used as an exhaust fan. The same contracting band clutch is used as in previous years, as they felt they could not improve on it. This clutch is very light, consisting essentially of a steel band contracted by a wedge shaped piece onto a bronze drum fast to the flywheel, it being almost identically the same mechanism as used for rear wheel brakes. A new muffler cut-out has been fitted into the pipe at the entrance to the muffler, and is operated by a foot button. The gears cannot be shifted while the clutch is engaged. This is accomplished by a pin which fits into notches in the gear shifting rod. When the clutch is released by the pedal it pulls out this pin by means of connected levers. A Krebs type of carburetor is used, with a diaphragm for supporting the piston shaped auxiliary air valve. The control levers for the spark and throttle are on a stationary sector on the wheel, while just below the wheel on the post is a small finger lever on a notched sector for varying the mixture by adjusting the nozzle opening. The jack shaft runs on roller bearings, as do also the change speed gear shafts. Stuffing boxes are used where the jack shaft comes out of the case to prevent oil working out. The pull on the rear wheel brakes is equalized by a short pivoted whiffletree link. The jack shaft brake is of the contracting type, cast iron shoes on a steel drum.

THE OLDS MOTOR WORKS

show a continuation of the old line of cars, with the addition of a straight dash runabout and new truck; also a new two cylinder two cycle car and a four cylinder car. Five models of pleasure vehicles in all. The cylinders of the two cycle model are cast separately, and are of the three port type, with crank case compression, the case being divided and a long bearing in the partition, with metal and felt washers inside, to prevent leakage of gas or oil. The oiling is by a Hill precision oiler, chain driven from the main shaft, to the hollow crank shaft and outward to the pins. A screen is used in the bypass to the combustion cham-



OLDS MODEL S.

ports open. Four rings, one at the bottom, are used on the piston. The ignition is by jump spark, with the plugs directly in the middle of the heads.

LOCOMOBILE COMPANY OF AMERICA.

Tracy's Vanderbilt Cup racer, which made such a very creditable showing on that occasion, is to be seen at the Locomobile stand on the main floor. The car has not been touched since the race, some of the mud still being visible which Tracy picked up on his way over the course; but this battered up, muddy machine seems to appeal to the people, who continually crowd around it, and gaze on it with veneration, as they would upon some historic cannon which helped save their country. Just beside the cup racer is the latest product of the Locomobile Company in the shape of a large touring car of 40 horse power. The car is of the popular straight line body type, in rich red with red upholstering. The painstaking care which the Locomobile people take in finishing up and assembling the important parts of their cars becomes evident when one looks at the chassis and completed product. The Locomobile Company also show a limousine and a smaller touring car in gray and black. This gray and black color scheme shows up a car very nicely, and for a small car is very desirable, making the car look much larger than it really is.

F. B. STEARNS COMPANY.

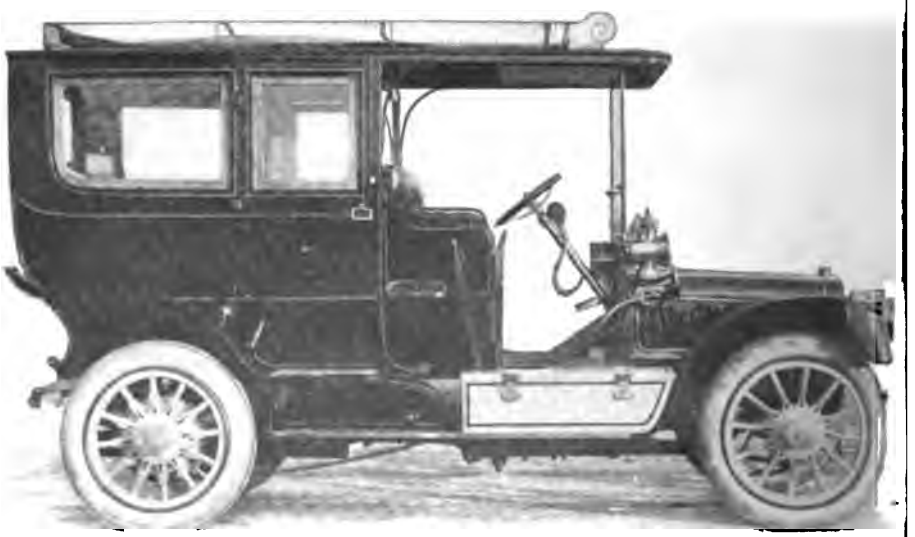
Two touring cars and a polished chassis make up the Stearns exhibit. The Stearns Company claim to use only the very best material, and all castings and forgings in each car are passed through an inspector's hands when they first reach the Stearns factory. Then pieces of every lot are tested to show that they come up to the required specifications. After being machined each piece must pass a micrometer test, and parts must be accurate to within the .001 part of an inch. One of the Stearns features is a ball bearing transmission giving forward speeds and reverse, built on known European lines. In fact the Stearns car is of the foreign type.

HOLLANDER & TANGEMAN.

At the Hollander & Tangeman stand are to be seen the Fiat models, ranging from the 20 horse power touring car to the 50 horse power touring car, with 134 inch wheel base, which is the most expensive stock car in the Garden Show. The 20 horse power is a bevel gear drive, while both of the larger cars have side chains. The engines and chassis are alike, except for size and power. A few changes have been made. A new patented system of pivoting the radiator on trunnions at either side on the frame to prevent straining and leaking is used. The carburetor has been slightly changed so that the gasoline nozzle opening varies with the opening of the throttle on the wheel. The mixture can also be varied from the dash. The make and break system is used, with current from a Simms-Bosch magneto. The governor rotates a gear fast to the igniter cam sleeve, so as to rotate the sleeve carrying the cams relative to the actual cam shaft within it. This changes the time of the spark according to the speed of the engine. This gear being in mesh with the gear on the magneto armature it also rotates the armature proportionally so that the spark is always made when the armature is in the maximum field. The sliding gear is operated by the selective system, and the gear shifting mechanism is all encased to keep out the dirt. Two brakes operated by a single lever are placed, one on the jack shaft, and the other on the front of the transmission case. The pull to these brakes from the single lever is equalized. The emergency brake lever operates through a special equalizing device the very large rear wheel hub expanding brakes. The special Fiat mechanical lubricator is placed on the dash. The multiple disc clutch has been changed, only steel plates and no bronze being now used, and it runs in oil. Individual screw caps are now placed over the valves, instead of the yoke held by nuts as used last year.

DECAUVILLE AUTOMOBILE COMPANY.

The Decauville Automobile Company exhibit the Decauvilles, the English Daimler and the C. G. V. The Decauville line consists of four cylinder engines ranging from the 12-16 horse power touring car chassis of 96 inch wheel base to the large 30-35 horse power touring car chassis with side chain drive and 125 inch wheel base. There are very few changes from last year's model. Ignition is furnished by high tension magneto direct to the plugs over the inlet valves or to another set of plugs by storage batteries through a quadruple vibrating coil on the dash. The oiling is accomplished by a pressure feed from the exhaust through sight feeds on the dash flooding the bearings and furnishing oil for the splash. The steering wheel is on ball bearings, and carries the spark and throttle on a stationary sector. All but the largest car have three speed sliding gears and shaft drive. The 30-35 horse power car has four speeds and reverse and side chain drive. Hess-Bright ball bearings are used in the transmissions. Two sets of brakes are supplied, one on the jack



DECAUVILLE LIMOUSINE.



FOUR CYLINDER NORTHERN TOURING CAR.

shaft or driving shaft, and the other on the rear wheel hubs. The clutch is of the self contained cone type. The English Daimler has a four cylinder engine, rated at 28-36 horse power. The transmission is of the four speed and reverse sliding gear type, with the selective system of handling, except the reverse, for which a separate lever has been provided, which is interlocked so no other speed can be thrown in. Side chain drive is used. The emergency brake lever handle protrudes from the lowest part of the arm of the driver's seat, and is pulled upward, while the foot brake pedal pushes forward. This arrangement gives a chance for a good purchase. The oiling is from a tank under the hood by exhaust pressure into two adjustable sight feeds on the dash, from which it flows to the engine. The spark and throttle levers are combined into one on the steering wheel. The clutch is a leather faced cone, with flat springs under the leather to make it grip gradually. All important bearings are ball bearing. Jump spark ignition is used, either by storage battery, single coil and distributer, or by Simms-Bosch high tension magneto to the plugs. The body is hinged at the rear, and may be lifted clear of the mechanism. The C. G. V. shows very little change from last year. The gear shifting lever on the large types has been changed to the selective system. Both storage battery coil and roller contact timer and Simms-Bosch magneto are furnished with one set of plugs. All gears are encased, as usual, and the spark and throttle control on the steering wheel are as before.

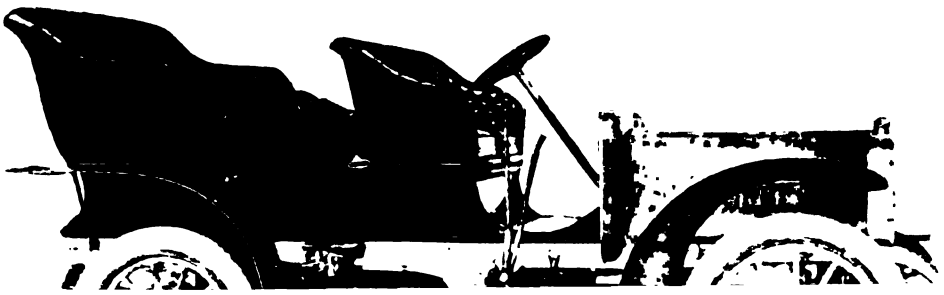
BABCOCK ELECTRIC VEHICLE COMPANY.

The Babcock Electric Vehicle Company is an old firm with a new name. It used to be the Buffalo Electric Vehicle Company. about is built on the lines of a gasoline car, having a hood in front and also wheel steering. Two other carriages, one of them with folding front seat, are also exhibited.

STUDEBAKER AUTOMOBILE COMPANY.

The Studebaker Company this year have three stands, the one on the main floor where a full line of their gasoline cars are shown; one in the basement, where deliveries of various kinds are to be seen, and one in Exhibition Hall, where they have a few electric pleasure cars and a large electric ambulance.

THE NORTHERN MANUFACTURING COMPANY show three distinct types. The small single cylinder runabout remains practically unchanged from last year, except for the longer wheel base. The engine is 7 horse power single cylinder under the body, chain drive. The next larger car is the two cylinder, with 20 horse power engine instead of 18 horse power. The engine is placed transversely under the hood. A planetary transmission is used running in oil in a case cast integral with the engine crank case. The transmission is by a long shaft to the bevel gear drive, no torsion rods being used. The wheel base has been increased to 106 inches. No side levers are used. The adjusting screws for the planetary gear are on the outside of the case and accessible. The cover of the crank case forms an oil tank, which uses the crank case pressure to feed the oil through a sight feed into the case. The cylinders are offset so that the splash does not throw oil too plentifully into the opposite cylinders. The plugs and priming cocks are set into an L shaped pipe, which protects the plugs from oil. The drive is through one universal joint direct to the pivoted rear axle. The high and low pressure mufflers are still used, giving about 8 feet of muffler and a noiseless exhaust. The Lacoste timer runs on ball bearings. The large rear hub brake drums are now of pressed steel instead of castings, 30 pounds being saved. The new 30 horse power four cylinder car, with its many new features, probably caused more comment than any other car in the Garden. The engine cylinders and the upper half of the crank case are all cast in one piece. The inside of the water jackets are cleaned and galvanized to prevent rusting. This casting costs to replace about the same as two ordinary cylinders cast in pairs. The cylinders are 4½x5 inches. The transmission is of the three speed and reverse sliding gear type, and is operated by a small hand wheel on top of the steering wheel. The lower half of the crank case is an aluminum casting, which forms the support of the engine or the frame, and also acts as a dust shield. It also contains the oil reservoir, which feeds into the two crank case compartments, float feeds maintaining a constant level in the case for splash. This tank has a dial which indicates how much oil it contains. The flywheel spokes act as an exhaust fan, and inside the hub is a leather disc fast at the edges of the flywheel, which is forced by compressed air against a steel plate, which is coupled by a universal joint to the driving shaft. The air pressure is produced by a vertical plunger pump worked by a connecting rod from the rear end of the cam shaft and reaches the clutch by passing through the hollow crank shaft. The timer is on the front of the cam shaft. Both valves are in the head, and operated by push rods and radius arms. The 2 to 1 gears are en-



cased and form a gear pump for the water circulation. The starting device is a handle which swings through an angle of about 90° It connects by a ratchet to the shaft, and in taking its grip on this ratchet it automatically retards the spark. The carburetor auxiliary air inlet is of fibre and has no springs. Air is drawn for the carburetor from a locker under the front seats, where the air is warm and no dirt can get in A lever, 2 inches long, on top of the wheel controls the clutch. A short lever under the wheel controls the throttle, and when retarded beyond the neutral puts on an internal band compressed air brake on the rear wheels. A ratchet foot pedal puts on another internal expanding brake in the rear hubs. Reverse is by a short pedal protruding from the bore of the steering column. There are no levers on the side of the car.

ELECTRIC VEHICLE COMPANY.

The well known Columbia cars are shown at three stands, the electrics in Exhibition Hall, gasoline in the main hall, and trucks in the basement. Their electric vehicles are very prominent at the Show, and a new electric just completed attracts a good deal of attention. This is a C spring victoria, and, contrary to usual practice, the rear or main seat is mounted on large C springs, which in turn are fastened to the main frame, which has the usual semi-elliptic springs. This rear seat is extremely luxurious, riding just like a cradle, and not a shock or jar from any obstruction in the road can reach the occupants of the rear seat, it is claimed. Besides the victoria there are electric hansoms, broughams, landaulets and phaetons. The Columbia gasoline car is so well known that any detailed account of the car would be superfluous. At the stand on the main floor are shown two chassis, two touring cars and a limousine. A line of commercial cars is shown in the basement. Columbia vehicles are claimed to represent the best results of the work of generations of wagon and truck builders, supplemented by motive apparatus of the highest standard of efficiency and reliability.

DE DIETRICH AUTOMOBILE COMPANY.

The De Dietrich Company suffer this year for lack of room. Placed in one corner of Exhibition Hall, a polished chassis of this well known French car takes up most of the space available. There are some beautifully polished chassis shown at the two shows, but for richness of appearance, without being flashy, the De Dietrich chassis is hardly excelled. Many of the foreign cars sold have bodies made to order to suit the purchaser, and at the De Dietrich stand the customer finds facilities aiding him in choosing a suitable type of body, consisting of a number of illustrations of different types of cars finished in colors.

GEORGE N. PIERCE COMPANY'S

stand contains a polished chassis of the Pierce Great Arrow, besides complete cars showing different bodies. The small one cylinder stanhope was not shown, and is practically unchanged. The 28-32 horse power, and the 40-45 horse power chassis are practically alike, except in size. Some changes have been made, the most important being the change in the transmission to a direct drive on the high. An Oldham coupling has been placed between the leather faced cone clutch and the transmission. The timer has been taken from the position in front of the cam shaft, and is now on a vertical shaft driven by bevel gears from the cam shaft. The governor and 2 to 1 gears are all enclosed, and the pump is accessibly located under the radiator and driven directly by the exhaust cam shaft. An auxiliary gasoline nozzle has been introduced into the carburetor, so it can the more quickly respond to sudden variation of opening. The steering gear has been changed from the bevel pinion and bevel segment to the nut and screw type, with ball thrust washers at the top and bottom. The oiling system has not been changed for about five years, and is as follows: At the bottom of the engine case is a drain or well into which all surplus oil from the crank pit flows through screens. From here it is forced by a gear pump to a tank placed over the exhaust pipe to keep the oil fluid at all seasons. The level of oil in this tank is shown on the dash in a glass indicator. From here it flows by gravity to flood all the main bearings, and through the hollow shaft to the crank p The surplus then flows into the pit at bottom. No splash is used, but the must take care of the cam shafts and p tons. This system seems to give entire isfaction. Both sets of brakes are on rear wheel hub drums and are bronz steel. The gear shifting lever is acces located just under the wheel, and an in locking device is used so no gears ca meshed while the clutch is engaged.

THE AUTO IMPORT COMPANY

exhibit at their stand three types of t Rochet-Schneider car, differing princip in their horse power. The 18-22 is a sh drive, while the 30-35 and the 50 h power have side chains. The feature the large car, which is typical of the oth are as follows: Four cylinder eng 140x140 mm. stroke, rated 50 horse pow A four speed sliding gear transmiss operated on the selective system and r ning on Hess-Bright bearings, 121 i wheel base and side chain drive to r wheels. The flywheel acts as exhaust f and in its hub is the new metal to me cone clutch, which is very long and of com paratively small diameter. This clut runs in oil, which is fed to it through hollow shaft from the rear division of t crank case. The make and break sp system is used, fed from a Simms-Bo magneto. The spark lever has bee changed from the dash to the top of t steering wheel. The lubrication is a pre sure feed upon the exhaust chamber of t rear cylinder through a sight feed on th dash to the engine case, which is divided into two compartments, the rear one w which receives the more oil in order to tak care of the clutch. The centrifugal gov ernor is encased, and operates the pist valve in the carburetor. The carburetor motor jacketed. There are two separat band brakes on the jack shaft, and also th emergency brakes operated by the side lever to the rear wheel drums. There are three foot pedals. The right one operates to release the clutch and then puts on one of the jack shaft brakes; the middle one operates the other brake, and the left one the clutch above. All brakes are metal to metal.

MATHESON MOTOR CAR COMPANY.

The Matheson is making quite a stir in Exhibition Hall, with its many exclusive features. They have only room for one complete car, a complete engine and a few extra parts. When a car comes out of the Matheson factory it is finished in every respect, for a more complete equipment is furnished than with any other car. A novelty is seen in the use of a carburetor with glass sides, which makes it possible to see how this important part is working by simply lifting up the hood. Another novelty is the water cooled brakes; anyone who has ever had a brake band run hot on his car when descending a long hill or mountain will appreciate this feature. Self



COLUMBIA LIGHT FOUR CYLINDER CAR.

arting from the seat, valves that do not quire grinding, automatic lubrication, au-matic carburation, make and break igni-n, large ball and roller bearings, a re-procating, rotary spring suspension, and ge wheels are a few features of the atheson. The regular equipment of this r includes top, glass front, gradometer, lometer, speedometer and a large variety extras.

THE AUTOCAR COMPANY

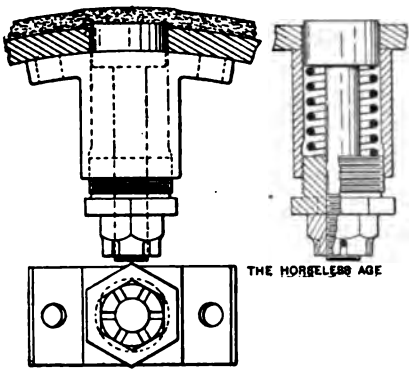
hibit their new four cylinder touring car increased horse power, with body much gher and with larger tires, but otherwise ong the same lines as last year's car. The nall runabout has a large engine of the me double opposed type as last year. The d side steering and control have been dis-arded in favor of wheel steering and the ecial "grip in the steering wheel" control. he same metal to metal clutch is used in oth cars. The push rods on the small en-ine are now adjustable in length, and a ew Holley carburetor is used. A three peed sliding gear, with interlocking device, s applied in both cars.

THE BUICK MOTOR CAR COMPANY

ave brought out a new four cylinder car n addition to their two cylinder opposed nodel. The latter model remains practic-lly unchanged, except in minor details, uch as hood and radiator. The four cylin-ler engine is rated at 35 horse power. The ngine has the flywheel at the front, and he metallic multiple disc clutch case and hree speed transmission are all made rigid o the engine, and supported at two points t the front and at the rear on three points lose together and resting on coil springs or flexibility. Shaft drive is employed. The Lacoste timer on one side and the cen-rifugal pump on the other are on short orizontal shafts at right angles to the en-gine, and are driven by bevel gears from he cam shaft. The cylinders are cast sepa-ately, with valves all mechanical and on opposite sides. Mud is kept off by a pan nder the mechanism, and by a shield be-ween the pan and front mud guards. The springs are both full elliptic, the rear ones eing very long and flat, having the axle ung to the rear of the centre. The wheel ase is 100 inches.

THE WALTHAM MANUFACTURING COMPANY

ave a line of five air cooled, four cylinder engines of the high speed variety and the Orient buckboard. The buckboard has been entirely changed from last year. The en-gine is hung on the side wood sills of the frame, and a friction wheel and disc trans-mission is used. It is claimed to be a great hill climber and noiseless. The engine will attain 2,600 revolutions running free and



DARRACQ CLUTCH SPRING PLUG.

flanges on the engines run lengthwise. The gears are encased. A special carburetor developed by the company is used. All valves are mechanical, and one spring by means of an equalizing yoke operates two adjacent valves. The drive is by shaft and bevel gear.

F. A. LA ROCHE & CO.

show 40-60, 20-32 and 15-20 horse power models. All are equipped with side entrance bodies and embody the latest features of Darracq design. The engines are now made with the valves all on one side.

An interesting novel feature in this year's Darracq model is an improvement in the clutch, whereby the latter takes hold more gradually in starting the car. The clutch is of the usual cone type, and secured to the inside of the aluminum cone; at distances of several inches all round its circumference are spring plungers, as shown in the accompanying drawing. The heads of these plungers slightly raise the facing leather, in such a manner that the leather at these points comes in contact with the friction surface of the female cone first, and as the spring plungers are adapted to give slightly, the engagement of the clutch takes place more gradually. The spring tension is adjustable.

SIDNEY B. BOWMAN COMPANY

display bodies upon four different chassis, with powers from 24 to 60 horse power. In the 24 horse power the cylinders are cast separately, with valves on opposite sides, all mechanically operated. The ignition is jump spark from Simms-Bosch high tension magneto. The spark is stationary; the engine and four speed sliding gear transmission are supported on a channel steel sub-frame. A cellular radiator and gear driven centrifugal pump are used for cooling. A Dubrulle force feed oiler on the dash supplies the oil to the parts. The drive is by shaft to bevel gear. On the transmission brake drum is a ratchet sprag. The emergency brakes are of the expanding internal type on the rear wheels, and the hub. A piece of the shaft to the transmission is removable, which permits of easy access to the clutch. The four speed sliding gear is operated on the selective system, and the drive is through side chains to the rear wheels. The clutch pedal is connected to the throttle, and no governor is used.

Parts Exhibits.

THE NATIONAL BATTERY COMPANY,

of Buffalo, N. Y., show a sample "National" vehicle storage battery cell, with a section removed, illustrating the method of construction. The positive grids, made in staggered form, possess large conducting surfaces; the negatives have a patented form of corrugated, punched and clinched grids, with active material on two sides of the plate. Light weight, stiffness and great capacity per pound are the claims of the National people for their vehicle batteries. An important feature of all National automobile batteries is a pair of soft rubber bridges in the cell bottoms, which greatly reduce the jarring that the elements receive, and results in less loss of active material from the plates. The company is prepared to furnish batteries for any purpose to which storage batteries are adaptable.

THE AUTOCOIL COMPANY,

of Jersey City, N. J., manufacturers of spark coils, are featuring for 1906 the "Unit" coil system. This consists of self contained, easily removable individual coils. For a three cylinder engine four coils would be carried; for a four cylinder engine, five coils, and so on, the idea being that it is much easier to insert a spare coil than to waste time on the road adjusting a cranky vibrator. Each unit coil is enclosed in a polished hard rubber case, moulded in one piece, making it absolutely damp proof. A choice of four styles of vibrator is offered, viz., Lacoste, compound, ordinary single spring and improved double spring. Unit coils enclosed in wood are made for those who do not care to pay the slight increase in cost of the hard rubber cases.

Many strong claims are made by the

BELDEN AUTOMOBILE TRANSMISSION COMPANY,

of Pittsburg, for their Belden transmission. In this transmission the drive is by shaft to bevel gears on the rear axle or countershaft, and is normally direct. Speed changes are effected by unmeshing the bevels and interposing a pair of spur gears in a peculiar manner. The periphery of the bevel gear is machined into a coarse pitch spur gear. The intermediate spur gear carries on its side two sets of pin teeth, which mesh with the coarse spur gear attached to the bevel gear. By means

many styles to suit different makes of cars. This firm is headquarters for the Bougie Mercedes in all threads; Guenet coils, with Carpentier interrupter; imported Hagen storage batteries (a prominent German make); the H. H. carburetor; the B. B. pump, a power or hand air pump; Herz's new patent safety switch; gaskets, wire terminals and many other important sundries.

THE MOTSINGER DEVICE MANUFACTURING COMPANY,

of Pendleton, Ind., have secured contracts to supply several of the largest and most important gas engine manufacturers of the country with their "Motsinger Auto-Sparker," which is to be incorporated as an integral part of every engine sent out to their customers. No changes of moment have been made over last year's model. Both touch and jump spark ignition systems may be started without the aid of batteries with this sparker, and the pivotal feature, controlled by the governor balls on the armature shaft, which has been fully described in THE HORSELESS AGE columns, is guaranteed to take care of all speeds above the normal.

C. BILLY,

of Paris and London, shows an elaborate sample line of imported automobile lamps. Many different types of lens and reflectors make it possible to fully meet the requirements of each individual purchaser. The majority of lamps are intended to be supplied by an independent generator, but a few models are shown which are mounted upon the generator. This makes a very compact arrangement, and for certain cases has many advantages. Oil lamps, electric lamps and motor cycle gas lamps are also to be had from Mr. Billy.

E. J. WILLIS & CO.,

the large wholesale and retail sundry house of Park place, New York, are making no attempt to display a full line of samples. The restricted space allotted to them in the top gallery makes it impossible to more than indicate the great diversity in specialties kept in stock at their downtown house. The Hopkins "Autolog" is being featured. This is a speed recording instrument, which indicates speed in both miles and kilometres, gives speed and mileage and time for each separate mile; speed from 1 to 60 miles per hour, speed from 1 to 100 kilometres per hour, trip mileage and total mileage. A three toned horn termed the "Exhaustaphone" and a late model of French siren horn are among the leaders for this season.

THE BETHLEHEM STEEL COMPANY

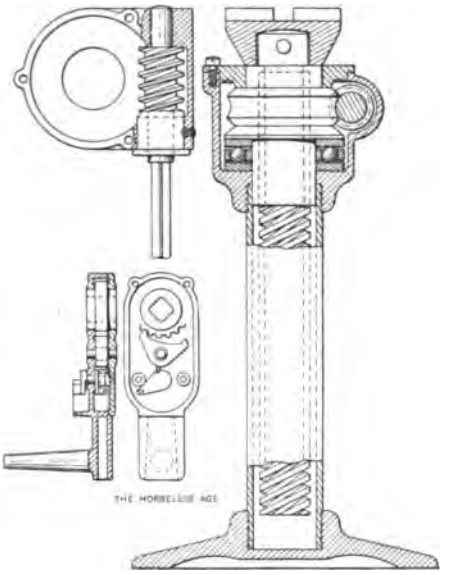
are exhibiting a line of drop forgings and flanged steel parts of various grades of steel for automobiles.

A. H. FUNKE

has on exhibition the Autolyte lamps, which come in different sizes and shapes, and have new patent hinges and locks; he also exhibits goggles, siren horns, a new bugle horn with eight tones and Autolyte generators.

THE ROTH JACK AND TOOL COMPANY.

This company, in addition to exhibiting a line of automobile jacks, are showing a key attachment which is placed on the starting and stopping lever of a car. This handle arrangement takes the place of the regular handle of the lever, and has a brass key fitting through the centre of it, it being impossible for the lever to be moved when the key is out. The mechanism of the jack consists of a worm and worm wheel and a nut and screw. The threads of the worm are of such pitch that the device is self locking and does not lower under load. The screw and the worm are made of crucible steel, and the worm wheel and nut are a single steel piece. The



ROTH AUTO JACK.

screw has a quadruple square thread, and is provided with a head adapted to take either a round or square axle. The jack has a round base, 6 inches in diameter, into which is screwed a tubular column made either of steel or brass, as may be desired. The worm wheel is mounted on a ball thrust bearing, which reduces the effort required to raise a given weight and minimizes wear. The gearing is such that 10⅝ turns of a crank which is slipped over the end of the worm shaft raises the screw 1 inch. The weight of the jack without lever is 10½ pounds, and its minimum over all height is 11 inches. The figure also shows a ratchet lever crank which can be furnished with the jack, and allows of its use in any position. The ratchet device is equally effective for both directions of motion—in other words, for raising and lowering the lifting bar. The jack is guaranteed to raise loads of 5,000 pounds. The firm also makes jacks for other purposes for loads up to 60 tons and any lift desired.

AUTO BRASS AND ALUMINUM COMPANY.

A new lubricator is the chief feature of this exhibit; it is made of aluminum, has positive sight feeds, and is made with any desired number of feeds. In addition, they are displaying brass and aluminum steering wheels, hinges, carburetors and other automobile specialties.

THE WEED CHAIN TIRE GRIP COMPANY.

The main portion of this exhibit consists of Weed chain tire grips, which are placed on tires to prevent skidding. They are also demonstrating Lashar's electrical speed indicator, which is so constructed that from the current producer electric energy in proportion to the speed of the car is passed through ordinary telephone cables to the mechanism operating the hand on the dial, which shows any change in the speed of the car.

THE GILBERT MANUFACTURING COMPANY

have on exhibition a line of tire cases, tire holders, inner tube cases, tire bands, tool rolls, leggings, knuckle boots, sleeve protectors, storm aprons and lamp covers. Their one specialty is a waterproof tire case having a spring wire at each end which tightens around the edge of the tire when placed thereon. This does away with all lacings.

SCHWARZ WHEEL COMPANY

are showing a general line of wheels for automobiles of various sizes; these are made for pneumatic tires as well as for solid. The company employs a special construction which is patented to them.

THE LUNKENHEIMER COMPANY

have a line of positive mechanical feed lubricators, grease cups, oil cups, straightway and angle strainers, globe and angle needle valves, steel and brass stem, with union, and Premier pressure oil cups for gasoline engines.

THE PANTASOTE COMPANY

are exhibiting. Pantasote—a fire and water proof material—for automobile tops and trimmings. It comes in all colors, and is used also for slip covers. In addition to this, they are showing a line of silk faced Pantasote for limousine curtains. To prove that Pantasote is waterproof they have a small tank at their booth in which is lying a piece of the material filled with water, and containing about twelve live goldfish.

DUPLEX IGNITION COMPANY.

This company's exhibit consists of a spark plug, which has two circuits, a lower and an upper one; a small black hard rubber switch on top of the plug when down connects with the lower electrode, making the lower circuit, and when up, with the condenser, making the upper circuit. When the plug is clean the switch is placed in the lower position. If the plug becomes short circuited from soot or oil, by pulling the switch up the spark will again jump.

THE C. T. HAM COMPANY.

In addition to their line of lamps of various styles and sizes for front, side and rear of automobiles, they are exhibiting

Tourist lamp, which shows a very
it light, having a corrugated lens. All
lamps burn oil and not acetylene.

HATCH & BRITTIN.

his exhibit consists of an accident case,
ch comes in two sizes. These cases
ain chemicals, salves, bandages, absorb-
cotton, shears and other essentials in
of an accident, and are especially
pted for being carried on automobiles
ause of their lightness in weight and
ipact form.

NATIONAL SALES CORPORATION

showing a combination of the Con-
ticut Telephone and Electric Company's
, with a plug switch attachment which
tens to the dash, and a low reading
meter to show the consumption of the
l while the engine is running. They
o have on exhibition a semi-dry storage
ttery, which is being demonstrated in an
side down position, lighting a number of
issler tubes.

HORACE E. FINE,

addition to his regular line of brass and
uminum monograms, name plates and
ense numbers, is exhibiting removable
uminum license lamp numbers on a phos-
hor bronze spring, which fits on the in-
ide against the glass of any lamp.

HARRY A. ALLERS & CO.

re exhibiting Solarine, a metal polish
which is especially adapted to the highly
olished parts of automobiles.

DUNN SEMI-DRY BATTERY COMPANY

ave an exhibit consisting of semi-dry bat-
ery cells, which appear the same as regu-
ar dry battery cells, being encased in card-
oard; these cells come singly, in pairs and
n cases of any number.

THE ENGLISH & MERSICK COMPANY

re displaying an exhibit of interior and
exterior dome lamps, safety door locks,
loor handles of various designs, body han-
lles and small brass parts for different
ses; also a line of acetylene and electric
lamps of their own make and any shape.

HARBURG AND VIENNA INDIA RUBBER COMPANY.

This is the first exhibit of this concern at any show in the United States. They exhibit a pneumatic tire the fabric of which is composed entirely of Egyptian cotton, which has even a longer fibre than the Sea Island or domestic cotton. The side wall of the tire is heavier than usual, and is reinforced by more fabric than is ordinarily used. This tire is of the clincher type, and appears to be most efficient and serviceable.

JANNEY, STEINMETZ & CO.

show the well known Hill lock valve for insertion in gasoline feed pipes of motor cars; also their line of pressed steel tanks for automobiles and motor boats. A new production of this concern is a tool for various stages in the manufacture of an automobile crank shaft, from the rough billet to the finished shaft. This firm is noted for its armor piercing projectiles, manufactured for the Government, and they lay great stress on the fact that their crank shafts are manufactured from the same high quality of steel as used in the projectiles. The Carpenter Steel Company also furnishes to manufacturers a 35 per cent. nickel steel for valves and valve stems. A very interesting feature of this exhibit consists of several armor piercing projectiles of large calibre, defining the boundaries of their space.

HENRY HOOKER & CO.,

of New Haven, Conn., are showing a finely built aluminum tonneau for a Renault chassis. This tonneau is made from sheet metal formed by hand over hard wood forms. They also show a limousine in the white which possesses a novel feature in the shape of two folding seats facing to the rear, which when not in use fold up against the back of the driver's seat.

THE DIEZEMANN SHOCK ABSORBER COMPANY

exhibit a novel device for dampening excessive spring vibration on rough roads. The device comprises an ingenious arrangement of friction discs and levers. The frictional resistance of the discs can be varied at will by means of a small spanner furnished with the device.

THE CLIFF AUTO WHEEL AND AXLE COMPANY,

of New York, exhibit a novel device, the object of which is to increase the comfort of passengers and to lengthen the life of the tires, whether they be pneumatics or solids. This device takes the form of a spring hub, embodying principles which have proved successful in the building of railroad cars. Two concentrically arranged coil springs dampen road shocks and absorb nearly all of them, allowing only the resultant small shocks to reach the elliptics.

CHARLES E. MILLER.

Among the accessories exhibited by Chas. E. Miller are a new Powell muffler; an assortment of Brampton chains; a combination siren horn; an electric horn operated by means of a diaphragm and storage or dry batteries; a 1906 model of the De Dion spark plug, and an automatic air pump, which fastens to the dashboard of the car.

JULIUS KING OPTICAL COMPANY

exhibit a line of goggles for motorists, including a miniature goggle for children. The feature of this exhibit is the "Auto Lorgnette." This consists of a steel frame covered with leather to match the car, the frame being divided in the centre by an extra band of steel, and one-half having smoked celluloid and the other a clear celluloid pane. The smoked half is for use on sunny days and the clear one for use on dull days. There is an opening for the handle in both the top and bottom, sisting of two half bells which are held together by a thin rod running through them. This bell is placed under the floor of the car and is operated by a foot pedal. In addition to this bell, speedometers of various makes and other automobile necessaries are exhibited.

POST & LESTER.

In addition to their regular line of horns, lamps, generators, goggles, etc., they have on exhibition a clock called the "Luna Motor Clock." This timepiece has a luminous dial, so that the time may be easily discerned, no matter how dark it may be.

THE NOERA MANUFACTURING COMPANY

have on exhibition a variety of oilers, oil guns, dope guns, fillers and single and double action pumps. The latest model pump has a folding wire base, removable handle and outside right angle pinnach. These pumps can be equipped with gauges.

LACKAWANNA LEATHER COMPANY.

This exhibit consists of an assortment of chrome leather for trimmings and tops. It comes in all colors and is called exposure proof material, as the company claims it will stand any weather conditions.

SIBLEY & PITMAN

are exhibiting a line of accessories, the chief features of which are the Abelle combination speedometer and odometer and the Climax auto cell dry battery, which is claimed to have a capacity of 27 amperes at 1.6 volts.

THE WAY MUFFLER COMPANY.

This company's exhibit comprises chest, neck and ear protectors made of cashmere wool, the different protectors being made separately or in combination, and can be had in any desired color.

THE RUSHMORE DYNAMO WORKS.

One feature of this exhibit is a lamp for electric vehicles which contains a spiral filament closely wound. Another interesting exhibit is an acetylene generator, made of brass, 6x6x15, with a capacity of, approximately, 25 feet. This contains a tapper weight, which moves by the vibration of the vehicle and shakes all particles of dust through the sieve and into a pan at the bottom. They are also offering a siren horn of their own manufacture.

THE MIDVALE STEEL COMPANY

are exhibiting a line of steel for gears, all kinds of transmission parts and axles. They also have at their stand facilities for testing their steels, which they do for any one requesting it.

L. J. MUTTY COMPANY.

This is an exhibit of artificial leathers and rubber clothes to be used for tops and curtains. They come in all colors.

THE AUTO SUPPLY COMPANY

are showing an annunciator to signal to the chauffeur, which will be much appreciated on closed cars especially. On the

of the car is arranged a bank of electric buttons. Gently pressing a button lights a small electric lamp directly underneath one of the following words on the annunciator: Left, stop L, slow, turn, home, fast, stop R, right. By pressing still harder a buzz is set in operation calling the driver's attention to the signal. By releasing the button, the lamp and buzz are rendered inoperative.

THE MOTOR CAR SPECIALTY COMPANY,

of Trenton, N. J., have added one more function to their "Lea" speed recorder. The casing has been enlarged, and now contains an eight day clock. The device is called the "Lea Speedistimeter." Speed, distance and time may be learned from this combination instrument; the speed in miles per hour, the distance of the trip or the total mileage, and the time consumed in making any portion or all of the journey. Another of this firm's specialties is the "Lea tire pump," a double cylinder air compressor built on the principle of an opposed cylinder gas engine. A crank motion is used, the crank handle being adjustable as to length. For chain driven cars of fairly high power the Roebling chain oiler is offered for the first time. An aluminum oil chamber is bolted to the countershaft or driving sprocket. The centrifugal force exerted by the revolution of the sprocket wheel causes oil to flow to the chain through a series of minute holes in the periphery of the oil chamber. It is claimed that the amount of oil delivered does not become excessive at high speeds.

PHINEAS JONES & CO.,

the well known carriage and wagon wheel manufacturers of Newark, N. J., who several years ago commenced catering to the automobile trade, are on hand prepared to take orders for any style, shape, size or strength of wheels for every kind of service. They possess a well equipped factory, have a large stock of well cured material constantly on hand and the "know how," which is the all essential point in the art of wheel making, has been in the family for years.

THE SWINEHART CLINCHER TIRE AND RUBBER COMPANY,

of Akron, Ohio, will make for 1906 twenty-six sizes of their cushion clincher tires. This is a solid rubber tire of great resiliency, the resiliency being obtained by building the tire with concave sides and a wide tread. From the mass of testimonials exhibited by the Swinehart people it is easy to realize that the tire question is the burning question of the automobile industry; that automobile users everywhere are anxiously seeking relief from the unsatisfactory and expensive reign of pneumatics. The tone of many of the testimonials referred to is one of praise and delight, and would indicate that in Swinehart clinchers some, at least, have found such relief.

THE BRENNAN MOTOR COMPANY,

of Syracuse, N. Y., are bringing out a new design of cylinder to be used on their double opposed cylinder engines intended to be placed crosswise of the car, as for shaft drive. In this type the valves are placed vertically, which allows the cylinder heads to butt against the frame members. The four cylinder vertical motors are provided with mechanically operated inlet valves this year. Their regular two cylinder opposed engines have been improved by the addition of a multiple feed pressure oiling system. The crank case cover is made into an oil receptacle or tank. The feeds are on top of the oil tank, or may be placed on the dash; pressure is taken from the crank case. The engine crank bearing oil tubes go directly through the base of the oiler, delivering oil directly to the crank bearings. This combination crank case cover and oiler may be had to fit any of the earlier makes of Brennan motors.

THE ATWOOD MANUFACTURING COMPANY

show a full line of gas lamps and generators. Extreme simplicity in the matter of emptying and recharging is the feature of the Nos. 40 and 41 generators, the removal of two thumb screws being all that is necessary. A new line of Diamond style oil and gas lamps is shown, and the No. 29 side oil lamp is said to be a great favorite. The miniature lamps used by the Oldsmobile Company on their working models of the Oldsmobile were made by the Atwood Company on special order.



THE BARNES STEERING GEAR.

THE PITTSFIELD SPARK COIL COMPANY

show a fine line of coils and electrical accessories. Dash coils are offered for any number of cylinders from one to six in either oak or light or dark mahogany. The vibrator is claimed to be exceedingly fast, yet absolutely positive in action. It is of the semi-hammer blow type, original in design, and patents have been applied for. The "Pittsfield" timer for one, two, three and four cylinders is put together without the use of screws. The "Pittsfield" switch, the "Jewel" mica spark plug, the "Jewel" marine plug and wire terminals are other specialties manufactured by this firm.

THE BARNES GEAR COMPANY,

of Oswego, N. Y., exhibit their adjustable steering gear for automobiles, of which a cut is herewith shown. It is of the screw and nut type, the nut being made in two halves. In case of lost motion due to wear, the cover in the jacket is removed, which leaves an opening adjacent to the adjusting screw. The check nut is then loosened and the screw drawn up, which elevates the adjusting trunnion lever, which is opposed by the trunnion lever on the main shaft. The steering hand wheel is then moved slightly, and when all lost motion has been removed the check nut is tightened again and the cover replaced.

MANHATTAN AUTO TOP COMPANY

exhibit in the basement their line of tops. With them are also the Perfect Manufacturing Company, makers of the Perfection vehicle washer, and the Heath Company, makers of the Heath "Dry Gas," a novel form of dust cut in which the float and float chamber are lacking.



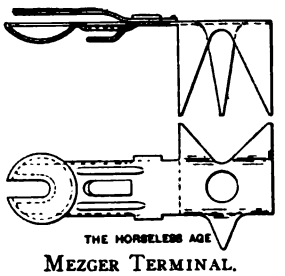
THEEN TWEET & CO.

rotary drive or with their new friction drive, and are fitted with a novel form of sight feed.

W. J. KELLS MANUFACTURING COMPANY show five styles of their radiators. These radiators are composed of two tube sheets connected by a multiplicity of non-corrosive metal tubes, and seem of substantial construction.

THE ATWATER KENT MANUFACTURING WORKS. of Philadelphia, have several new specialties for 1906. Foremost among these is what they term their "spark generator," but which is really a spark coil combined with an improved type of mechanical make and break, and a secondary distributor, the instrument depending for current upon batteries. The interesting feature is the mechanical make and break. The firm calls it a "mechanical vibrator," but it is distinctly stated that but one spark is produced at the plug. It may be remembered that for several years the mechanical make and break more than held its own in competition with magnetic vibrators, but great improvements in the latter and the seeming necessity at that time for a stream of sparks, instead of a single spark, caused them gradually to displace the former. Multiple coil magnetic vibrators have been always a source of annoyance to the inexperienced. This firm, it may be said, has gone back to first principles, endeavoring to refine and perfect the mechanical make and break; its good points have been accentuated, its imperfections eliminated or modified. The shaft, driven by the secondary engine shaft, carries a notched cam, which when driven clockwise raises a "lifter." By means of the lifter and an elbow lever the duration of contact between the platinum terminals remains a constant, and a quick make and break is accomplished at all engine speeds. If the motion of the shaft should be reversed, as when an engine kicks back at starting, no spark is produced. The continuation of the shaft through the coil box is made into the secondary distributor. Small battery consumption is claimed, a spark advancing lever is provided, and the whole outfit is mounted on the coil box, making a very compact arrangement. The regular offering of the company consists of separate timers for one, two, three and four cylinders, an easily manipulated dash switch of simple construction, voltmeters, ammeters, volt-ammeters for pocket and dash. A neat improvement in the pocket instruments has been made in the new models. Terminal leads have been discarded. The bottom of the metal retaining case is made to act as one terminal; to obtain a reading cored work. This firm is making a specialty of cylinder work, and is prepared to take orders for machining same to drawings and testing the jackets under water pressure. Pistons, rings, exhaust pipes, and air cooled cylinders are other automobile castings for which they claim a high standard.

A. R. MOSLER & CO. make a strong feature of their new "Soot-proof" plug and new timer, and they also show a complete line of coils. Their latest novelty is the Mosler eccentric snap timer. Wear on the parts is reduced to a minimum and good contact assured. The main shaft A of the timer runs on two ball bearings, B, C. The one B, which is grooved both in the shaft and case, acts as a thrust as well as a supporting bearing. The main shaft is provided with an eccentrically arranged stud D, projecting a short distance from the end. On a ball bearing E on this stud is mounted a rotary contact F, the periphery of which is arranged in position to engage the contact points H of the casing. All the ball bearings are adjustable. The fibre casing G



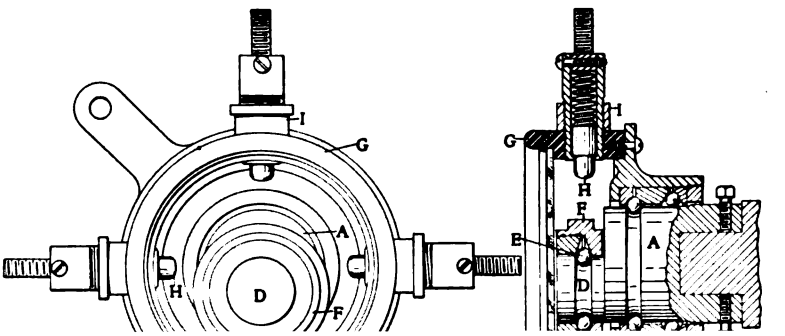
MEZGER TERMINAL.

contains the required number of contact points H, which are adjustable in or out by nuts I on the outside of the casing. The steel contact lugs, which have platinum points, are held inwardly by coil springs. As the shaft turns the rotary eccentric is brought against the yielding contact points of the casing, rolling over them, thus avoiding the severe wear of the wipe contact. The rolling also serves to constantly present a new point of contact to each lug, thus avoiding undue wear at any one point on the rotary member. By adjusting the contact points of the casing in or out, a longer or shorter contact may be obtained. This adjustment is very delicate. To advance or retard the time of ignition, the casing of the timer is revolved about the shaft in the usual manner.

THE COOPER HEWITT ELECTRIC COMPANY exhibit their Mercury Arc Rectifier for charging the main driving batteries of electric motor cars; also a small Mercury Arc Rectifier for charging ignition accumulators. The latter outfit is built practically along the same lines as the larger ones. The switchboard is 11 inches by 13 inches, back of which is the converter bulb, occupying a space of 9 inches. The maximum output is 5 amperes at 30 volts, allowing of charging from two to ten cells at a time. The outfit is provided with a handle at the top, and is not too heavy to be carried about. The Cooper Hewitt Company are also providing some of the automobile manufacturers with mercury vapor electric lamps for their plants. These lamps are claimed to be more efficient and more economical than either arc or incandescent lamps.

EDWARD SMITH & CO., of New York city, the varnish makers, are represented for the purpose of explaining the merits of, and taking orders for, their varnishes. They are prepared to furnish a line of varnishes especially adapted to the hard usage which automobile finishings generally receive. A few new shades and colors have been added to this year's stock.

WRAY PUMP AND REGISTER COMPANY. Pumps, tire pressure gauges and jacks are the specialties exhibited by this firm. The Kellogg compound double acting pump is a high pressure pump which, with little exertion, will produce a pressure of 200 or 300 pounds. The Kellogg multiple gear pump is a combined pump and pressure gauge, with valve lifting coupling that will show the interior tire pressure while pumping. Other types of pumps are the "Wray compound," the "triplex compound," recommended for garage work, and the



"Kellogg" single action pump. Another of this firm's specialties is the National tire pressure register, an enlarged model of which is mounted at this booth. The ease with which one of the compound pumps can be made to show 200 pounds pressure on the gauge elicits much favorable comment.

VALENTINE & CO.

have on exhibit a line of motor varnishes and paints for finishing work, in all colors.

THE WM. ROCHE DRY BATTERY COMPANY

had a very attractive exhibit of their dry cells, coils, switches, timers, etc.

SAMSON TIRE COMPANY

This exhibit consists of Samson tires with and without peg treads, inner tubes and casings.

THE MICHELIN TIRE COMPANY

are exhibiting a line of tires, shoes and inner tubes.

ORLANDO W. YOUNG

exhibits a full line of oils, greases, metal polishes and Cox's rubber patches, plugs and cements.

J. M. DELANEY & CO.

exhibit the Healy leather covered tire. It is claimed for this tire that it prevents skidding and is very durable.

THE AUTO ACCESSORIES COMPANY

show an attractive line of automobile clothing, also Cape cart tops and gasoline and oil automobile lamps.

STEVENS & CO.

show a full line of lamps, horns, tires and other automobile sundries, including a line of American made horns.

THE NEW YORK CARRIAGE TOP COMPANY

show a very effective Cape top in Pantasote, and submit samples of Pantasote in various colors to suit the taste of purchasers.

HOLLEY BROTHERS'

exhibit consists of a line of carburetors of various types specially made for different cars, as well as a high tension magneto called the Huff.

PATTERSON, GOTTFRIED & HUNTER

in their exhibit are showing a line of automobile tools and repair kits, including the Ellis off-set wrench and the Giant silver metal ratchet wrench.

W. J. DUANE & CO.

exhibit in the Concert Hall the "Coat of Mail," for which it is claimed that it cannot be punctured, will not skid, and will not calk up with snow or mud.

THE HEINZE ELECTRIC COMPANY,

of Lowell, Mass., exhibit a very compact coil and attract quite an amount of attention by fusing bits of copper wire between the terminals of the coil.

THE MANHATTAN STORAGE COMPANY

at their space in the Balcony extension show a full line of auto supplies, including the Majestic detachable tire, the Majestic Alpha type searchlight and three tube horns.

THE DUFF MANUFACTURING COMPANY

exhibiting among their line of automo- jacks a new single action jack which lifts only on the down stroke, thereby eliminating the extra labor of the up stroke.

SPRINGFIELD CARRIAGE TOP AND UPHOLSTERY COMPANY.

This concern shows a full line of Cape tops fitted with side joints or straps, according to preference of purchaser, glass fronts, etc.

THE DETROIT MOTOR CAR SUPPLY COMPANY

show an aluminum side entrance body fitted with a leather Cape cart top of the side joint type. This company makes tops of leather only, and bodies in either aluminum or wood.

THE HAVEMEYER OIL COMPANY

have a neat exhibit of Havoline special gas engine cylinder oil in four grades. Also Havemeyer gear compound, useful in transmission cases, and Havemeyer hand paste for removing dirt from the hands.

THE VOORHEES RUBBER COMPANY

exhibit their automobile cushion tires in the Concert Hall. It is claimed that the grade of rubber in these tires is superior to that used in others, and that the construction is such that the tire cannot leave the rim.

C. COWLES & CO.

exhibit a new electric annunciator for communication between the interior of the closed vehicle and the driver's seat. This device is operated by push buttons from the interior and contains very little mechanism.

E. F. HODGSON,

of Dover, Mass., shows a "Wigwam" portable auto house, the chief feature of which is that, instead of the usual lag screws or ordinary bolts, it is fastened together with key bolts. The house is complete with doors, sash and blinds.

H. & F. MESINGER MANUFACTURING COMPANY,

at their space in the Balcony extension, exhibit their well known leather tire, the tread of which is this year given tractive power by a multiplicity of leather discs attached to the body of the tire by small screws.

THE HYDRAULIC OIL STORAGE AND DISTRIBUTING COMPANY

exhibit the Snell Hydraulic System of oil storage and distribution. This system will handle fuel oil, lubricating oil or gasoline, and is operated by hydraulic pressure from the city mains.

LEON RUBAY

is exhibiting the Lacoste high tension distributer, which works with a single coil. The engine can be started from the seat. There are also on exhibition the Lacoste commutator, Lacoste coils and terminals, and the Durandel tire protector.

THE AMERICAN ELECTRIC NOVELTY COMPANY

show a device for starting a machine from the seat; also a trip detector, a device for detecting any movement of a car after it has been put up for the night. This is a small round brass case containing a plunger attached to the case by a spring which revolves a dial, registering the distance the car has been moved. Another article shown by this company is a new gasoline filler, a collapsible brass tube containing a filter through which the gasoline is poured in to fill the tank, and an extra brass tube into the top of which a gauge is set to show the amount of gasoline in the tank.

ALBERT CHAMPION

is showing a line of imported automobile accessories, comprising Nieuport magnetos, Nieuport spark plugs, an electric horn operated by a vibrating diaphragm, Nieuport coils, imported ignition wire, new snap terminals, siren horns, dome lights and a portable storage battery charging outfit.

THE MILWAUKEE RUBBER WORKS COMPANY

show the Fawkes airless clincher tire. This tire fits standard G & J rims, and it is claimed that it can be applied or removed in ten minutes without special tools. The new cable fastening is an improvement for 1906, and it is claimed for this fastening that it absolutely prevents the tire from leaving the rim.

F. H. WHEELER.

At the booth of F. H. Wheeler, of Indianapolis, a full line of Schebler carburetors are on exhibition. A number of prominent firms gave this carburetor a thorough test in 1905, and are said to have praised it highly. No radical change in design has been made, refinements in details of construction being the principal change in the new models. In addition to the standard pipe sizes, special types are manufactured to fit the inlet connections of different makes of cars.

THE MIDGLEY MANUFACTURING COMPANY.

of Columbus, Ohio, show samples of the popular Midgley tubular steel wheels. No radical changes have been made in the general construction of these wheels, the road experience of 1905 having developed no structural defects. The Midgley people lay great stress upon their perfected brazing methods. The wheels are entirely immersed in a bath of molten brass, and while red hot they are placed under a heavy press and held there till they set. Midgley wheels are furnished in two styles, the "Artillery" style for both front and rear, and the "French" or "Chariot" style for rear wheels only.

UTILITY COMPANY.

For 1906 the Utility Company is featuring its improved "squeal skin" tire band. These bands are made of hog skin, fitted with eyelets to be laced over a torn casing. They are waterproof and very tough. The new bands are provided with studs, which add materially to the life of the band, and at the same time prevent skidding. This firm markets the "Uko" mica spark plug in various threads and types; "Gre-Solvent," the well known cleanser; "Triple P compound," for single tube tires; "Utility" metal polish powder, which is ready for use upon the addition of gasoline; "Handy" jack, and will soon offer to the trade a storage battery for ignition purposes.

THE HORSELESS AGE

...EVERY WEDNESDAY...

Devoted to Motor Interests

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The New York Shows.

Probably no better solution of the New York show question would have been possible than that which has been brought about by the coup of the Association of Licensed Automobile Manufacturers in securing the Madison Square Garden building, and the consequent decision of the Automobile Club of America to hold an independent show in the neighboring Armory. So far as the visitor is concerned the two exhibitions are practically one big show, the only point in which the comparison with a single show housed in two buildings fails is that a separate entrance fee must be paid for each exhibition. The two buildings are less than a block apart, and are therefore much more favorably situated, relatively, than the Grand Palais and Serres de la Ville, which accommodate the Paris Salon; and also more favorably than the Coliseum and Armory which will house the coming Chicago Show.

The spirit of competition which the division of exhibits into two rival shows has engendered has had a most happy effect. From the first the organizing management of both shows has been much more systematic and businesslike than the exhibitors were accustomed to in former years. A good deal has been done to insure the comfort of the visitors, and the Madison Square Garden appeared much less dusty on last Saturday night than on the occasion of former shows. An innovation for New York shows is the elaborate uniform decoration of the show buildings, which affords a pleasing and harmonious *ensemble* been entirely dispensed with, having proved a hindrance to the circulation of the crowds on days of great attendance.

The two shows are practically equal to each other in number of exhibitors and general importance of exhibits, a point on which the industry as a whole may congratulate itself, as it insures that neither will be slighted by the interested public. Both shows have been extensively advertised, and few will be the "out of town" visitors who will not pay a visit to both of the exhibitions. Where the greatest amount of business will be done will depend more on the exhibitors than on the show managers.

Neither show was entirely completed at the time the doors were thrown open to the public, but among such a large number of exhibitors there will always be a number of dilatory ones. There were no signs of models being completed at the show, as has been the case in former years, thus reflecting the earliness of the season. The exhibits of one prominent Western manufacturer, who is offering an extremely low priced car that is awaited with considerable interest, were not in place at the Armory on Saturday night.

The greatest possible divergency may be observed with respect to the finish of the cars, and particularly the chassis on view. There are many finely polished chassis to be seen at both exhibitions, and it is noticeable that these have considerable power of attraction for the average visitor. Other chassis are finished in bright enamel colors, still others in aluminum paint or bronze, and some in a dark dull color which

The most striking thing in connection with the shows is the great number of exhibitors. Both buildings are about as crowded with exhibits as the Madison Square Garden alone was in former years, thus proving that the size of the show in recent years has been limited by the available floor space, and not by the extent of the industry. The least desirable space in either building is that in the basement, but at both shows a considerable number of exhibitors have been able to find accommodations only below stairs.

High Speed Gasoline Motors for Stationary Work.

The question as to whether the high speed gasoline motor as developed for automobile service will ever replace to any marked extent the present heavy, slow running type of stationary gasoline engine offers an interesting subject for speculation. So far, there are no signs of such a development in this country, but this may be due simply to the fact that the builders have been fully occupied in supplying the demand for automobile and marine motors. Abroad, several prominent manufacturers of high speed motors have developed direct connected electric generating sets, pumping sets and similar industrial work machine and motor combinations, which appear to be giving excellent satisfaction. It is almost certain that, as competition in the light motor manufacturing industry in this country increases, attempts will be made here also to introduce these motors in fields where the heavy, slow running type of gas engine is now exclusively employed.

In comparing the merits of high speed and low speed motors for any given purpose, the factors generally considered are first cost, operative economy, floor space economy and depreciation. For some classes of work, such as driving electric lighting dynamos, the closeness of regulation is also an extremely important factor. It may be of interest in this connection to note that a similar development from low speed to high speed machines has already taken place in the steam engineering field. While some twenty years ago the slow running Corliss type of engine was used almost exclusively for power installations of moderate and large size, the high speed engine is now generally to be found in all except the largest plants. Higher steam economy, closer regulation and greater economy of floor space have undoubtedly helped the high speed engine to this victory. The small steam engine (under 25 horse power) has almost entirely passed out of use, and been superseded by the gas and gasoline engine, and this in turn is likely to be superseded in the course of a few years by the modern high speed explosion engine of the automobile type.

For electric lighting purposes especially the multiple cylinder, high speed motor possesses a number of important advantages. With a moderate sized flywheel the fluctuations in speed with a four cylinder high speed motor are very much smaller than those of a slow speed gas engine of the same power, thus admitting of direct connection of the dynamo to the motor, dispensing with belts. It is not uncommon at present to employ a double belt reduction in gas engine generating plants comprising high speed dynamos, and the amount of floor space necessitated by such an installation, as well as the great percentage of loss in the belts, is a serious disadvantage. The want of floor space economy of gas engine generating sets is probably the chief reason why steam-electric generating plants are still generally used in large office buildings, where floor space is extremely valuable. A generating set comprising a four cylinder vertical gas motor and a direct connected dynamo would occupy no more floor surface than a direct connected steam generating set of equal capacity. The superiority of the internal combustion principle of generating power for such purposes as dynamo driving is becoming constantly more marked as new processes for cheap power gas generation are perfected. There is little, if any, difference in the fuel economy of high and low speed engines, and any advantage of the low speed engine in this respect would be more than balanced by the belt losses with the low speed engine.

One point that would probably be urged against the high speed motor by the advocates of the present type of stationary gas engine is that at high speeds the working parts are subjected to much greater stresses, and a high speed motor is, therefore, more liable to disarrangements and breakages than its rival type. This same objection was urged against the high speed steam engine, but has not prevented its final triumph. It is only a question of proper design to render the high speed gas motor thoroughly reliable, and the problem of high speed gasoline engine design is at present receiving an unusual amount of attention from capable engineers. The great advances which have been made in this respect in recent years warrant the prediction that the high speed explosion motor will soon have attained a degree of reliability that will enable it to meet requirements. When, therefore, the manufacturers of this type of motor make a serious attempt to introduce their product in the stationary power field, they are very likely to succeed, especially in cases where floor space is valuable.

Legislative Prospects.

The season of legislative activity is at hand again, it behooves the automobile organizations, and particularly the various State associations, to keep close watch of the bills introduced in the different State legislatures, and hold themselves prepared to fight any obnoxious measure that may be proposed. It is known that new legislation on automobiles is contemplated in several States this winter; and although public sentiment regarding automobiles appears to become generally more tolerant it cannot be concluded from this that there is no danger of any oppressive restrictions being forced upon automobilists. The majority of legislators are predisposed against automobiles, and no fairly satisfactory measure can be expected except by putting forth every effort to defeat obnoxious clauses. Most of the State associations were organized for no other purpose than to fight for equitable automobile legislation, and they would sadly miss their object if any undesirable law should be passed without having encountered the most determined opposition on their part.

Calendar of Automobile Dates and Events.

January 13-20.—A. C. A. Show, Sixty-ninth Regiment Armory, New York.

January 13-20.—A. L. A. M. Show, Madison Square Garden, New York.

January 22-27.—Ormond-Daytona Beach race meet.

February 3-10.—Chicago Show, Coliseum Building.

February 5-10.—Washington Automobile Show.

February 12-17.—Detroit Automobile and Sporting Goods Show.

February 17-25.—Cleveland Show.

March 3-10.—Philadelphia Show.

March 13-30.—Buffalo Show.

March 16-23.—Boston Show.

Sixth Annual A. C. A. Show.

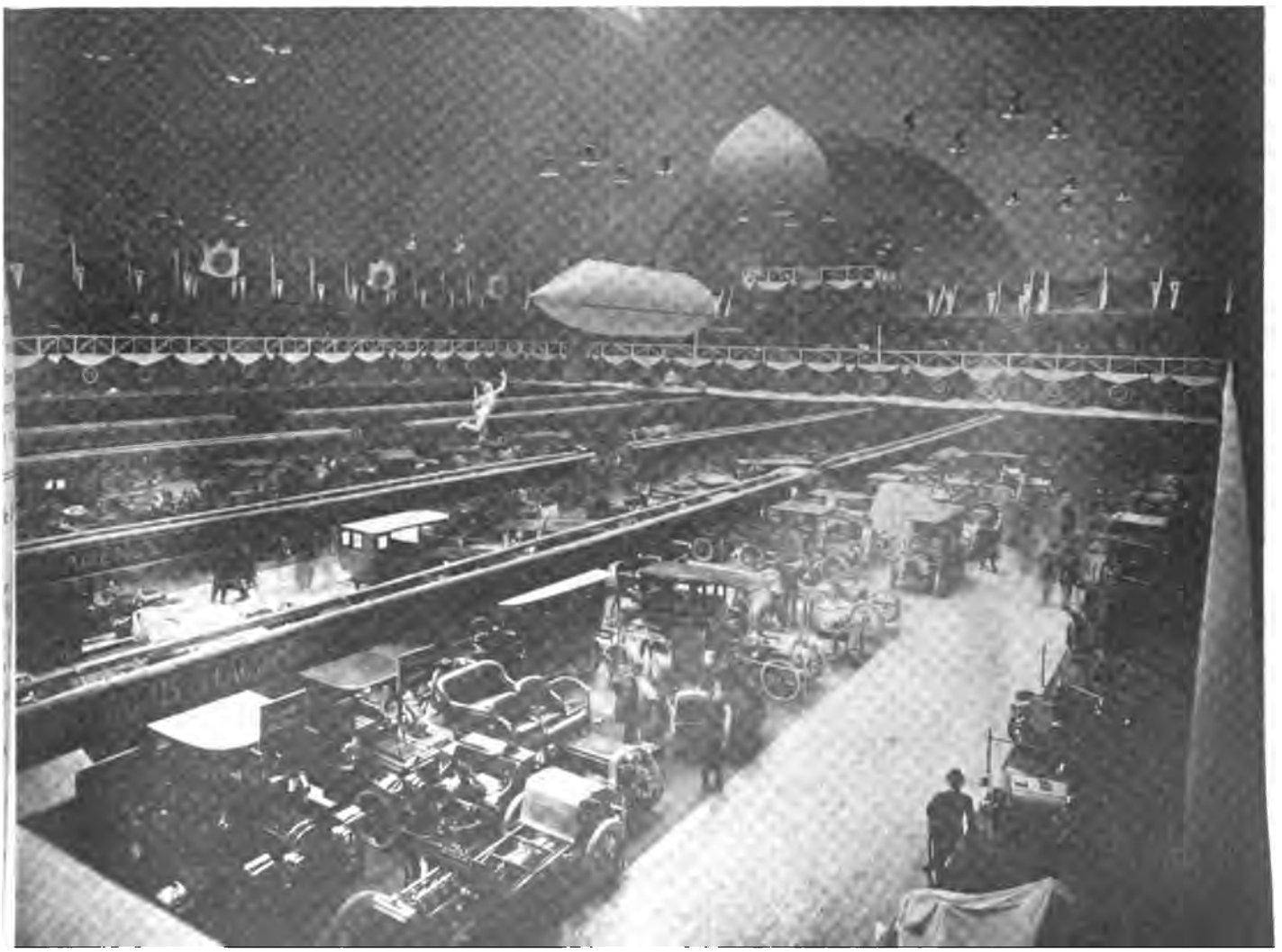
Opening of the Show.

Although in no way as beautifully decoed as Madison Square Garden, the Sixninth Regiment Armory presented a ɔtty and pleasing sight in its simple ɔorations of green and gold, and with its ʌs of magnificently finished automobiles. ıe great Armory building was not fully ɯplete, and the men and women in their ɜıing clothes more than once rubbed up ainst fresh paint and stepped into piles — dust that covered dainty shoes with a ıite coating. Unpacked cases in the aisles, rrow, crowded, temporary entrances ıich were choked from 8 o'clock on with struggling mass of people, some fighting r admission, others fighting to get out, ırred somewhat the pleasure of visitors; t once inside of the hall one was repaid r the trouble of getting into the crush d struggling into the place. The crowd gan to gather as early as 7 o'clock at the rmory building, but were not admitted ıtil 8 o'clock. There were many protests ɜard, for the night was raw and rainy, and ʌndsomely gowned women shivered in the cold awaiting the pleasure of the rather gruff doorkeepers who refused them admittance. Thousands of complimentary tickets had been sent out and thousands were used, and at 8:30 o'clock the great building was crowded to its utmost limit. It was almost impossible to make one's way through the aisles or to see anything, so great was the crush.

In the main hall the exhibits were practically all in place and had been artistically arranged. Cars of every type and price were represented, there being shown 135 pleasure vehicles of sixty-four different makes. The crowd which made its way to the Ford exhibit to see the new low priced runabout and six cylinder car was disappointed, finding a sign displayed of "Cars delayed in transit."

The foreign exhibit attracted considerable interest, a number of cars being shown that are not of the most widely known makes. Throughout there was that same excellence of design and finish that marks the auto of today, and the foreign cars seemed to be in no way superior in appearance to their American competitors. The baby Reo car, a model weighing but 243 pounds, attracted considerable attention. Generally speaking, the greatest improvements had been made along the line of protecting machinery working parts from dust and grit, improving brakes and ignition systems, the general use of aprons and dust pans, the use of the bevel gear drive on many types of car, the almost general discarding of the horizontal motor for the upright engine in front, and the simplification and improvement of lubrication systems. Running in oil, dust proof, large bearings with plenty of room for taking up wear, positive water pumps and elegantly finished cylinders and working parts all contribute to the perfection of the machines shown. The crowd evinced great interest in the working parts of the various cars which most of the manufacturers exhibited, and also in the chassis shown.

Down in the basement of the Armory the exhibitors were "up against it for fair." It was evident that every effort had been made to get the main floor and balconies cleaned up and finished, and as a consequence everything had been thrown down into the basement. Some of the exhibitors had braved the dust and dirt and had their



cars in place, but the greater number were not to be seen. The steps leading down to the basement were dirt covered, and just as the crowd began to arrive some intelligent foreman set a gang of negro laborers at work sweeping them down. Then the trouble began. Handsomely dressed women plunged through the dust filled air and determinedly fought their way into the basement. Once down there the conditions were even worse. At every turn men were at work carting away piles of rubbish or raising clouds of dust sweeping unsprinkled floors. Mortar, cement, shavings, nails, boards and all sorts of building refuse lay in the visitors' path, but withal the crowd groped its way through the choking dust and tried to see what there was to be seen. Some of the exhibitors, unable to stand the stifling atmosphere, covered over their cars and fled. Quickly the word spread through the building that it was advisable to secure a dust coat or overalls and jumper before venturing down into the basement, and the crowd began to get wise. The exhibitors down there, seeing that there was no use in trying to do business until the cleaning was over, gradually departed, and left the laborers to finish up, so that on Monday evening they could begin to do business in earnest.

Upstairs everything was going along serenely, and the crowd was well pleased with what it saw. The exhibit was in a great way the duplicate of that at the Garden, everything new in the line of machines, parts and sundries being shown. There is no doubt that the Armory Show will be in every way as popular as that at the Garden, and if anything there was a larger attendance there on Saturday night than at Madison Square Garden. It was a curious crowd, though, that attended the shows on the opening night, and now the exhibitors will await the coming of the men who really want to buy. They all expect a remarkably busy season, and the indications are that they will have it. One thing in particular about both shows that impressed itself on the minds of those who attended was the fact that despite all the thousands of dollars spent by the A. L. A. M. and the A. C. A. for decorations, the manufacturers themselves had spent little or nothing. In other years they had gone to considerable personal expense in fitting up their stands, but this time there was a remarkable absence of all this. Everything was plain and businesslike, and expensive show cases and fittings were conspicuous by their absence. The automobiles themselves, with their handsomely painted bodies and flashing glass and brass work, were ornamentation enough, the manufacturers thought, and in the fact that the display was thus simplified rested a great deal of its attractiveness and beauty.



Complete Car Exhibits.

ACME MOTOR CAR COMPANY.

The Acme people show their Model XIV, a 30-35 horse power car, with five passenger side entrance body and Cape top, and their XV, a 45-50 horse power car, with a very large body having a capacity of seven persons—three on the rear seat, two on the extra seats in the tonneau facing forward, and two in the front seat. A stripped chassis of the high powered car is also shown. The large car shows a number of improvements. The change gear is of the Mercedes type. It is provided with four speeds forward and one reverse, of which the third speed is a direct drive obtained by bringing the corresponding gear, which is provided with jaw clutch members, into contact with similar members on the main driving members of the gear. The fourth and high speed is a geared up speed. This arrangement is used for the reason that it has been the experience of the company's men that all driving is done on the third speed. The drive from the gear to the wheels is by double side chains, and the differential shaft is provided with two band brakes, a each side of the gear casing, whic applied by a pedal, through diffe links. The rear hubs have inter panding brakes, operated by the emer brake lever. The emergency brake is connected with the clutch. An inter disc clutch is employed, having discs of steel, and is entirely self-cont Hess-Bright bearings are used thro the car, except upon the axles, whic roller bearings.

LANSDEN COMPANY.

This company show an electric c very original construction—a speed about called the Electrette. The bod a divided seat for two persons almos rectly over the rear axle and a long low torpedo front, under which the b is carried. The Edison accumulat used. There is ample foot room bet the dash and the seat. The motor driving mechanism are beneath the and the motor drives by chain to a under the footboard. This is provided a differential and the drive to the w is through side chains. The driver's is at the left and the steering is by wheel. The company also exhibit a which has an express wagon body of ventional design.

THE LOZIER MOTOR CAR COMPANY

are offering a new Model D touring this season. It is one of the largest built, having a wheel base of 117 in. 36 in. wheels, 55 in. tread and a road ance of 10 in. The four cylinder m is rated at 40 horse power, having inders 4⅝ by 5½ in., cast in pairs. outsides of the cylinders are finished baked gray enamel. The motor fram bolted to the side of the chassis. valves, which are of a nickel steel position, are mechanically actuated—i and exhaust being on opposite sides. pistons and cylinders are ground. crank shaft is machined from a solid forg slab. The crank bearings, after being ha ened, are each ground on their own c tres. The bearings are unusually large long. A composite bearing is used both crank and shaft. Ordinarily the pho phor bronze receives the thrust of the m tor. In spiral grooves in this is run babbitt which, in case of excessive heatin will be forced slightly above the bron and carry the shaft until the parts ha cooled. From the centre of the exhau cam shaft is geared a third shaft, whic extends toward the dash, operating th centrifugal pump and high tension magne The high tension cable is covered wi three layers of vulcanized rubber, thre braids, then five coats of enamel, ea baked separate, which gives an insulation able to stand 40,000 volts. An exceptio



JACKSON MODEL G.

The semi-elliptic springs are supplied with separate oil cups for supplying oil between the leaves. The transmission is a selective sliding gear type. The high speed is a direct drive obtained through an internal and external gear, the countershaft in the gear box being then idle. The gear shafts, differentials and differential shaft joints are mounted on self-contained ball bearings. A pawl and ratchet back stop on the differential brake drum enables the operator to start the car on steep grades with all brakes free. A small hand lever attached to the emergency brake quadrant controls the pawl catch. In reversing this is automatically disengaged. A gasoline tank of 25 gallons capacity is mounted under the rear of the chassis, two pounds pressure from the exhaust feeding the gasoline to a Schebler carburetor. The car weighs 2,700 pounds.

THE JACKSON AUTOMOBILE COMPANY

have just brought out a four cylinder, 40-45 horse power touring car. It has a wheel base of 108 inches, semi-elliptic springs and shaft drive. The cylinders are 5 by 5 inches, cast in pairs, with all valves mechanically operated from one side. A Brown-Lipe sliding gear is employed and a multiple disc clutch of two bronze and three cast iron plates. There is only one universal joint in the drive. The hood is rather long, with considerable space between the engine and honeycomb radiator to make the pump and gears more accessible. The company have also made a few changes in their 20-24 horse power car, which has the opposed motor under the hood. The cylinders are 5¼x5 inches. It has a planetary gear, in which the slow and reverse each operate through two pinions. The high speed clutch is a combined expanding dog and multiple disc clutch of five steel plates. The valve mechanism is unusual. A secondary shaft is located directly over the crank shaft. From this long bronze rocker arms extend the full model with opposed motor under the body, increasing the bore of the cylinders ¼ inch and placing the cam shaft and push rods on top of the motor, instead of underneath. The tonneau is made detachable.

THE AUTOCAR EQUIPMENT COMPANY.

Of the many and varied types of trucks, buses and delivery wagons of the Autocar Equipment Company, of Buffalo, N. Y., only one type is on exhibition. The special feature of their bus is the body design, the car being capable of carrying from fourteen to sixteen passengers with comfort. Large plate glass windows run lengthwise of the car and entirely disappear when the window is opened. The interior of the body is exceptionally roomy and is neatly upholstered with leather. Power is furnished by either an electric or gasoline motor, as desired, the latter being of the four cylinder vertical type, water cooled, and fitted with mechanically operated valves. The electric car is driven by two independent Westinghouse motors with chain drive to sprockets on the rear wheels. A Westinghouse single lever horizontal controller, with four speeds ahead, is employed for speed changes. Internal expanding brakes are attached to the rear wheels, the brake drum and sprocket being integral. Their trucks are of 2, 3 and 5 ton capacity, but still larger ones will be built to order.

DOLSON AUTOMOBILE COMPANY.

The Dolson exhibit presents a high powered touring car

type, cylinders cast in pairs with 5 inch bore and stroke. The crank shaft is of nickel steel and set 1½ inches off the centre of the cylinders. Jump spark ignition is used, the spark being produced with a 6 volt storage battery and Lacoste coil. Both the spark and throttle lever are placed upon the steering wheel. The steering mechanism is of the irreversible worm gear type and enclosed in a metal case. The clutch is a special multiple disc type, with heavy bronze friction rings provided with lips, which engage studs on the inside of the flywheel and set between steel discs, which are pinched against the bronze by toggles when operated. The transmission is of the slide gear, direct drive type, with three forward speeds and one reverse. Both transmission shafts are provided with roller bearings. By a specially designed interlocking device the clutch cannot be engaged unless gears are in mesh, rendering it impossible to strip the gears. The power is transmitted from the gear box to the differential by a propeller shaft, parallel to which is a torsion rod, which extends from the centre of the rear axle to a plate mounted between two cross beams. By this arrangement the propeller shaft is relieved of strains. Forty-nine brake horse power is claimed for the car, which, fully equipped, weighs 2,500 pounds.

THE RAINIER COMPANY.

The new Rainier car is known as Model B, and differs from the older model (which is still continued) in that it has a longer wheel base, a more powerful motor (30-35 horse power) and low tension magneto ignition. At the stand were shown a limousine, a two passenger runabout with torpedo back and painted a light red, and a highly polished chassis; also the more important parts, such as a rear axle, a gear box, a driving shaft and the control levers; while mounted on the wall of the booth





RAINIER 22-28 HORSE POWER.

were exhibited the framed sectional drawings of the individual parts. One feature of this car that strikes the eye of the observer is the long and substantial control levers with spiked toe plates. The magneto used is a Simms-Bosch, and is driven by enclosed gearing. Cams are forged onto the cam shafts. The radiator fan is supported on the forward cylinder and not on the radiator. Lubrication is by a Hill oiler. The rear axle is of the floating type and is mounted in ball bearings. The bodies are made entirely of aluminum, with large double side entrance and trimmed in hand buffed leather. The rear seat is 52 inches wide between cushions, affording comfortable seating capacity for three persons, and there is space in the tonneau for two extra seats, if desired. Under the rear seat is a large locker accessible alike from the front or rear. The dash is of concave pressed steel, free from mechanical appliances, except for the oil sight feed. The Rainier cars are sold under a one year's guarantee, covering not only defects but also wear of all parts except tires.

RICHARD-BRASIER AUTOMOBILE COMPANY.

In motor design and construction the three Brasier models for 1906 are practically the same. All have offset cylinders and longer connecting rods. These two changes are intended to lessen the friction in the cylinders. The pistons are also longer, and the piston pin bearing further from the head and, consequently, from the heat of the combustion chamber. The longer piston distributes the wear more, and prevents so much oil reaching the combustion chamber. All valves are now located on the same side of the motor and actuated from a single cam shaft. The manifold, through which the exhaust gases pass, is water jacketed, the object being to reduce the tendency of overheating valves, to reduce the noise of the motor, and to reduce the back pressure. The cam shaft (which is larger than formerly) and the cams are cut from a single bar. The 2 to 1 gears are mounted on taper shafts, keyed and locked by a nut. The crank case is fitted with internal guard plates, to prevent excessive splashing of oil into the cylinders. In the 15-25 horse power and 25-36 horse power cars natural water circulation is employed, and fans are used. The larger car has a gear pump and no fan. A novel change has been made in the make and break system. A special cam shaft horizontally mounted on top of the cylinders runs in ball bearings. The cams carried on this shaft directly actuate the outside arm of the internal striker of the ignition plugs. The vertical shaft which drives the ignition shaft from the lower timing gear carries an automatic dog clutch coupling, which releases in case the engine starts backward. The magneto is directly driven, instead of geared. The two small cars are provided with an oscillating lever beside the seat to start the motor. The clutch on the three models is a leather face cone, but is fitted with a locking system which gives a rigid connection when the clutch is fully engaged. This is accomplished by steel plunger rods held in the slides in the male clutch member and constantly pushed forward by coiled springs. As the clutch is engaged, the leather face gradually takes hold until completely engaged, when the four or six plungers drop into the nearest of thirty-six holes in the wheel web. The small car is driven by shaft, and the two larger ones are driven by side chains.

PALAIS DE L'AUTOMOBILE.

The new Delauny Belleville cars are exhibited by A. C. Neubauer. There are three models, 20, 24 and 40 horse power, all very similar, except in size and power. All motors are of the independent type with five crank shaft bearings. Both make and break and jump spark systems are employed. A plunger pump takes oil from the bottom of the crank case and forces it to all engine bearings. A gauge on the dash registers about 28 pounds per square inch when the pump is operating. If the pressure falls below this point it signifies that more oil is to be put in the crank case by the foot pump. A small water tank is provided just over one end of the jack shaft with hose leading to a water jacketed break on the shaft. Circulation is by the thermo system. The carburetor is provided with a circular top that shuts off the gas supply when not in use, to prevent dirt getting into the large vertical valve. Beside the clutch pedal, close enough to be operated by the same foot, is another pedal that throttles the engine and prevents racing if the hand throttle is neglected when



MAXWELL DOCTOR'S MODEL "N."



WHITE TOURING CAR.

e clutch is thrown out. The dash carries ›thing but the oil and water gauges.

AMERICAN PEUGEOT AUTOMOBILE COMPANY.

The transmission of the Peugeot cars as been moved forward under the foot ›ard and a third internal expanding foot ake is placed just back of the gear case. his operates without throwing out the utch, and will slow both car and motor. he transmission is now of the selective pe. The steering column can be varied everal degrees in slant to suit the taste. he dash pot of the carburetor is protected rom the dust in the air by a cast flange ›ack of it. Oil is pumped from a tank at ›ne side of the chassis through a single drip on the dash to each engine bearing. An exceptionally large exhaust manifold is used on these cars.

ENGLISH DAIMLER COMPANY.

This car is provided with a small lever beside the change speed quadrant which acts as a safety catch, preventing the throwing of any gear while the reverse is in. The compensating rear wheel brake has been placed in front of the rear axle, instead of underneath, to avoid breakage from road obstructions. The muffler has been taken from under the crank case to the rear of the car. A simplified carburetor gives a more uniform mixture. Two D. W. F. ball bearings are placed in the clutch —one on each side the collar. The coil is placed just back of the fan to keep it cool. The former 45 horse power racing car will be built this season as a touring car.

MAXWELL-BRISCOE MOTOR COMPANY.

Very few changes have been made in Maxwell cars since last season. In the touring cars the composite phosphor bronze and babbitt bearings are provided in the engine and transmission. The flywheel weighs about twenty pounds more than fifteen pounds. A pressed steel frame is used instead of armored wood. The new cars of this company are a gentleman's speedster, the "doctor" Maxwell, a delivery vehicle and a four cylinder car. This latter was not exhibited owing to lack of space, but a demonstrating car was in operation. In this car the crank and transmission case are in one. The main bearings of the engine and gears are adjustable from underneath the case. A wedge can be forced upward by turning a bolt, thus bringing the two halves of the bearing together. The "gentleman's speedster" is similar to the tourabout, but with still higher compression in cylinders.

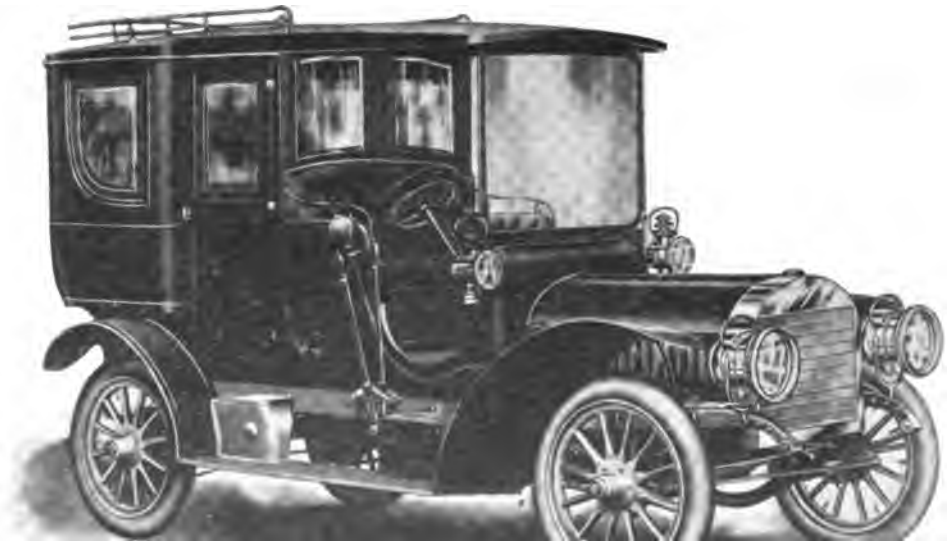
WHITE SEWING MACHINE COMPANY.

Six different types are shown as follows: Extension landaulet, limousine, runabout, touring car with Cape top, and one with victoria hood and a semi-limousine. The chassis of all models are identical. The standard touring car body is along the new victoria lines. The company also have an imperial victoria, which is not exhibited. The Model F runabout is a very stylish car. It has a long, rakish appearance, and the lines are symmetrical and artistic. Inside the cars elegance is found in the upholstery, portfolios for small parcels and other conveniences.

THOMAS B. JEFFERY & CO.

exhibit five cars, being their Types 1, 3, 14 and 15, and a stripped chassis of their Model 15, the new four cylinder car. The last two types mentioned embody the most radical changes made by the company this year. The motors are made with individual cylinders and have the valves located in the cylinder heads. The rocker arms which operate the valves are provided with adjustment screws to take up wear. The pistons have six rings each, arranged in pairs. An interesting feature is that the starting crank is equipped with a device which retains the handle in a horizontal position when not in use, and by means of which the spark is automatically retarded when the handle is engaged with the crank. The device consists of a catch and spring actuated rod, the rod flying back when the catch is released, which occurs when the handle engages with the crank, and pushing the spark control lever into the retard position. The product of this company was fully described in a recent issue of THE HORSELESS AGE.

THE GROUT BROTHERS AUTOMOBILE COMPANY, of Orange, Mass., have at their stand two gasoline cars and one chassis. For the first time they do not show a steam car. The chassis of all the cars are alike, and are equipped with four cylinder vertical motors rated at 35 horse power, which have individual cylinders. The valves are all located on one side and are operated directly from a cam shaft in the crank case. The





RAMBLER MODEL 15.

jump spark system of ignition, in which four coils are used, is employed. A feature out of the ordinary is that the internal ring timer is made with the ring absolutely fixed, the variation of the spark being obtained by moving a sleeve upon which the revolving member is fastened up and down upon a screw. The advantage claimed for this construction is that the high tension wires are not subjected to any bending, and are therefore not so likely to break. A three speed sliding change gear is used and side chain drive to the rear wheels.

CLEVELAND MOTOR CAR COMPANY

show four of their 1906 models, 30-35 horse power, four cylinder touring cars, and one finely polished chassis. The new model is of the side entrance tonneau type, with 104 inches wheel base, and weighs complete 2,300 pounds. It has a laminated wood dashboard, a cellular type cooler, and a dust pan underneath the engine and change gear case. The latter parts are mounted on a sub-frame, and the dust pan is fastened to the side frames and lies close to the sub-frame members. The car has low tension magneto ignition, which can be regulated from the steering wheel, the magneto supplied being a Simms-Bosch. The carburetor is connected through a separate inlet tube to each pair of cylinders. A mechanical lubricator with six feeds is provided, one of the feed tubes leading to the shaft of the bevel driving pinion on the rear axle. The rear axle is of the ball bearing floating type, and the front axle an I section forging. There is a peculiar form of combined universal and sliding joint interposed between the engine and the gear box, which takes up the motion of the clutch while it is engaged and disengaged. The muffler is placed at the extreme rear of the frame, and is provided with two outlet tubes which extend downwardly and sidewardly, and have their discharge ends flattened, the object being to secure a dust laying effect. The engine has four separate exhaust pipes, which extend down to a large collector pipe connecting with the muffler. The torsion reaction of the rear axle is taken up by a torsion brace rod, the forward end of which is supported between springs from a cross member of the frame.

CRYDER & CO.

exhibit several models of the Leon Bollee car, for which they hold the American agency. This car, while of the typical French type, has novel features in almost every detail. The engine is an extremely low speed one, its speed range being up to 800 revolutions per minute. It is fitted with a double ignition system, one set of spark plugs being supplied by a Simms-Bosch high tension magneto and the other set by a storage battery and coil. The carburetor is of the Leon Bollee double jet type, which was probably the first double jet device actually used on a stock car. The throttle valve is connected to the clutch, the object being to prevent racing of the motor upon throwing the clutch out. The carburetor is supplied with hot air taken from around the exhaust pipe. Behind the cellular radiator is placed a belt driven fan, the belt tension of which is automatically maintained constant by a coiled spring, and is also readily adjustable by hand. A cone type clutch is fitted, which is entirely free on its shaft, thus preventing binding of bearings due to slight dis-alignments between engine and gear box. The clutch drives through six studs, passing through slightly larger sockets in the web. The change speed gear is of the selective type, giving four forward speeds and one reverse, and is mounted with a three point support. The lubricant is fed by air pressure produced by a hand pump, secured to the dash, the oil passing through sight feeds on the dash, which have the bearings to which they feed marked upon them. The car has a wheel base of [illegible] inches, and is therefore adapted for any type of body. The drive to the rear wheels is by side chain. A very substantial transmission brake is provided, consisting of a steel band lined with cast iron blocks. The rear axle to the rear wheel brakes is of similar construction.

AMERICAN LOCOMOTIVE AUTOMOBILE COMPANY

The American Locomotive Works near a year ago secured the rights for the manufacture in this country of Berliet cars which are made in Lyons, France, and equipped a factory in Providence, R. I., for the purpose. A subsidiary company, known as the American Locomotive Automobile Company, has been formed to handle the business. On the opening night, when the writer visited this stand, there was as yet only one car on exhibition, a 24-30 horse power side entrance tonneau model. The car is perhaps best described as of the general Mercedes type, having cylinders cast in twin fashion, with valve chambers on opposite sides, low tension magneto (Simms-Bosch) ignition, a metal to metal clutch, selective change gear system and side chain drive. The cam gearing is enclosed, and there are two foot brakes acting on the differential shaft, one on either side of the gear box. The frame is of imported pressed nickel steel, the engine crank shaft is of nickel steel forging, oil tempered, and the cam shafts are forged integral with the cams. A close fitting sheet metal dust pan extends underneath the frame from



BERLIET LANDAULET, AMERICAN LOCOMOTIVE AUTOMOBILE COMPANY.

front to the jack shaft. The radiator is of true cellular construction, and has the water circulated through it by a centrifugal pump located between the motor and the radiator. No fan is placed behind the radiator, but the flywheel spokes are given the shape of fan blades. The company will also manufacture a car of 40-50 horse power of similar general design. Only the best quality of materials are to be used in the construction of these cars, imported materials being largely used for the present. The company observe that their long experience in locomotive building fits them particularly for the work of building automobiles, there being many similarities between the two branches. A one year's guarantee against defective parts and the offer of one free overhauling during this period are to be given with these cars.

THE CORBIN MOTOR VEHICLE COMPANY

exhibit a large car and high powered runabout and a chassis, all with their well known air cooled motors. Motor and gearing are carried on a single aluminum base, which rests on the front frame member and on a cross-frame member at its rear end. The timer is of a new design. It is driven by spiral gears from the left cam shaft. The timer shaft is horizontal, and carries a fibre slab with a straight top at its outer end. This block is stationary, and carries the connections for the secondary wiring on the top edge. The spark wire is carried by an oscillating sleeve without moving the secondary wires; in fact, only one wire moves when the spark is varied. The details of this device are not now available. The oil tank is on the left side, near the dash, and contains a pump driven by chain at a considerable reduction of speed from the exhaust cam shaft. From the pump a single pipe leads to a sight feed distributer on the dash, having six adjustable feeds. The drive is by propeller shaft, with two universal joints. These are very simple, consisting of a split bronze ring and a fork on each of the connected shafts, as shown in sketch. The torsion rod is connected to a frame member by a double spring. All brakes are applied to the rear hubs.

BARTHOLOMEW COMPANY.

A small side entrance car finished in black and two large cars, one in black and the other handsomely finished in gray, both with Cape tops, are shown. There is no exhibition chassis and it is understood that no changes of importance have been made from last year's construction. A planetary gear is displayed on a rack. The gearing proper is of rather conventional internal gear form, but the high speed clutch is separated from the gearing by a long bearing. This clutch is quite simple. It consists of an internal driven drum, and a two armed spider carrying two fibre lined shoes. These are normally held out of engagement by springs and are thrown into



CORBIN 1906 MODEL E LIGHT TOURING CAR.

imperial and stanhope, will in the future carry motors in front under a hood, but very low down, almost on a centre with the front wheels, the front axle being bowed down to permit this. A shaft extends from the motor perfectly horizontal to the differential on the rear axle. The depot carriage has the motor up in the hood, with a spur reduction gearing to the horizontal shaft. Just forward of the differential on the driving shaft is an expanding brake. Twenty-four cells are carried on the larger cars, which attain a speed of from 14 to 20 miles an hour, and have a mileage capacity of 40 miles.

LEBANON MOTOR WORKS.

The Upton touring car is of the four cylinder vertical type. The cylinders are cast in pairs, with water circulation completely around each cylinder. The clutch has metal to metal friction surfaces, consisting of bronze and steel discs. The transmission gives three speeds forward and one reverse, with direct drive on high speed. The rear axle contains articulated shafts which apply the power to the wheel hub and do not carry the weight of the chassis. The front axle is of I beam construction. The brakes are of the inside and outside type, both being applied to drums on the rear wheels. Ignition is by jump spark, imported coil and storage battery.

THE RAUSCH & LANG CARRIAGE COMPANY

exhibit electric carriages which present unusual features. Three types of cars are shown, a stanhope, a surrey and a coupé. The principal objection to electrically driven machines heretofore has been the comparatively small mileage per charge of batteries. This objection has been eliminated on the Rausch & Lang machine, it is claimed, the company guaranteeing 75 miles on one charge of battery. This extreme mileage is produced without the aid of a special battery, and without injury to battery or motor. The claim of the company is that the





NAPIER SIX CYLINDER CAR.

high mileage is obtained by the elimination of friction in the working parts, as well as the use of tires of small resistance.

The easy running qualities of the machine permit the battery to be discharged at a lower rate, hence the increased mileage. A maximum speed of 19 miles per hour is claimed for either type of machine. An overload capacity of 400 per cent. is also claimed, which gives the machine exceptional hill climbing power. The surrey is equipped with a No. 2 Hertner motor, which develops 1½ horse power on twenty-four volts. The stanhope and coupé, being of lighter construction, are equipped with a No. 1 Hertner motor, developing 1 horse power on twenty-four volts. Three brakes are used, the motor brake being operated by the controller lever. The steering is done by a side lever, with adjustable ball and socket joints. Chain drive is used from end of countershaft to each rear wheel.

NAPIER MOTOR COMPANY.

The Napier runabout, which was exhibited first at the Boston Show last year, is practically the same at present. The motor is of standard four cylinder Napier design, of 18-20 horse power. The wheel base is 90 inches and the car weighs 1,500 pounds. The tires are 32x3½ inches. The transmission has sliding gears with three speeds, and the car is fitted with a direct shaft drive and metal to metal clutch. The Napier synchronized ignition system, using a single coil and storage batteries, is used. The company also display a limousine and touring car body and a new 60 horse power car.

NATIONAL MOTOR VEHICLE COMPANY.

Of the cars shown by this company Model D now has a 40 horse power motor with 4½x5 inch cylinders. The wheel base has been lengthened 6 inches. A change in the ignition system is that the dynamo is now arranged to only charge the storage battery. The new six cylinder 50-60 horse power car has a wheel base of 121 inches. In the tonneau is arranged a jumper seat which folds against the front seat when not in use. With this in use the five passengers in the tonneau all face forward. The bodies are of cast aluminum throughout.

PANHARD & LEVASSOR.

and 35 horse power Panhards ith the same type motors as formerly used in the 50 horse power model, only of smaller size. When the direct drive is in use the other gears do not revolve. The gear box is much smaller. The shaft between the motor and gears is divided to facilitate disassembling. The carburetor is provided with a leather diaphragm, which is acted upon by the pressure of the circulating water and governs the action of the motor. The clutch is composed of the multiple disc type. Internal brakes are provided on the rear wheels and the car is given 9 inches road clearance.

THE DAYTON MOTOR CAR COMPANY.

The Stoddard-Dayton cars are slightly altered in nearly every detail. The new four cylinder runabout contains a motor built in the Dayton plant. The cylinders are cast in pairs with valves on opposite sides. The motor develops 18 horse power. The wheel base of this car is 84 inches and the weight 1,250 pounds. The general construction is the same as their other cars, which were described in a recent issue. The clutch is of the disc type, with thirteen copper and steel discs. The rear axles are of the floating type, the load being carried on roller bearings in the housing, allowing the disassembling of the axle by removing the hub caps. The internal brakes on the rear wheels and transmission are lined with camel's hair.

MORS AUTOMOBILE COMPANY.

The Mors horse power rating is increased to 17, 28 and 45 horse power. The leather facing has been taken from the clutch, leaving a metal to metal contact. Otherwise the cars are the same in general design. The Mors starting device is interesting. A small air tank is placed on the outside of the car beside the chauffeur's seat, and provided with a hand pump. On the dash is a special form of carburetor. Relief cocks on the motor are opened, and with the hand pump a charge of gas is forced through the carburetor to the cylinders, expelling the foul gas, so that the first spark is quite sure to start the motor. The two larger cars are provided with a supplementary jump sparking system.

PUNGS-FINCH COMPANY.

This exhibit comprises a complete 28-32 horse power touring car and an exhibition chassis. Substantial construction is a conspicuous feature of these cars. The cylinders are cast in pairs, with the top of the water jackets left open. This facilitates casting, as the cores get better support. A top is bolted on, containing in its centre a water connection, nothing else being on top of the cylinders. All piping, water, inlet and exhaust are unusually free from any acute angles. The engine and transmission have both been enlarged. The gears slide on an octagonal shaft mounted on Hess-Bright ball bearings. A leather faced disc clutch is used.

YORK MOTOR CAR COMPANY.

The "Pullman," made by the York Motor Car Company, is a four cylinder car, made in two sizes, 28 and 35 horse power, with bore and stroke respectively of 4½x4¼ and 4½x5 inches. The cylinders are cast individually, faced off and bolted together to give the effect of a single large casting, the water connection being continuous through the joint, thus doing away with all except terminal connections. A chain driven gear jump and a flanged tube radiator are used. Ignition is by a single coil, jump spark system, with a novel form of distributor, which consists of a steel rod, mounted above and to one



NATIONAL MOTOR VEHICLE COMPANY FOUR CYLINDER CAR.

ide of the cylinders and extending clear cross; at the end next to the dash it enters a timing box, inside which projecting rms are attached to this rod which come n contact with the spark plugs as the rod otates, the primary circuit being closed n the timing box at the proper moment. The rod is at present driven by a chain rom the cam shaft, but this is to be hanged at once to a bevel drive. There re no wires to detach when removing the lugs. The crank shaft has five bearings. All bearings and pistons are oiled by force feed oilers from individual pipes. One of the little conveniences on this car is an aluminum casting, formed to receive a couple of oil cans, that is attached to the drip pan. The clutch is an expanding ring, similar to those used for brakes. It expands inside a split brass cylinder, which in turn expands inside the flywheel, this giving a double surface for friction and wear. It is held closed by a coiled spring in the same manner as cone clutches. The slide gear is of typical construction, of the progressive type, and has an aluminum case. The gears are made from solid bar tool steel and hardened. The rear drive is a typical bevel gear shaft. The frame is composed of an outside steel plate, ⅛ inch thick, and an inside angle iron with a 1⅜ inch piece of wood bolted between them, forming a series of three laminations. The inside projecting ledge of the angle iron serves to bolt the different parts to. The rear springs are of the three spring platform type, with the cross spring at the rear; the front springs are semi-elliptic.

THE ARIEL MOTOR CAR COMPANY

show a chasis and side entrance tonneau. The engine is a four cylinder, 4¾x4 inches, rated at 30 horse power. All valves are mechanical, set at an angle in the heads of cylinders, and operated by a cam shaft above the centre, rocker arms extending in each direction from over the cams. This shaft is driven by a vertical shaft and bevel gears from the crank shaft. The spark timer is located at the extreme end of the cam shaft, ignition being by jump spark. The cylinders are cast individually. The pump is of the gear type, mounted on the vertical shaft intermediate of its length. The radiator is a special multi-tubular design, the tubes being vertical and the flanges continuous. The balance of the chassis is typical, embodying such features as bevel drive, and pressed steel frame construction.

WAYNE AUTOMOBILE COMPANY.

The Wayne Company show three models, of which the feature exhibit is the 50



FRAYER-MILLER FOUR CYLINDER CAR.

hibited will be entered in the Ormond races.

THE HENDEE MANUFACTURING COMPANY.

This company are the manufacturers of the well known Indian motor cycle. This year, in addition to the regular Indian roadster, with a single cylinder motor, there are also exhibited a motor tandem, a tricycle, a motor tri-car, a motor tandem triplet and a parcel carrier. These vehicles can all be built up, starting with the bicycle as a basis. The tandem is obtained by adding a rear seat frame, the tricycle by substituting a two wheeled truck for the single front wheel, the tri-car by adding a seat suspended over the front tricycle, and the parcel carrier by substituting a roomy box for the seat. The exhibits show a fine finish, and the front seat of the tri-car is very nicely upholstered and comfortable. The two cylinder Indian racer, which won an enviable record at the Mt. Washington climbing contest, is also exhibited. Minor improvements have been made, including the substitution of a 2¼ horse power motor for the old 1¾ motor, enlarging the muffler and providing a muffler cut-out.

OSCAR LEAR AUTOMOBILE COMPANY.

The Frayer-Miller car is represented by one nicely polished chassis, one side entrance open touring car with Cape top and one luxurious limousine, seating a total of six passengers. The last mentioned vehicle is upholstered in Bedford whipcord, and has a pair of removable seats in the limousine to accommodate the two extra passangers.

the cylinder head, walls and valve seats, these parts being shaped to give considerable radiating surface and surrounded by aluminum jackets which communicate with the blower. The advantage of the system resides in the automatically varying cooling effect, which is claimed to insure a uniform cylinder temperature regardless of variations in engine speed. The front of the bonnet is designed to give a planetic radiator effect. The transmisison gear is mounted on imported ring type ball bearings and is enclosed in a barrel type aluminum case with removable heads. Four forward and one reverse speeds are obtained by means of two sliding sets. By shifting an internally toothed drum over the end of the clutch pinion the two parts of the first motion shaft are locked together, and the drive is then transmitted direct. The shafts of the change speed gear on which the pinions slide are formed with integral feather keys, instead of being squared.

REO MOTOR CAR COMPANY.

At this stand THE HORSELESS AGE representative had an interview with R. E. Olds, who said: "This company exhibit cars with single and double cylinder horizontal and four cylinder vertical motors. The larger cars are fitted with limousine, standard side entrance, or single seat bodies, to suit the purchaser. The stripped chassis of a two cylinder car is shown, which follows generally the lines of last year's model, with improvements in detail. A new oiler is used, to which a good deal of attention has been given. It consists



LANE STEAM TOURING CAR.

livery of the pump, is regulated from the outside of the oil box by set screws, whose inner ends are struck by the plungers toward the end of their stroke, which is thus limited as desired. The difference in stroke is taken up by springs interposed between the actuating cam and the plungers. By this arrangement the oil is taken from the bottom of the oil box; and it is found that the delivery of oil to the pistons as described suffices for ample engine lubrication. An independent carburetor is employed for each cylinder of this car. A complete working model of the two cylinder car attracts a great deal of attention. This appears to be perfect in every detail and has been run. It is made to scale from the same drawings as the large car, and is only about one-fourth as large."

ARDSLEY MOTOR CAR COMPANY.

The Ardsley car is about one year old, and this year the style of construction is the same as last, with improvements which have been suggested by experience. Its makers have confined themselves to one model, and the design shows careful study. A compression relief is now fitted to the engine, which is operated by pulling out a cylinder in front of the radiator. This slides the exhaust shaft so that a supplementary set of cams come into play which keep the exhaust valves open through one-half of the compression stroke. The commutator (Lacoste) is now very accessible, its cover being just back of the radiator and close to the side frame. It is driven by spiral gears from the inlet cam shaft. An entirely new carburetor of the company's own make is employed. The only moving part is the throttle, which serves to control the engine speed and, at the same time, to regulate the air supply at all speeds. This is accomplished by moving the throttle plunger in the sleeve, progressive movements of the throttle first opening slits in the sleeve for starting, and then opening a larger court to provide the necessary air when the motor speeds up. There is a screw compression grease cup on the rear of the dash for forcing grease



REO FOUR CYLINDER TOURING CAR.

to the gear case bearings. The muffler is not only provided with a cut-out, but regulation of the cut-out may be obtained by means of a small hand lever moving over a sector mounted on the dash and connected by a cord to a valve lever which is held in such a position as to deliver the gas to the muffler by contracting springs. The rear axle is of the ball bearing floating type and the reaction of the drive and the brake action is taken up by a torsion brake rod running to a cross member of the frame.

LOGAN CONSTRUCTION COMPANY

have an exhibit including trucks and delivery wagons, runabouts and touring cars of the pleasure type. Their motors are all of the double opposed type, the 10 horse power being air cooled, and the larger sizes water cooled. The two cylinder air cooled motor has sheet copper flanges, which are perforated and tapered to rest over each other on a turned cylinder body, providing 54 square feet of radiating surface on each cylinder, which enables the designers to carry 75 pounds compression without overheating. A funnel shaped stack covered by wire gauze is fitted over the crank chamber, which permits a draught of cool air to act on the pistons at each revolution of the flywheel. The expulsion of the hot air from the crank chamber on the suction and firing stroke carries oil to the bottom of the screen, from which it flows down the sides of the funnel to lubricate the pistons. Suction inlets and mechanical exhaust valves are used. The cam shaft is made of machine steel, case hardened, and the driving gear shaft and cams are an integral forging. The transmission is of the sliding gear type, and by a special interlocking device the gears cannot be shifted while the clutch is engaged. The general construction is the same in all types. A specially designed equalized trussed frame is a prominent feature of the Logan cars.

THE JOHNSON SERVICE COMPANY

show a steam car built on gasoline lines. The engine is of four cylinder trunk piston construction, with a very close resemblance to a typical gasoline engine, including poppet valves, cam shafts, etc. There are no stuffing boxes, slide valves or any of the usual steam practice. The cranks are set at 90°. The cylinders are all cast in one piece, and are covered with asbestos and a neat sheet metal cover. There is no flywheel. The cam gearing is 1 to 1, the pistons, of course, getting an impulse at every revolution. The pump is driven by an eccentric on a secondary shaft geared with a large reduction to the crank shaft. A hand auxiliary pump is used only in starting in the morning. The boiler, which is placed directly behind the engine under the bonnet, is of the semi-flash water tube type, the tubes being imported from Scotland. They are seamless and fastened at the ends with right and left couplings. They are coiled in helical form, the different helicals intersecting one another and all connecting

ries, forming a tube 400 feet long. It aimed that the absorption of heat is so t that the gases emerge at only 300°, that 1 pound of fuel will evaporate 15 ds of water. The safety valve is usu- set at 500 pounds. Kerosene is used fuel. There are three sets of cams, giv- two-thirds and one-third cut-off and rse by moving the shaft lengthwise. is operated by a hand wheel mounted he steering post and concentric with the ring wheel. Another wheel operates the ttle. The cylinders are 3¼x4, and are d at 30 horse power on the one-third off. This is said to be by actual test on brake. A glass is inserted in the foot- rd, and beneath this is a mirror, which ects a view of the burner and pilot light. e chassis frame is of pressed steel con- uction. The springs are semi-elliptic. e drive to the rear axle is a typical shaft ve, the propeller shaft being exceptionally g because of there being no change gear. e body is a beautiful limousine, and the ndenser is placed on the roof, where it is rcely seen.

THE FORD MOTOR COMPANY

ow a four cylinder, side entrance car d a two cylinder runabout similar to last ar's models, also their new six cylinder r, and a stripped chassis of the same, ghly polished. This chassis presents a ry trim and handsome appearance, due the finish and carefully considered ar- ngement of piping and auxiliaries. The lves are all on the right hand side of e motor. The cylinders are cast separate- , but, considering the number, the bon- t is not very long. The inlet and ex- ust pipes extend practically straight ongside the cylinder heads, are close to- ther, and their connection to the valve ambers is close and direct. The car- uretor connects with the inlet at its cen- e by a vertical pipe. The cam gears are mpletely enclosed in an integral exten- on of the aluminum crank case. The ar pump is just back of the radiator, and s driving pinion is also within the crank sing extension. The pump shaft extends the rear, passing through a hole in the rward engine supporting arm, and drives e new style Holley-Huff system mag- eto through an Oldham coupling. A lanetary transmission gearing of conven- ional internal gear, two speeds and reverse ype, is used. It is very compact and is upported by a special aluminum casting, which also carries the transmission brake nd reverse pedals. The connection of the everse pedal with its brake band is di-



PREMIER FOUR CYLINDER CAR.

though the mechanism is very simple. The front spring is transverse, connected at the centre to the front frame member, and shackled to the side near the knuckles. Rock rods run from the front of the axle ends to the middle of a transverse frame member near the centre of the car. The motor has four cylinders cast in pairs, 3¾ inch bore and 3¼ inch stroke, and is guaranteed to deliver 15 horse power. A small Holley carburetor is fitted. All valves are on the left and mechanically operated, the piping being similar to that of the six cylinder car. The flywheel is in front of the engine and serves also as a fan. Transmission is by planetary gear, controlled by a single hand lever and three pedals. The steering gear and engine control group are of the same design as in the large car. The model shown has been rushed through for the Show, and has not been exhibited before, even to agents.

THE LANE MOTOR VEHICLE COMPANY

display a chassis and a complete side entrance touring car. In general design these steam cars are very much the same as last year. The makers are now using roller bearings on the engine, crank and connecting rods. The feed water pump is now bolted to a frame cross member just back of the engine case, and occupies what would ordinarily be considered an inverted position, in that the stuffing box is at the bottom. The piston is operated by an eccentric strap running from the crank shaft at a point beside the flywheel. The piping has been somewhat simplified and rearranged to give greater access to the engine and other parts. The compound engine is rated at 15 horse power, but by "simpling" can be made to develop 27 horse power, it is said. The water supply, 20 gallons, is said to be sufficient for 100 miles running.

MITCHELL MOTOR CAR COMPANY.

In addition to cars of their old types with minor improvements, the Mitchell Motor Car Company have this year produced two entirely new models. One is a touring car accommodating five passengers, having a four cylinder vertical motor rated at 30 horse power. The exhaust vales are in chambers on top of the cylinders, operated by cross arms and tappets from the cam shaft. The inlet ports admit gas below the exhaust chambers, so that the incoming charge tends to drive up burnt gas remaining in the cylinders, and to present a perfectly fresh combustible mixture for ignition. The designer states that this engine will run 2,300 revolutions per minute. A Splitdorf commutator, driven by special gear from the half time shaft, is fitted. The crank arms are left just as they come from the hammer, with the "skin" intact, only the bearing surfaces being machined, insuring a stiffer and tougher crank than



when finished all over. The change gear is of the sliding type, with no gears running on high speed. There is a registering device which insures perfect meshing of gears at all speeds, and also an interlocking device, preventing gear shifting with the clutch engaged. The other new car is of similar design, but has an 18 horse power motor, and seats two persons only. It is intended especially to meet the demand for a runabout of great ability, and it is expected to have a ready sale to owners of larger touring cars who also feel the need of a high grade runabout. This company also exhibit a truck of 1 ton normal load capacity, with 14 horse power, two cylinder vertical motor forward; sliding gear transmission; three speeds and reverse, and Cardan shaft drive. Three inch Firestone tires are fitted.

KNOX MOTOR TRUCK COMPANY.

This company show a single truck of 6,000 pounds capacity. The whole power plant is carried as a single unit by a low main frame, the crank and motor casings being combined in one box of very stiff construction. The main frame is supported at the rear end directly on the rear axle, and in this year's models the front end is suspended by a yoke from the front body springs. The front frame ends are looped to surround the axle, and take up twisting sprains, but allow the axle to lift at either end through a wide angle without tilting the body. The radiator is now supported on the main frame on separate, flexible springs, to protect it against rough usage. The transmission from the engine to the wheels is by spur gears entirely. Speeds are changed by the sliding system, and the gears are of ample width. The outer rear axle is strongly braced, and takes all running strains, the inner driving shafts being of the "floating" type. The engine is run with a fixed spark, and an extremely simple device is employed for retarding the spark temporarily in starting. When the car is stopped it is considered always desirable to apply the hand brake. The brake rod carries a lug which, when the brake is put on, strikes a part of the commutator casing and rotates it so as to give a "two inch lag." The hand brake is always set when starting the motor. A novel device for priming the carburetor is employed. This consists of a check valve having a stem extending to the side of the truck, which, when pushed in, shuts off practically all air. When the engine is turned over an almost solid jet of gasoline is drawn into the cylinders. There is no ratchet or other locking device for the throttle lever. The throttle bearing in the carburetor is long and sufficiently tight to hold the throttle in any position in which it is placed. Timken roller bearings are very liberally used, being applied even to the cam shaft. The driven clutch member, when the clutch is disengaged, can be turned over, with gears in mesh, by a touch of the finger.

E. H. V. COMPANY

show, in addition to complete cars, one of their compound internal combustion engines, in sections exposing the interior moving parts in such a manner that the operation can be most readily understood by the layman. The engine is driven by an electric motor belted to the flywheel, and all the movements can be clearly followed. Of the three cylinders, placed side by side in a row, the two end ones are the same as in the ordinary four stroke cycle internal combustion engine. The middle cylinder receives the exhaust gases from the end ones in turn at equal intervals. The high pressure end pistons travel up and down together in their cylinders, so that both reach the top at the same instant, and the low pressure piston travels in the opposite direction through the same length of stroke, its crank pin being at 180°, or half a revolution from those of the high pressure pistons. The moving parts are thus balanced in a manner similar to the common type of four cylinder vertical engine. One of the high pressure cylinders takes in a charge of combustible mixture, compresses it and then the spark ignites the charge for the impulse stroke. About the end of the stroke the exhaust valve opens to discharge the inert gases, and at the same instant the corresponding inlet valve of the low pressure cylinder also opens to receive the exhaust from the high pressure cylinder. The sectional area of the low pressure cylinder is three times that of the high pressure one, this giving three times the area of piston to be acted on at low pressure. As the high pressure piston moves up and expels the inert gases they expand into three times as great a volume as when contained in the high pressure cylinder, and consequently transfer additional power to the crank shaft of the engine. At the end of the expansion stroke of the low pressure piston the thoroughly expanded and cooled gases are discharged into the atmosphere by the opening of the exhaust of the low pressure cylinder. The action of the charge of the other high pressure cylinder is similar. The low pressure piston thus receives an impulse every down stroke, or twice as often as the case of a four stroke cycle engine.

THE FRENCH WESTINGHOUSE COM

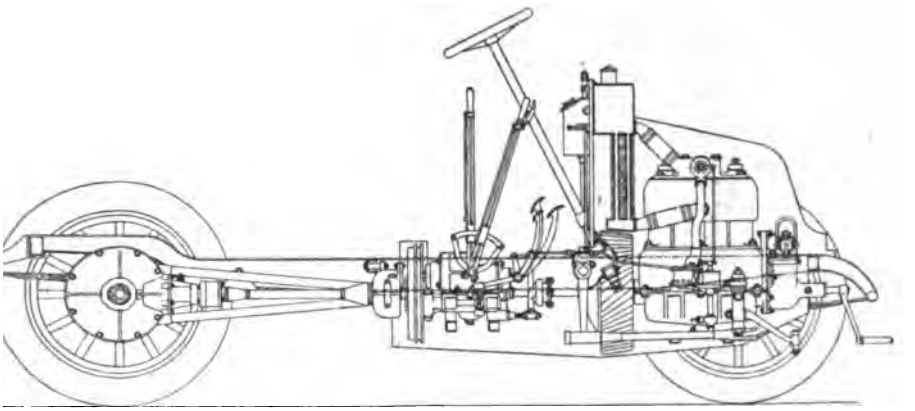
exhibit the Westinghouse, which attracted considerable attention at St. Louis year. The chassis on exhibition is fully finished throughout and is commented on by spectators. A four inder vertical motor is used with mechanical valves located on each side of the inders. An automatic carburetor of float feed nozzle type is used. Two valves on the carburetor, of different mensions and spring tension, supply auxiliary air, the weaker spring for speed and the heavier for high speed the motor. Exhaust pressure acts on gasoline and oil tank as in the Mer car. Both ignition and gasoline controls are located on the steering wheel. A Bosch low tension magneto is used in junction with hammer make and break plugs. The ignition control consists rocker shaft which causes the cam to gage the igniter rod earlier or later shifting the spark lever. The clutch the Panhard type, and consists of discs 3-32d of an inch thick. The transsion is of the selective sliding gear and has a three point suspension. foot brakes are used, one on the mission and the other on the differe The emergency brake is internal, expanding with wire cables running to the lever.

RENAULT FRERES AGENCY.

There are two new Renault cars. A 50 horse power touring car and a horse power car usually fitted with de ville or landaulette body for city only. The 20-30 horse power car, as as the new touring car, has four speeds stead of three. A new type of accelerator valve is placed at the bifurcation of the let pipes between the two middle cylinders instead of in the carburetor. Other these cars are along the same lines former models. The 10-14 horse power exhibits a radical departure in the mo The aim has been to construct a sm compact, economical city car. The



COMMERCIAL MOTOR CAR COMPANY'S TRUCK.



RENAULT 10-14 HORSE POWER CHASSIS.

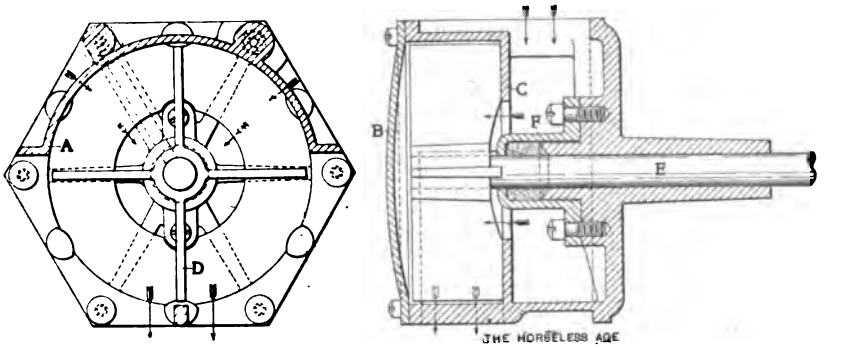
tical cylinders are all cast integral. The e is 75 mm. and the stroke 176 mm. e inlet is automatic. The accelerator ve is placed in the inlet pipe similar to other models, but is operated by a foot lal only, there being no control levers the steering wheel. The time of spark all Renaults is fixed.

CHARRON, GIRARDOT & VOIGT.

There are a few changes to be found in Charron, Girardot & Voigt cars. An irely new design of carburetor, with rm water circulation, is used. The ing of the valves has been altered. ese two changes, it is claimed, have inased the power of all the cars 10 to 20 cent. The motors have a three point spension. Two arms from the crank se rest on the chassis opposite the rear inders. A U-shaped frame extends ng the sides of the case and has an n resting on top of the frame in the ntre in front. The combined gear and ferential case is also supported at three ints. The two bearings of the jack aft, which hang below and outside the assis, form two points, and the third is a cross beam at the connection with the otor. Steering has been facilitated by eater leverage and larger bearings on e steering column. The spark and throtlevers on top the steering wheel now main stationary when the wheel is rned. The speed changing lever locks ly at the neutral point between the slow d reverse, and is intended to catch at is point to prevent throwing into the rse gear too suddenly. The break on the ck shaft is an internal expanding type, out 13 inches in diameter, and operates th the lightest touch on the pedal.

WELCH MOTOR CAR COMPANY.

The Welch Motor Car Company exhibit ie limousine, one side entrance open tour- g car and one polished chassis, all being heads at an angle of 45 degrees with the vertical, opening directly into the cylinder. In this manner the wall surface of the combustion chamber is reduced to a minimum and the charge is fired near the centre of the compression space, whereby the flame is propagated through the charge in the shortest possible time. The writer was told at the stand that the advance of spark necessary at maximum engine speed is only 25 degrees of the crank shaft revolution, whereas in some other engines it is as high as 45 degrees. Another point of interest in the construction of the engine is that the upper half of the crank case is cast from a high tensile bronze, while the lower half, which does not support any of the strains, is of aluminum. A change which has been made in this year's model is that the water circulating pump is built into the centre of the radiator and has the fan mounted on its shaft. The pump is of the centrifugal type and of peculiar construction. It consists of a cylindrical chamber divided into two compartments by a partition wall with a circular opening in the centre. The forward compartment contains the pump paddlewheel, driven by belt from the engine, while the rear compartment is empty. The radiator



WELCH WATER CIRCULATING PUMP.

A, pump case; B, cover plate; C, partition; D, paddle wheel; E, pump shaft; F, stuffing box.

ity of circulation. The change speed gear is of a special design, employing two multiple disc friction clutches and one double positive clutch, all controlled by a single lever through the intermediary of a cam mechanism.

E. W. BLISS COMPANY.

The engine of this machine is of the typical four cylinder type, with valves on opposite sides, and is mounted on a three point suspension. The clutch is of the Mercedes coil type and runs in oil, is oil tight and has a universal connection to the gear case, which is claimed to be impossible with the Mercedes. Another point they call special attention to is the ease with which the clutch may be tightened. The change gear also has a three point suspension, it only being necessary to remove a small cap with a wrench and then tighten up a nut. The change gear is somewhat similar to the Mercedes, both shafts having bevel gears connecting to the differential on the cross shaft. The drive is by side chains. The shafts attached to the sprocket pinions are joined to the differential shafts inside an extension of the case. By removing a small cap, these shafts may be disconnected and taken out. The differential brake is inclosed in a separate chamber in the gear case and runs in oil. It is of the internal expanding type. The distance rods are provided with hinged joints to allow of sidewise movement. Rear brakes are internal. The axles are I section, made of chrome-nickel steel. The springs are semi-elliptic, 40 and 56 inches by 1¾ and 2 inches. The gasoline tank is located in the rear, and pressure is supplied from the exhaust. The gear case has ball bearings. The pump is centrifugal, and the radiator is of the multiple tube flange type. Steering is by nut and screw. The frame is of pressed chrome-nickel steel. The cylinders are 4½x6, and the engine is rated at 30 or [illegible]

steel alloy. There are ten points in which the starting crank will catch the crank shaft. The steering knuckles have their yokes on the loose ends and the pivots are very close to the hubs; this, combined with a cambered wheel, insures very easy steering. The gasoline capacity is thirty gallons. They call attention to the ease with which the hand and foot brake levers may be detached, by simply unscrewing a couple of nuts.

BERKSHIRE AUTOMOBILE COMPANY.

The Berkshire is a four cylinder water cooled side chain drive machine and is exhibited in conjunction with the E. W. Bliss Company's new car. The valves are all mechanical, arranged on opposite sides of the cylinders. The cylinders are cast individually and are 4¼x5½ inches. Ignition is by jump spark from four coils and a storage battery. A centrifugal pump is operated by gear from the cam shaft gear. The radiator is of the honeycomb type. The oiling system is what is known as the flush feed, a tube leading from a reservoir forcing the oil to flow over the entire surface of the crank bearings, down through the crank shaft and up through the connecting rod bearings, the shaft being drilled to allow the oil to pass through to the various points. The surplus oil acts as a splash for the pistons. The change gear of this car is somewhat out of the usual line, although it may be classed in the sliding gear type. There are two parallel shafts, with a series of gears mounted thereon, which are in constant mesh, those on the engine shaft being keyed, while those on the other are free to rotate. A short section of the second shaft is made in the form of a ten tooth spur gear, while the gears have internal gear teeth cut on their inner surface, the pitch diameter of both being the same. The shaft moves endwise, and enters first one gear and then another, the gears acting as positive clutches to lock each external gear to the shaft in turn. The company exhibit a chassis and side entrance tonneau.

BUCKEYE MANUFACTURING COMPANY.

This concern exhibits several models, using the Lambert friction drive. They have adopted the four cylinder vertical motor, of which they exhibit two specimens. These motors are suspended on the three point principle. The frame suspension is by semi-elliptic springs in front and full elliptic in the rear. The friction drive in this car consists of a friction disc on the motor shaft against which is pressed a longtitudinal movable driving disc on the transverse shaft. This shaft carries a differential, and the drive to the rear wheels is by double side chains. The radius rods for the rear axle are engaged by the transverse shaft, and in bringing the driving friction disc in engagement with this drive, ansverse shaft is rocked forward on he chain distance to the rear wheels reserved by the radius rods which vard the rear axle, the rear spring connection being pivotal to accommodate this motion. The company also show a car with a two cylinder motor, which is similar to their last year's model.

VIQUEOT COMPANY

The Viqueot Company show a large, finely finished limousine and a well finished chassis. The engines are of four cylinders, 40-45 horse power of the individual type, with valves on opposite sides of cylinders. The cam shafts are driven by oblique spur gears outside the crank case. They are semi-protected by aluminum covers. The engine is directly mounted on the pressed steel frame, as is also the transmission. Ignition is by high tension magneto, fibre gear driven, the commutator being mounted on a vertical shaft driven from the inlet cam shaft. The pump is of the centrifugal type, driven by fibre gear from the exhaust shaft gear. The radiator is of flanged tube construction. The cam shafts are of the outside, boxed-in construction and have their bearings individually oiled from a multiple force feed oiler. The clutch is a conical one, and a Cardan joint is interposed between it and the transmission. The latter is of the progressive, sliding type and has the reverse gear in mesh only when backing. Ball bearings are used in transmission. Transmission to wheels is by double chain. A band brake acts on the sprocket pinion cross shaft, and internal expanding brakes act on the hubs. The later have an equalizing device, which is claimed to be new; the two levers are connected with a cable with a large amount of slack in it and running over a pulley connected to a rod to the hand lever shaft, the cable converging at an angle of approximately 45 degrees from the transverse. At first sight it would appear that the pull was not direct, but upon analysis the arrangement is shown to be correct. The springs are all semi-elliptic. A sheet steel pan extends from the radiator back under the engine and transmission.

THE DORRIS MOTOR CAR COMPANY.

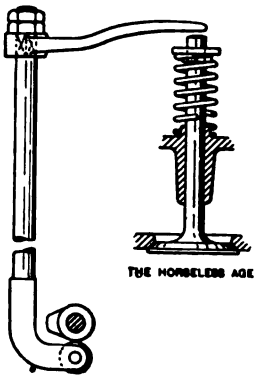
The Dorris Motor Car Company exhibit a side entrance tonneau and a chassis with four cylinder engine, slide gear transmission and bevel gear drive. The cylinders are cast in pairs and bolted to a cast-iron crank case of nearly square sectional form, the latter having two side plates, clamped on by a yoke common to both, for easy inspection. The valves are located in the top of the cylinder heads and operated by the well-known walking beam from push rods extending to cam shafts in the case. Ignition is by jump spark, the plugs being located rather low down on the side of the cylinders. The commutator is mounted vertically, close to the top of the crank case, to one side and between the middle cylinders. The pump is of the gear type and mounted directly upon an extension of the cam shaft, which also carries an eccentric for operating the oiler, which is attached directly to the cylinders on the exhaust side. The radiator is of the fluted tube type, made by the Long Manufacturing Company. The oiler has four pipes, one leading to each cylinder in the pan of the piston. The flywheel spokes are cast in the form of fan blades. A multiple disc clutch is inclosed in the hub. The change gear case is bolted direct to the engine support in positive alignment so that flexibility is not required in the drive between the two. The gear box countershaft hangs below the main shaft. On the high gear the drive is direct. The rear construction includes bevel drive, brakes, etc. The suspension of the rear is of the three spring platform type with the cross spring in front. In the steering knuckles the yokes are attached to the swivelled members. The front axle is of I section. The dashboard is dished and the steering post passes through it. A drip pan of sheet steel is attached under the engine.

THE WINDSOR AUTOMOBILE COMPANY

A side entrance tonneau and a polished chassis, with friction drive transmission, are exhibited by the Windsor Automobile Company. The engine is a typical four cylinder water cooled affair, with cylinders cast in pairs. There is no flywheel directly mounted upon the shaft, but a shaft nearly 30 inches long is attached to the engine shaft by a flange coupling, and to the other end of this shaft are attached by the same means two large discs separated by 8 or 10 inches. Their adjacent faces are covered with leather. These discs, of course, act as flywheels. Between them are mounted two shafts, one on either side, extending out beyond the chassis frame and having a sprocket pinion keyed to its terminus. These shafts each have a sliding pulley feathered upon them which are caused by the turning of a hand wheel concentric with but under the steering wheel, to shift toward or away from one another, the connecting medium being wire cable running over loose pulleys and trunnion rings, rods and levers, to cause them to move in unison. The space between the discs is slightly larger than the diameter of the shifting pulleys, perhaps a sixteenth of an inch. The bearings of the shafts are designed to allow a slight lateral movement under the control of a hand lever at the seat. When the lever is pushed forward it causes one pulley to come in contact with the front disc and the other with the rear one. As they are then in contact with opposite faces of the discs, they are both caused to revolve in the same direction, which in this case is forward. A backward movement of the hand lever causes the pulleys to exchange discs, which causes them to rotate in the opposite direction and, consequently, reverse. In other respects the car is of typical construction.

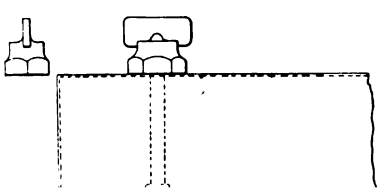
MARION MOTOR CAR COMPANY

A complete description of this car has already been published, but some points deserve special mention. A chassis and complete car with a side entrance



MARION VALVE MECHANISM.

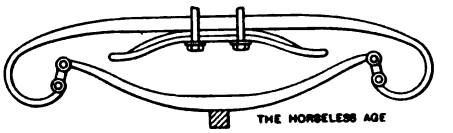
ating five, are shown. While the exust valves are set directly over the cens of the cylinders, the objection freently made to this construction, that it volves too many loose connections beeen the cam and valve, is obviated by placing the valve tappets by "pull down" ds, having arms at their upper ends to rike the valve stems, and carrying the m rollers at their lower ends below the m shaft. The motor is oiled from a nk extending along the right side of the ank case, provided with a valve and pipe ading to each of the four compartments, to which the crank case is divided by ansverse partitions. These valves are ntrolled by keys on the ends of the alve stems. The key sockets are slotted nd the valves stems are spring urged ownward, so that normally the keys fit the slots. When more oil is needed in crank case compartment the correspondg key is pulled out of the slot, whereon it may be turned, when the valve ens and oil passes through a supporting m cast on the crank case. The level of il within the crank case compartments is etermined by sight glasses communicating ith the supply pipes. A small pipe leads p from the carburetor to the crank of a inch straight trunk inlet pipe which laid right against the valve chambers nd communicates directly with the inlets. his large pipe is kept warm by the cylinders, and provides a constant gas supply ith ample reserve; and it is stated that he motor will throttle down to 100 revolutions without load, and with every cylinler firing evenly. In this car the brake



pedal is interconnected with the clutch, but the emergency brake lever is not. The rear springs are double elliptic, and the upper member is provided with supplementary leaves to take up extraordinary deflection.

RAPID MOTOR VEHICLE COMPANY.

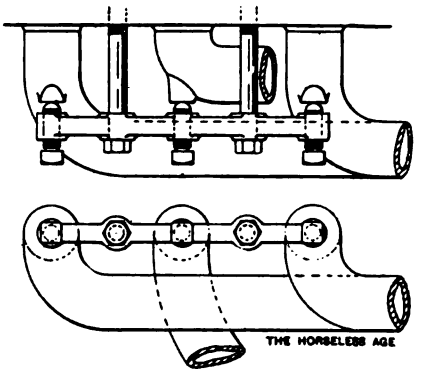
The Rapid Motor Vehicle Company, of Pontiac, Mich., exhibit their 2,000 pound delivery wagon and a 1½ ton truck. These vehicles are propelled by a gasoline motor of the two cylinder double opposed type, having mechanically operated inlet and exhaust valves. The valve seat is screwed into the cylinder, and, by the use of a specially provided spanner wrench, can be removed to regrind with the same ease as a suction valve. Ignition is of the jump spark type. Accessibility and durability, rather than beauty of finish, have been the aim of the manufacturers of these vehicles. A small box on the side and below the floor of the truck not only carries the coil, tools and battery, but is provided with a door which permits the operator to examine the wiring, commutator, carburetor and plugs. In fact, it appears that nothing short of a complete breakdown would call for the operator crawling beneath the vehicle. The pump is of the double gear type,



SKETCH OF MARION REAR SPRING.

and pumps through the cylinder into the tank, from which the water flows by gravity to the radiator. The transmission is of the planetary type, and so arranged that when traveling on high gear a reversal of the gear lever releases the clutch and applies the brake simultaneously. The motor is bolted to a cross beam of channel steel. The transmission shaft is suspended from the frame and runs in a universal joint bearing to allow for unevennesses in the road and consequent strain on the shaft and bearings. A supplementary spring suspended from a cross beam over the rear axle comes into action in case the truck is loaded beyond its maximum capacity. The truck on exhibition is fitted with five seats capable of seating twenty persons, and presents a showy appearance as a sightseeing car. These seats can be removed or attached with but little labor, as the occasion requires.

MOLINE AUTOMOBILE COMPANY.



MOLINE TUBE CONNECTIONS.

ber to the straight, long main pipe, and the inlet pipes lead from a second manifold to a single inlet chamber in each of the cylinder pairs. The pipes all curve downward from their connection with the cylinder heads and are provided with bosses to receive the ends of set screws for holding them in position. These set screws are carried by a straight bar reaching right across all three pipes, and this bar is itself held in place by two set bolts passing between each exhaust connection and the inlet connection and nuts. The fan is loose on its driving shaft, and a friction disc against a shaft, spring pressed against a corresponding disc on the fan, serves to drive it. Any interference with the fan motion will cause slipping of the driving connection, but will not damage the fan. The fan is gear driven from a fibre pinion on the pump shaft, which in turn is driven from the half time shaft by a steel gear of large diameter, giving a rather large fan and pump movement. The half time shaft is driven by a phosphor bronze pinion on the engine shaft. In this car the clutch is not thrown out by the service brake, but it is disconnected by applying the emergency brake.

DURYEA POWER COMPANY.

This well known car does not depart in any respect from its former design, and atlhough so widely different from more common usage, its features are so well known that they can hardly be called peculiar. Improvements are made all along the line, however, from year to year, and a few interesting points may be noted. The springs for the make and break ignition have been put in an entirely exposed



tougher and heavier. The new Fisk red inner tube is being shown for the first time, and is claimed to be superior to anything of the kind on the market.

MORGAN & WRIGHT.

This hustling firm have an attractive tire exhibit showing the various types of tires manufactured by them. The Dunlop clincher with a new rim is being specialized. The rim is what is known as the Universal and is so made that by reversing the two side rings either clincher or Dunlop tires may be used on it. The company also make a tire of what they call the wholly wrapped tread, which takes the place of the old moulded tread. Two breaker strips are being used on the tires and they are being made heavier all around. There is also increased weight in fabric.

THE MITCHELL PUNCTURELESS PNEUMATIC TIRE COMPANY,

Swampscott, Mass., present a pneumatic tire which represents a radical departure from existing methods. The outer tire is about an inch thick on the tread, the inner tube is what is familiarly termed a hose pipe. Between these two, the outer casing and inner tube, is a solid rubber leg or plug made in sections, each overlapping, the under side of the leg being leather covered to prevent chafing. The leg is held in position by a metal clincher through the sections. The sides are enclosed with steel flanges that are bolted through tire and clincher, fastening the whole firmly.

The exhibit of the

EDISON STORAGE BATTERY COMPANY,

of Orange, N. J., consists of their regular line of storage batteries. They also show a new cell, with some changes in the positive electrodes.

THE ST. JOHN RUBBER TIRE COMPANY,

116 Broad street, New York, show a tire constructed in one piece. The tread or face of the tire is solid, from three-quarters to 1½ inches in thickness. The inside rim, which fits to the wheel, is also solid. These two rims rest on the rubber cushions formed by circular opening three-quarters of an inch in diameter around the tire. They are fastened to rims of the regular clincher type with three-eighths of an inch brass bolts. A half round brass plate or nut rests in the nut between the cushions, into which the bolts fit.

THE MAYO RADIATOR COMPANY,

of New Haven, Conn., have an exhibit consisting of a line of aluminum hoods, dashes and numerous styles of radiators.

THE AMERICAN GENERATOR COMPANY,

Sixty-third street and Park avenue, New York, exhibit a generator or surface carburetor which they claim gives increased power while showing an economy of fuel. The tank is filled with absorbent wood felt, each layer of felt being separated by an aluminum tray which is perforated every two inches from top to bottom. The gasoline is poured in at the top of the tank and is taken up by the absorbent, the excess fluid being drawn off at the bottom. The engine by suction draws from the generator a warm gas, the quantity of which is governed by a regulator through which it passes immediately before entering the engine. All air and gas passages are of 1 inch diameter.

THE WERNER CAR IMPROVEMENT COMPANY

show a novel seat suspension and shock absorbing device described elsewhere in this issue.

THE ROLLINS MANUFACTURING COMPANY,

Boston, Mass., show the Hoffecker speed and mile register. This device, in addition to giving the miles per hour, also gives the miles per trip from 1 to 100 by an indicating hand that can be turned back to zero when desired. The total mileage is recorded as well. The instrument is attached to the dashboard, and is actuated by a flexible cable and gear attachment on the wheel of the car.

THE CONSOLIDATED RUBBER COMPANY,

No. 1784 Broadway, New York, show a line of the Kelly-Springfield endless tires, as also a complete line of the Swinehart Clincher Tire and Rubber Company.

THE KINSEY MANUFACTURING COMPANY,

Dayton, Ohio, in addition to Kinwood radiators, mechanical oilers and mufflers, show a gasoline gauge or indicator, which can be placed in any tank, and which consists of a float and indicator stem. The gauge rod or indicator stem, which is attached to the float, is flush with the top of the tank when it is full, and as the tank is emptied it rises, showing the depth of gasoline in the tank.

THE SHEDDAN MANUFACTURING COMPANY,

Baltimore, Md., show "the perfection air cushion," which they claim will absorb and dissipate any shock. It is made of heavy brass casting, fastened to the frame and the lower side of the spring, and consists of a plunger fitted into a tight cylinder filled with air, a ball check valve allowing of suction of air at both top and bottom of the cylinder.

FRANCOIS RICHARD,

511 West Fifty-ninth street, New York, shows an automatic carburetor which can be used for kerosene, gasoline or any liquid fuel. It consists of a float feed device, with two air valves and two gasoline valves. It is cast in brass in two pieces and weighs about 9 pounds.

THE HULL MANUFACTURING COMPANY,

Buffalo, N. Y., are showing a canopy top, the woodwork of which is varnished mahogany finished, and which has a plain glass front sliding window, three-quarter inch standards finished in black, and curtains of artificial leather. They also show an extension Cape top, made with four curved bows and curved outside slat irons, brass finished, covering of mackintosh material, side and rear curtains and flexible curtain lights with folding front hood. When the top is lowered it is practically level with the top of the rear seat.

JOHN BOYLE & COMPANY,

New York, show a line of auto hampers made of 8 ounce sole leather, finished in black patent leather, with nickeled trimmings. The hampers have steel frames and are lined with waterproof material; they are constructed in different shapes and sizes, being shaped to fit the different types of cars. A waterproof paraffine cover is delivered with each hamper and the hampers are claimed to be both dust and water proof. This firm also exhibits a line of aluminum license pads and lamp numbers; also tool kits of canvas and of rawhide.

THE EVER-LASTIC TIRE WORKS,

of Chester, N. J., exhibit a filling for pneumatic tires, a composition resembling very soft rubber. This preparation while in a fluid state is forced into the tire under a heavy air pressure till it is completely filled. After standing for forty-eight hours the filling coagulates and gives the same resiliency as the air filled tire, it is claimed and is not affected by traction of the wheel nor by hot or cold weather.

THE SCANDINAVIAN FUR AND LEATHER COMPANY,

of New York, have an exhibit consisting of a very elegant and extensive selection of automobile wearing apparel for both ladies and gentlemen, including coats, wraps, dusters, gloves, caps, veils, lap robes, etc., in silk, leather, rubber and furs, the exhibits being shown on life size figures.

THE SURVEY MAP COMPANY,

41 Lafayette place, New York, exhibit a line of road maps which have been prepared from actual road work of members of the A. A. A. under supervision of the secretary of the Touring Committee. These maps cover seven of the Eastern States and are issued in sections, so that it is not necessary to have the map of the entire State before one's eyes. Explanatory route cards are furnished with each map, showing distances, turning points, etc. With each set is furnished a leather bound case, with transparent celluloid sides, enabling one to keep the map in sight on one side, and the route guide on the other, at the same time protecting them from water, dirt and grease.

THE AUTO-LOCK-PLUG COMPANY,

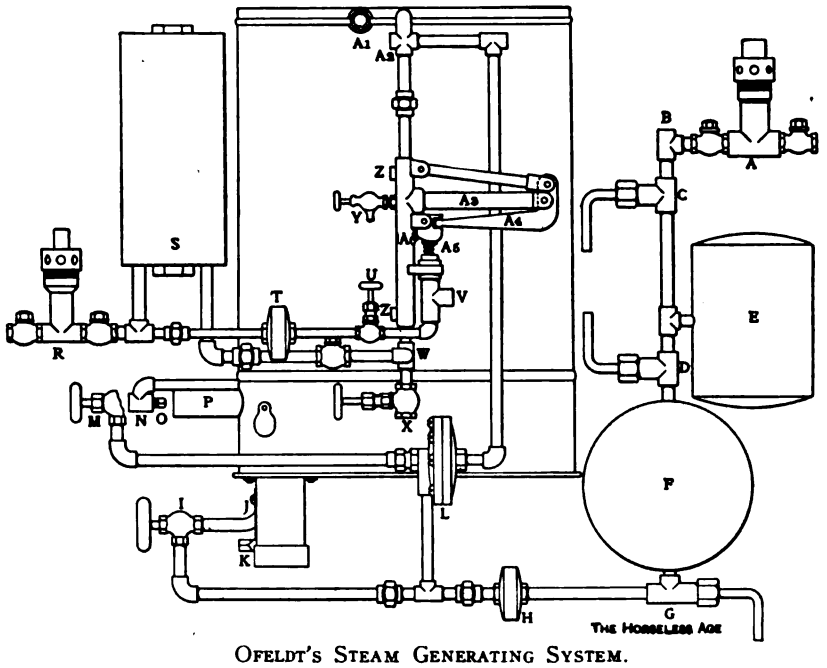
31 Nassau street, New York, are showing a device claimed to prevent the stealing of a car, or its use without the sanction of its owner. This device prevents closing the circuit of the battery switch and starting the igniter without a key. The key is part of a Yale lock, which, combined with a battery switch, operates a cut-out plug and thus closes or breaks the circuit. The removal of the key from the lock breaks the circuit and it cannot be closed again until the key is inserted. This lock is placed directly above the plug socket and prevents the closing of the circuit by any other means than the key belonging to the lock.

MADISON-KIPP LUBRICATOR COMPANY,

f Madison, Wis., show a line of valveless ıbricators, the special feature of which is hat they contain no valves or stuffing boxes n the pumping mechanism, which is placed ›n the inside. The amount of oil is regu-ated by a thumbscrew at the top while he engine is running, and each feed is cap-ble of independent regulation. A vacuum :heck valve is used in the feed pipe to pre-ent the oil from escaping when connected ›efore the throttle. These lubricators are nade in quart, half gallon and 2 gallon ›izes.

G. H. CURTISS MANUFACTURING COMPANY,

Hammondsport, N. Y., show a single cyl-inder and a double cylinder motor cycle, the latter having V cylinders and a 58 inch wheel base. The frame is 22 inches high, made of 1¼ inch tubing, with three-quarter inch forks and stays. Ignition is by means of four dry cells in a steel case attached to the rear stays, using two coils. Transmis-



OFELDT'S STEAM GENERATING SYSTEM.

sion is by a V belt. The carburetor is float feed, automatic device, with a compensating air valve and a throttle.

WAGNER MOTOR CYCLE COMPANY,

1900 Broadway, New York, show a motor cycle, single cylinder, with a 54 inch wheel base, weighing 125 pounds; also a ladies' tandem, with a wheel base of 80 inches, and weighing 160 pounds.

F. W. OFELDT & SONS,

Nyack, N. Y., show a line of steam specialties. Their burner is shown in operation, the gases passing into the air without any disagreeable odor. A small boiler over the burner supplies steam to run a new compound engine which they are putting on the market. This engine is a double compound, with one high and two low pressure cylinders $\frac{3\times4\times4}{5}$. It is strongly made, runs in oil, and is capable of a wide range of horse power. It is claimed that it will make 1,000 revolutions per minute, and develop 30 horse power at normal speed. They are also showing a 15 horse power compound engine, which runs in oil, both engines being of the horizontal type. The generating outfit has received considerable attention from this firm, and the accompanying cut shows their new generating outfit and speed system.

THE GEARLESS TRANSMISSION COMPANY,

of Glens Falls, N. Y., show a gearless transmission, the frame of which is suspended at four points by means of bolts from cross members attached to the car frame. Levers projecting from the sleeves on the inner side of the hub bearings are operated in unison from a foot pedal to bring the side wheels into contact with the engine flywheel and the central wheel on the shaft simultaneously. The shifter rod connected to the central wheel is operated from the side lever, and adjusts the central wheel on the shaft to that point on the side wheels to obtain the desired speed. To change the speed or to reverse the motion, the side wheels are brought into contact with the engine flywheel and the central wheel by a foot lever, and the direct clutch is automatically withdrawn.

THE GLEASON-PETERS AIR PUMP COMPANY

exhibit consists of a full line of their air pumps, tire pumps, compression grease and oil guns, dashboard pumps, portable storage outfits, and general air appliances, particular attention being called to their triple cylinder, high pressure power pump, which they show driven by electric motor. It is claimed that but little power is required to operate, as the number of cylinders afford a large volume, while their small diameter gives a high pressure. Each is fitted with a yoke of seamless brass tubing and independent intake and outlet valves, which prevent air from cushioning in the supply pipe. The cylinders are 2 inches in diameter. The height over all is 33 inches, and the weight 130 pounds.

COOK'S RAILWAY APPLIANCES COMPANY.

of Kalamazoo, Mich., are showing the "Standard" automobile jack, of 8½ pounds weight, with a one ton lifting capacity, finished in aluminum. A turn of the eccentric side of the frame reverses the movement of the lifting rack upward or downward, as desired. All working parts are interchangeable. This firm also exhibit a portable tool grinder, which is operated by hand, and is especially adapted for sharpening drill bits. By means of an adjusting screw the drill bit can be held in the same position with reference to the face of the emery wheel while grinding both lips of the bit, thereby securing a symmetrical cutting edge and the necessary clearance.

THE HICKS SPEED INDICATOR COMPANY,

Brooklyn, N. Y., show an odometer consisting of a spherical dial 3⅛ inches in diameter offset from the dashboard, showing two rows of figures, the upper line being the trip register and the lower the register for the season. The speed indicator is inclosed in a compact case, is 3¼x 4½ inches in size, and indicates the speed of the car up to fifty miles an hour. The parts are made of substantial material. The main drive gears are milled out of tool steel, and lubrication of all bearings is through an oil cup placed on top of the indicator, which feeds to the bearings through small tubes.

THE SAFETY ELECTRIC ELEVATOR COMPANY,

136 Liberty street, New York, show a small working model of an elevator, especially adapted for garages of more than one story. The elevator machine, bolted directly to the platform of the car, consists of a horizontal drum revolved by an electric motor. On the periphery of the drum is fitted a spiral track, which engages and travels on two series of rollers set in the guide posts. The motor being started, the drum revolves and the car ascends or descends as desired. The machine being attached directly to the platform of the car does not necessitate the use of any other space than that of the elevator shaft, thus saving space and eliminating all overhead machinery.

WM. P. MILLER'S SONS,

75 Third street, Long Island City, show a line of Excelsior cylinder oil, machine oil, graphite grease and automobile chain lubricant; also a belt and wheel dressing which they claim prevents all slipping and makes a slack belt do the work of a tight one.

THE TEEL MANUFACTURING COMPANY,

Medford, Mass., exhibit tire irons, portable wind shields, tire cases, trunks and trunk racks. The wind shield is made of celluloid instead of glass, and when not in use the front rolls down to the top of the dasher and the standards fold on top of the roll. The Teel tire cover is a casing with a facing held in position by two round wire hoops, that fit in the clincher of the tire, and are held in position by ball and socket.

W. H. BROWN,

of Chicago, shows a dust deflector or guard that is attached to the rear of the tonneau. The guards are vanes extending around the back of the car body. As the car moves forward they scoop clean air from the sides and carry it to the back, distributing it so as to maintain an equilibrium of air pressure. They are made of mill order steel, enamelled. A solid notched tire is also shown; it is claimed that resiliency is obtained through the notches.

THE CONNECTICUT TELEPHONE AND ELECTRIC COMPANY,

Meriden, Conn., exhibit an extensive line of spark coils, lever switches, volt-ammeters and accessories.

HUTCHISON ELECTRIC HORN COMPANY,

New York, show a line of dry storage batteries and charging devices, which have been thoroughly described in our columns; also an electric horn or attachment that can be attached to any horn by removing the reed and bulb, screwing on a projector, connecting to either ignition or operating battery, and by buttons located in convenient places about the car and on the steering wheel, enabling the occupants of the rear as well as the front seats to sound the horn by pressing a push button.

THE DETROIT MOTOR CAR SUPPLY COMPANY,

Detroit, Mich., show a highly finished body, of graceful lines and roomy tonneau, with wide side entrance doors, surmounted by light weight canopy extension top, made of two ply Dublin cloth, with rubberized centre, the top being padded between bows with curled hair to prevent sagging.

THE GRAY-HAWLEY MANUFACTURING COMPANY,

Detroit, Mich., show the 1906 model Gray mufflers in different sizes, these consisting of four chambers, the inner and outer drums of which are interlined with asbestos. The chambers are so arranged that the exhaust travels the length of the muffler four times before reaching the exit. A cut-out is provided inside the dome on the rear end of the first chamber, which allows the gas to escape directly through the regular exhaust pipe. The auto chime shown by this firm is made of polished brass divided into compartments; it gives a clear musical sound, and is operated by the exhaust.

At Both Shows.

S. F. BOWSER & CO.

show a full line of their safety gasoline storage outfits, self measuring tanks, pumps and adjustable measure oil cabinets. A new addition to the Bowser line for 1906 is a portable wheel tank. by means of which gasoline may be conveyed from the main storage tank to the car tanks with absolutely no exposure. The tank is mounted on two wheels, hand cart style, and is provided with pump.

THE PRESTO-O-LITE COMPANY.

Much is seen and heard of compressed acetylene gas nowadays. The Prest-o-Lite Company, of Indianapolis, Ind., make a specialty of adapting this valuable system to automobiles and road vehicles. They have on hand at their booth a large number of tanks. An important feature of the compressed system is the absence of water, which gives it a great advantage over the generator in freezing weather. The possibility of the tank exploding if caught in a roadside fire or a burning building has been practically eliminated by placing inside the pressure gauge a safety fusible plug, which melts at 200° Fahr., allowing the gas to escape. Should the safety solder prove defective a pressure of 500 pounds will rupture a thin piece of metal and effect the same result.

THE GABRIEL HORN MANUFACTURING COMPANY,

of Cleveland, Ohio, show their well known Gabriel automobile horns in the following sizes: 2 chime, 3 chime, 4 chime and 8 chime. The latter is a new model. Each horn is tuned to a musical key, and the 8 chime containing an octave, it will henceforth be possible for the owner of a Gabriel horn to call for right of way with a few bars from "Home Sweet Home," "Tammany," or "Go Tell Aunt Nancy." The pressure necessary to blow these horns (one pound is sufficient) is obtained by by-passing a portion of the exhaust from either a steam or gas engine through the horn. This is easily done by a small foot lever. The "Foster Shock Break" is a new addition to this firm's product. It consists of a small steel cylinder, in which a piston is compelled to force oil through eight small holes in its valve disc during its vertical travel, thus modifying the strain on springs and obviating discomfort to occupants occasioned by sudden bumps.

REMY ELECTRIC COMPANY.

The Remy high tension alternating current magneto, which has been gaining in popularity among American manufacturers during the last few years, has been brought to a high state of mechanical perfection in the 1906 model. The mechanical improvements and refinements in workmanship incorporated in the new magneto have made it necessary to increase the price, but the Remy people claim now to have a magneto which is not excelled by any foreign machine of the same type. No radical changes in design have been made. Many improved details are also to be seen in their low tension magnetos.

THE WEBB COMPANY.

In the 1906 model of the Webb Speedometer a number of changes have been made. These instruments indicate the vehicle's speed by means of a small aluminum vane or flyer, which is raised by the blast from a small air pump or blower over a vertical thermometer type scale. In last year's model the blower was attached to the wheel and connected to the indicator on the dash by rubber tubing. A flexible shaft drive is now used, and the blower has been incorporated in the base of the instrument. The result is a more compact outfit. The easily read scale, with its prominent, large sized figures, has been retained.

THE HARTFORD SUSPENSION COMPANY,

makers of the Truffault-Hartford shock absorber, have greatly improved the adjusting device in their new 1906 model. A 3 prong, strong steel plate spring has been placed against the outer disc, rendering the device practically self-adjusting. If at any time more friction is necessary a turn of the nut holding the spring against the disc is all that is required. The entire set may be attended to in less than a minute. A number of prominent American manufacturers have adopted the Truffault-Hartford on their cars, but a stronger testimonial to its merits is the fact that it is being placed on two French cars on a royalty basis over the original foreign made Truffault.

INTERNATIONAL A. V. TIRE COMPANY,

at their booth on the balcony of the Garden, are showing a full line of their stock tires. They have not brought out anything radically new for 1906, but have been working along the old lines, and improving and strengthening their previously successful and popular tires. The tires are exhibited on wheels, and there are the usual inner tubes and cross sections to be seen. A. C. Matlock is in charge of the exhibit and receives the friends of the company.

THE EASTERN CARBON WORKS,

of Jersey City, N. J., exhibit five sizes of dry batteries, especially adapted to gas engine work; also a new idea in battery terminals, for which they claim a positively locked connection. The copper terminals are tipped with a rubber bushing. The nuts on carbon and zinc bite into the rubber when screwed down, and it is claimed they will not work loose. A line of standard flashlights is also carried by this firm.

DIAMOND CHAIN AND MANUFACTURING COMPANY.

In the Concert Hall the Diamond Chain and Manufacturing Company, of Indianapolis, show a full line of samples of their chains. Thirty-three styles are shown, ranging in widths from ¼ inch to 1 5-16 inches. Almost any pitch can be supplied, and in methods of construction and quality of material used by this firm no comparison can be made with the chains turned out several years ago.

THE RAILWAY APPLIANCES COMPANY,

of Chicago, show a full line of their "Autocle" wrench sets. This wrench was introduced last year, and met with considerable success. The handle contains a ratchet movement working in either direction and a universal joint which permits the tool to be used at an angle of 90 degrees. The small sets have ten sizes of sockets; the large sets thirty sizes. The sockets are made in square and hexagon form, a special length being provided for

the removal of spark plugs. This firm is just introducing the Stanwood automobile step or running board, a light weight, strong and neat appearing step made of crimp steel in an open formation, which allows all mud, dirt and snow to drop through and acts as an efficient foot scraper.

THE UNCAS SPECIALTY COMPANY,

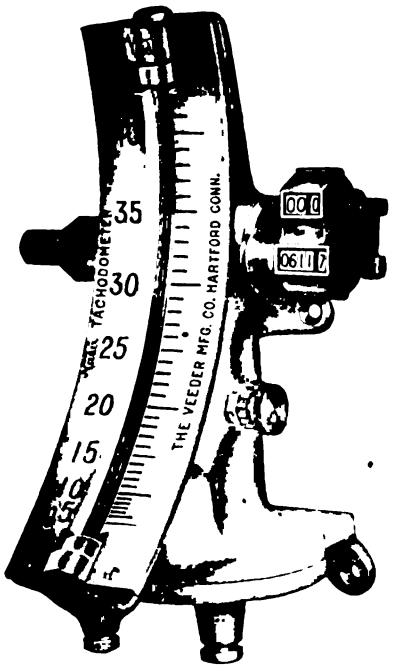
of Norwich, Conn., show the Leavitt secondary distributer, which they have been advertising for some time. The distributer is of very simple, compact and strong construction. The hard rubber casing is in two parts, one threaded into the other. Perfect insulation is claimed under all conditions of service. A line of single and multiple dash coils is also shown.

THE VEEDER MANUFACTURING COMPANY

are exhibiting an entirely new instrument known as the tachodometer, which is a combination speedometer and odometer, giving the rate of speed the car is traveling at and also the distance covered. A testing table has been fitted up and the tachodometer is shown in operation by means of an ordinary automobile wheel to which it is attached as in ordinary usage, and this is run by a small electric motor. Several small motors are also used to demonstrate the old Veeder line of odometers. D. J. Post, treasurer of the company, is in charge of the exhibit, and has a number of able assistants. A complete line of attachments for Veeder odometers and tachodometers to all types of cars are shown. The parts of the various instruments are also exhibited, showing the simplicity of construction and the fact that reliability is assured by the absence of complicated or small working parts.

THE HYATT ROLLER BEARING COMPANY'S

exhibit on the balcony at the Garden is at once interesting and instructive, and has attracted considerable attention. P. S. Steenstrup and a corps of competent assistants are in charge, and are kept busy furnishing visitors with information and data regarding these well known bearings. The exhibit consists primarily of various sizes of bearings, which are shown in parts demonstrating the construction. The 1906 bearing has been improved, inasmuch as it is now self contained, the rollers and bushings being so manufactured that they are kept together at all times. This makes it easier to handle the bearing when it is removed for cleaning or other purposes. Several axles of the bevel gear drive type are shown complete with the Hyatt bearings in actual use. The bearings are also shown for use on shaftings. An original and clever idea to demonstrate the fact that roller bearings run twenty times easier than plain bearings has excited considerable interest. A steel plate with a level attached, showing it to be perfectly true, is placed on a table. On this are two small trucks, each loaded with 375 pounds of pig iron. The one is fitted with plain bearings and the other with Hyatt roller bearings. Strings are attached to these and connected with weights. By putting ordinary scale weights on the end of each string until the trucks are drawn with their load across the steel plate the fact is demonstrated that the roller bearing moves with one-twentieth the friction of the plain bearing.



VEEDER TACHODOMETER.

THOMAS PROSSER & SON,

of 15 Gold street, New York, agents for the Krupp Company, of Essen, Germany, show an interesting lot of special grade steels made by the famous Krupp Company for automobile use. They have on exhibition in a mutilated state crank shafts, valve stems, solid axles, pressed axles, sprocket blanks, gears and frame members. Delivery can be made in four to six weeks.

THE COLUMBIA LUBRICANTS COMPANY,

of New York, show a full line of their "Monogram" lubricants, consisting of five grades of gas engine cylinder oil, two steam cylinder oils, machine oil, graphite gear grease, a graphite motor grease for use in compression cups (this grease being of much heavier texture than the gear grease); a yellow gear grease and a yellow motor grease to be used in place of the two just named by those who do not care for a graphite grease; a non-liquid oil which will stand intense heat without oozing out of the bearings and will also flow well in cold weather.

THE DAC AUTOMOBILE SUPPLY HOUSE,

of 1684 Broadway, New York, show a very select line of imported accessories, consisting of commutators, coils, magnetos, goggles, plugs, wire, switches, voltmeters, ammeters, voltammeters (pocket and dash), electric ceiling light for limousine body which may well be used in other positions, Regal screw jacks, wire terminals, etc. This house is especially exploiting the Besnard acetylene searchlight projectors, Le Tonnant horns and the Dupont siren horns.

THE CONTINENTAL CAOUTCHOUC COMPANY,

of Hanover, Germany, makers of the Continental pneumatic tires, show samples of different sized tires, also tubes, repair outfits, bandages and other accessories. Still longer life is claimed for the latest model improved tires, and a new non-skid metal studded tread can now be furnished, firmly fastened as an integral part of the outer shoe, which is claimed to be a great improvement over the detachable non-skid casings.

THE MOTOR CAR EQUIPMENT COMPANY,

of 55 Warren street, New York city, are featuring the Blanchard French horns, for which they are sole agents. Some new and distinct types are shown. The triple twisted "Autophone" is a very fine sounding horn, but the leader in this line is the "Centralphone," somewhat higher in price, but of superior tone. Reeds, screens and bulbs for these horns are continually carried in stock. This firm also handles a full line of lamps, generators, goggles, bells, caps, storm coats, gauntlets, tools, clocks, jacks, pumps and other automobile accessories.

THE REPUBLIC RUBBER TIRE AND SHOE COMPANY,

of New York city, make a specialty of all sorts of tire repairs and are featuring the "Hercules Non-Skid Leather Cover and Tire Protector," an endless band of chrome tanned leather entirely enveloping the tire, to the tread portion of which is riveted another heavy leather band. The rivets project about ¼ inch above the tread. Between the under side of the rivets and the rubber portion of the tire is placed a protecting layer of asbestos; the band is then securely vulcanized to the body of the tire.

THE WITHERBEE IGNITER COMPANY,

of New York city, have made a number of improvements in their latest model storage batteries for ignition purposes. The plates are now supported at both top and bottom, preventing their being broken from the connectors by the jolting of the car. An improved method of exterior enclosure has been adopted, which, it is claimed, will absolutely prevent short circuiting from moisture. A very complete line of electric lamps—side lights, front lights, tail lights, inspection lights, limousine ceiling lights, etc.—is now offered by this company. One battery supplies current for ignition and lighting. It is said that four lights and four plugs may be run forty hours on one charging at a cost of 50 cents. Their new factory, with a capacity of 1,500 batteries per week, will be in full operation by the end of this month.

THE SPRAGUE UMBRELLA COMPANY,

of Norwalk, Ohio, show their latest creations in extension tops and canopies for touring cars and runabouts. A very stylish extension top which may be folded com-

pactly behind the rear seat is the feature of their exhibit. This firm pin their faith to wood bows, claiming a metal bow will not stand the strain of automobile work. Glass fronts in oak, cherry, sycamore or mahogany, and celluloid fronts in whipcords, rubber or imitation leather are regularly carried in stock.

STANDARD ROLLER BEARING COMPANY.

An extensive line of ball and roller bearings is shown by the Standard Roller Bearing Company, of Philadelphia. Their product includes roller bearings with casings and sleeves; journal roller bearings; roller thrust, ball thrust and conical roller thrust bearings; grooved ball shaft bearings; the "Grant" conical roller bearing; steel, brass and bronze balls of all sizes, hardened and ground sleeves and casings. In addition to this line of regular goods, they now show complete sets of automobile axles for either shaft or chain drive.

THE RANDS MANUFACTURING COMPANY,

of Detroit, Mich. (formerly the Wheeler Manufacturing Company), show a line of their standard automobile tops. This firm give emphasis to the fact that in their factory is made everything that goes into the makeup of their tops, with the exception of the covering material. The bow sockets on these tops are made of seamless steel tubing with drop forged attachments. Factory facilities have been increased 200 per cent., giving a capacity of 5,000 high grade tops and 10,000 ordinary grade tops per annum.

M'CORD & CO.

For 1906 McCord & Co., of Chicago, present their force feed lubricators, with capacities of from four pints to ten pints and with any number of feeds from one to ten. An exhibition dash has been arranged upon which are mounted four of their multiple feed oilers driven by an electric motor. A pressure gauge is connected in the circuit, giving a visible record of the pressure produced. This firm also manufacture and exhibit the McKim copper-asbestos gaskets in all sizes; the Hibbard automatic tire pump, which is fastened to the vehicle wheel and pumps the tire while the car is in motion, and a twisted wire belting for light work.

THE EDMUNDS & JONES MANUFACTURING COMPANY,

of Detroit, show a very fine line of lamps for automobiles, launches and motor boats. Fourteen models of gas lamps, an oil side light, an oil tail light and a Government regulation oil lamp for launch use make up their regular line. In addition, they are marketing a gas generator and a launch whistle, the latter being a combined whistle and air pump built to produce a shrill, far reaching sound.

A. W. HARRIS OIL COMPANY,

of Providence, R. I., have on exhibition a simple arrangement whereby one may obtain an ocular demonstration of the difference in fluidity and viscosity between their five grades or body of cylinder oil. A grooved polished metal plate is placed obliquely beneath cans containing the oil, which is allowed to drip onto the grooves, flowing into empty cans at the lower end of the plate. Their line consists of light, medium, heavy, extra heavy bodied gas engine oils; a heavy bodied transmission oil; steam cylinder oil for superheated steam; semi-solid oil; medium and heavy motor grease; graphite grease and "Scouree," a liquid polish for metal surfaces.

DIAMOND RUBBER COMPANY.

The usual line of standard wrapped tread tires are shown at the Garden exhibit, and there are also a number of specialties that are attracting attention. The new Barnum protector is one of these. This is a tire protector made somewhat like the Samson type, of heavy leather, with steel studs. It differs from the Samson in its method of application to the tire, however. The protector is made in various sizes, slightly smaller than the tire that it is to fit over. The tire to which it is to be applied is then deflated and the cover slipped over it. The air is then pumped in again and as the tire fills out the protector is firmly gripped by the rubber and is held in place so that it cannot slip. To remove it the tire is deflated. The Marks detachable rim is also shown. By means of this a tire may be removed in less than a minute and replaced equally as quickly. It is impossible to pinch a tube and all the other advantages of a quickly detached rim are claimed. A new flat tread tire is shown with a particularly heavy tread. A radically new exhibit is what is known as the Diaphragm tube. This is in reality two inner tubes in one. Two tubes are taken and placed one within the other. Each tube has an individual valve, and when the tube is placed in a tire and one of the tubes is inflated the other is pushed up well inside the rim and out of harm's way. In case of a puncture the tube punctured deflates and it is only necessary to remove the nail or other foreign body that caused the puncture and then pump up the second tube and proceed. This obviates the necessity of taking the shoe off, removing the old tube and replacing it with a new one. A car fitted with Diaphragm tubes would consequently have eight inner tubes in its four wheels, instead of four, as is ordinarily the case. The valves for pumping up the tubes are on opposite sides of the tire.

R. E. DIETZ & CO.

have a most attractive display of lamps in the Balcony of the Garden. All sizes, grades and types are shown. The Peerless hour lamp, a new side oil lamp for touring cars, is brought out this year. The usual mirror lens lamps with bracket attachments and the acetylene generators of other years are shown.

THE TIMKEN ROLLER BEARING AXLE COMPANY

exhibit their line of differentials, etc., showing the many applications of their bearings. They have a brand new feature in the Hedgeland solid anti-skid auto axle. By means of this axle both wheels at all times drive at the same speed while the engine power is being exerted on them. It is impossible for one to slip around or remain still and the other drive, as is the case with the present form of differential gears. It is claimed that the driving power with this axle is greater than with any other, and that by the even application of driving power skidding is made impossible.

THE BADGER BRASS COMPANY

show a full line of lamps and generators, and have large crowds continually at their exhibit on the Balcony of the Garden. The well known Solar lamps are to be found in all sizes and styles. A new lamp brought out is called the Parabolens projector, fitted with imported lenses. A new type of gas generator is shown which is claimed to be better built and more easy of operation than any before placed on the market.

THE WHITLOCK COIL PIPE COMPANY

exhibit a full line of their radiators and coils in the Garden. The Whitlock hood for automobiles is one of the new 1906 features. It is made of steel or aluminum and of any size and shape, with or without louvres. The company also shows twenty-two different types of radiators made in the distinctive designs for the various makes of cars on which they are used.

THE ROSE MANUFACTURING COMPANY

show a full line of Neverout lamps. Several new designs of the Mangin mirror lens searchlight projector are shown. Condenser mirror lens headlights are also shown and are entirely new in design. A foolproof gas generator is specialized. This makes gas only as needed, has no gas confined under pressure, and is guaranteed impossible to explode. A feature is that when the gas is once shut off at the lamps there is absolutely no after generation.

HARTFORD RUBBER WORKS.

E. S. Benson, the hustling representative of this progressive company, receives visitors at the booth at the Garden, and explains the new Hartford Universal rim and also the new Hartford Dunlop one cure wrapped tread tire, which is a new feature this year. The new Hartford detachable bead rims enable the use of either the standard Hartford or Dunlop or any clincher tire.

SHELBY STEEL TUBE COMPANY

show a full line of steel tubing, axles and parts for automobiles. Aluminum castings are also exhibited, which are said to have the greatest tensile strength of any on the market and also the greatest elastic limit. It has taken five years to develop this.

LIGHT MANUFACTURING AND FOUNDRY COMPANY

show a large assortment of aluminum and other castings and are introducing as a specialty their new plastic bronze of Automobile brand. They claim that this metal wears 50 per cent. better than any other and is stronger and easier to shape up and work out.

WARNER GEAR COMPANY

show their usual line of differential and bevel gears. The well-known Warner differential is still being starred and is ably demonstrated and explained. It is claimed to be from 50 to 100 per cent. stronger than any other on the market. Bevel gears and sprockets are also shown.

LOUIS DUSENBURY,

New York, shows a line of upholsteries for limousines in goatskin leather, broadcloth, satin, silk for curtains, broad lace, carpets, etc., as also the "Ideal" robe, designed for auto drivers, which fastens about the waist, and has a separate place for each foot, constructed in such a manner that foot levers can be freely operated.

THE GILBERT MANUFACTURING COMPANY,

New Haven, Conn., present a line of fabric supplies consisting of enamelled duck tire cases, storm aprons, tool rolls, lamp covers, sleeve protectors, leggings, rawhide tire bands and Gilbert tire irons.

HESS-BRIGHT MANUFACTURING COMPANY.

Ball bearings for all sorts of heavy service are shown by the Hess-Bright Manufacturing Company. The exhibit consists of the various bearings for automobiles, shafting, electric motor and other such uses, and parts showing the bearings assembled and unassembled. The application of the bearings for automobile service is also shown. R. D. Macdonald is in charge of the exhibit.

GOODYEAR TIRE AND RUBBER COMPANY

are exhibiting at the Garden their new Goodyear detachable tire, the Goodyear clincher tire and the new Goodyear endless solid tire, with continuous or scalloped tread; also the Clincher endless solid tire, all of which are adapted to the new Goodyear universal rim. The line is much the same as that of last year, including the wrapped tread tire. The new quick detachable rim is demonstrated at the booth.

C. S. SPLITDORF

exhibits in his stand at the Garden, on the balcony, a complete line of spark coils, high tension magnetos, and new timers. William J. Hart is in charge. The exhibit is tastefully arranged, the smaller articles being contained in the regulation store glass case. Spark plugs, switches and a general line of electrical appliances for automobiles are shown.

B. F. GOODRICH COMPANY.

The exhibit of this popular tire firm at the Garden, located in the same spot as last year, was crowded during the opening night with a steady stream of visitors, who inspected the tires exhibited, and arranged for placing their orders. The standard clincher tire is shown in various sizes with the regular integral tread and also the Bailey non-skid tread, as are the other stock tires manufactured by the company. A special demonstrator is on hand, however, to show the workings of the new Goodrich quick detachable tire and rim. This new rim provides a flap to protect the inner tube and guard against pinching, eliminates the use of lugs and clips, prevents creeping or becoming detached, either deflated or inflated, employs no bolts, screws or turnbuckles of any sort, and may be fitted to any car without extra cost. It is claimed and demonstrated that a tire can be removed in less than a minute.

GRAY & DAVIS.

Mr. Gray, of this popular and hustling firm, was, as usual, one of the first nighters at the Madison Square Garden show. He stated that the outlook for the lamp business for this year was particularly bright, owing to the fact that such large numbers of cars are to be turned out. All of the Gray & Davis exclusive and original pattern lamps are shown, and their assortment is one of the most complete ever exhibited. It contains lamps for every possible use in connection with automobiles. Style 55 is one of the leaders and is a new type for this firm. It is fitted with the parabolic lens and silver reflector and is not only a very beautiful but very powerful lamp as well. A new generator has also been turned out and is now on the market. It is hand riveted and made of polished brass and is fitted with a three way valve, which, when closed so that neither water nor gas is turned on, allows the surplus gas to escape into the air, so making it impossible for the generator to heat up or catch fire. Mr. Gray stated that his firm was kept busy not in keeping up with the styles in lamp manufacture, but rather in creating new ones. This exhibit was one of the most largely visited on the opening night and many kind words were heard from pleased users of Gray & Davis lamps.

NEW YORK AND NEW JERSEY LUBRICANT COMPANY

show a full line of lubricating oils for various purposes and also their well-known non-fluid oil. Mr. Kimble, who is in charge, explains all about viscosity and the other secrets of oils. Great advances have been made in the matter of lubricants, and particularly in the securing of cylinder oils that will not carbonize. Oil guns and other accessories are also shown.

FIRESTONE TIRE AND RUBBER COMPANY.

J. M. Gilbert, sales manager of the company, was in charge of the Garden exhibit and demonstrated the good features of the new pneumatic tire which is now being put on the market. Having cornered the commercial vehicle field, the Firestone people are going gunning for the pleasure vehicle end of the business. The pneumatic tire is fastened to the rim with a side flange and bolts. A socket wrench and the hands are the only tools needed to remove it. The tire is of a tough wrapped tread and is fitted with brass clips on the side to prevent creeping. It is also claimed to be impossible to pinch the tube or rim cut the tire and a tire may be removed and replaced in a remarkably short time.

WARNER INSTRUMENT COMPANY

show a complete line of the well-known Warner auto-meters. These instruments are shown working on wheels driven by electric motor and also in parts, their construction being explained in detail to those interested. The company guarantee the accuracy of these instruments in giving the "how far" and "how fast" under all conditions. A. P. Warner was highly pleased with the outlook for business and stated that he expected an increase of 100 per cent. over last year. This would be helped in a great extent by the manufacturers themselves, many of whom had ordered Warner instruments in large numbers.

SPRINGFIELD METAL BODY COMPANY

are showing two types of auto tops of improved design. Curved irons are used and the usual end nuts, which are continually working loose and being lost, are dispensed with. A patent slat iron on the bows prevents rattling. Altogether the tops are more artistic than in the past and have better lines. H. M. Billings, the president of the company, states that there are over twenty of them on different make cars about the Garden, and this is exhibit enough. The demand for tops has greatly increased and 1906 will see very few cars on the road not so equipped.

BYRNE, KINGSTON & CO.

exhibit the Kingston carburetors, spark coils, spark plugs, steering wheels, pumps, mufflers, etc. George Kingston and five assistants look after affairs there. The new K. C. carburetor, with central float, is shown for the first time, as is a new and improved spark coil. Five types of carburetors are shown in all, including one very cheap one for marine engine work without a throttle. The speed of the motor is controlled by the spark alone. A new timer is shown, which is similar to the Lacoste, but exhibits a few unimportant changes.

BRISCOE MANUFACTURING COMPANY

at their exhibit in the Garden are showing a full line of their popular radiators, which includes several of special design. The trend of the manufacturers is toward fitting their cars with radiators of distinctive design, and the Briscoe people have met this by turning out a dozen or more types of flat tube construction. B. S. Morley, of Detroit, who is in charge, exhibited a new departure in the way of a front and radiator for air cooled cars. These machines in the past have invariably been of freak design, because the makers have feared to put a front on that would block the flow of air to the engine. In the new radiator, which is in appearance a duplicate of the honeycomb radiator so universally used in water cooled cars, the flow of air is not

interfered with, and the appearance of the car is greatly enhanced. A new flat film tube radiator is also shown. This radiator will not collapse, and gives a better and quicker radiation of heat.

PARISH & BINGHAM COMPANY,

of Cleveland, Ohio, have the corner of the balcony at the armory, and exhibit a full line of their well known pressed steel auto frames and their component parts. These frames are said to be the strongest made, and are positively guaranteed against buckling or spreading. They are of cold drawn stock, cold pressed, and are made under monster hydraulic presses having the terrific power of 6,000 tons. The frames exhibited are all highly polished. The company reports a most excellent business, and anticipate a large increase over last year.

G. & J. TIRE COMPANY.

Herbert Githens, known from coast to coast as a courteous and able salesman, presides at this important exhibit at the Garden, and welcomes the friends and patrons of the G. & J. people. A full line of 1906 tires are exhibited. This, of course, includes the well known open cured clincher tire, as well as the Dunlop square tread tire. A full assortment of repair patches and supplies are also shown. The exhibit is probably smaller than it was last year, owing to the tendency to do away with a great variety of designs and to standardize on a few "tried and true" ones. This exhibit, like the others on the balcony, is devoid of special decoration or elaboration in the way of stands for cases for displaying goods.

JONES SPEEDOMETER COMPANY.

This popular instrument is being shown with the 1906 improvements. A new adjustable vertical shaft connection is being shown, by means of which it is possible to attach the speedometer to either side of the car and at any angle desired. A new signal operated by electricity for use in limousine cars is also shown. A series of electric buttons in the car are labeled right, left, stop, faster, slower, and when pressed ring a bell attracting the driver's attention, while on a dial on the dashboard a signal light is lit under a corresponding word. By means of this the movements of the machine may be controlled by the passenger without inconvenience.

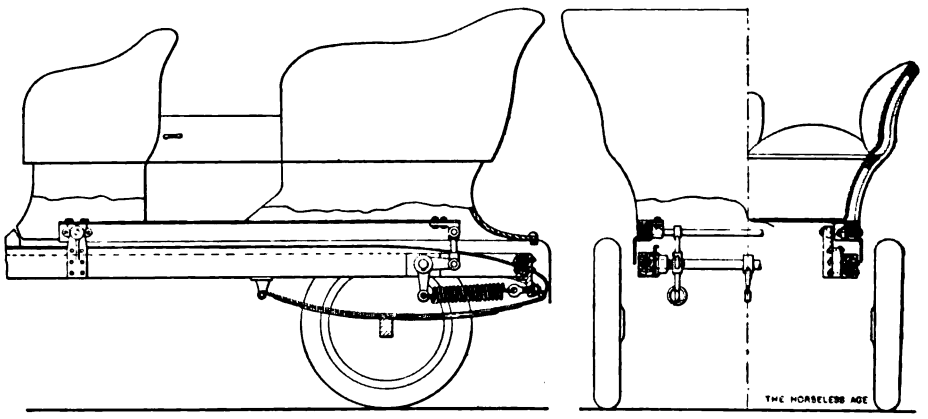
Book Review.

Subject List of Works on Heat and Heat Engines (excluding Marine Engineering) in the Library of the Patent Office.—Published by the British Patent Office, 25 Southampton Buildings, Chancery lane, London, W. C. Price, 6d.—This appears to be a very complete list of everything that has been published in book and pamphlet form on gasoline and steam engines and the related branches of physical science. The list ought to be useful to anyone desirous of making a thorough study of any particular branch included within the scope of the list.

New Vehicles and Parts.

Werner's Seat Suspension.

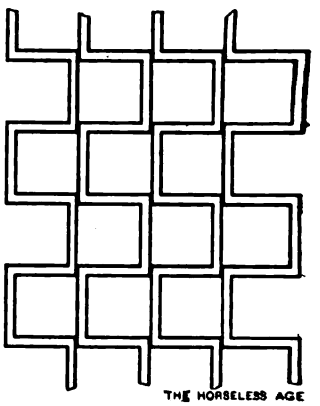
A novel seat suspension and shock absorbing device has been introduced by the Werner Car Improvement Company, of New York. This device, which has been patented here and abroad, comprises a horizontal auxiliary frame, which carries the tonneau, being pivoted at its forward end to the chassis near the centre of the wheel base, in the zone of minimum vibration, the rear part of said frame being yieldingly supported by a relatively light spring device carried by the chassis. The arrangement is claimed to be simple, hidden from view, and can be easily applied to any open touring car. By a somewhat different arrangement the device can be applied to limousine bodies with excellent results. Persons riding in a 2 ton spring truck and then in a cab will at once notice the vast difference in comfort, due to the difficulty of combining in one and the same spring the requisite strength and easy riding qualities. In the new seat suspension this difficulty is overcome by using two separate springs. The upper spring device supports only the rear portion of the body (weighing some 600 pounds at the most, including the occupants). This spring can therefore be of very resilient character, having the effect of ordinary carriage springs. The rear portion of the whole loaded car (weighing some 2,000 pounds) is supported by the main spring, which is of a correspondingly substantial character. It should be noted that the only rigid connection existing between the body and the chassis is of a pivotal character, located in the zone of minimum vibration.



WERNER'S SEAT SUSPENSION.

The Livingston Cellular Radiator.

A new cellular radiator of novel construction has been placed upon the market by the A-Z Company, of 462 Eleventh avenue, New York city. As is well known, the original method of making cellular radiators consisted in first making a coarse mesh work of wire, and then placing square tubes into the meshes and soldering the wires and the ends of the tubes together. In this manner straight vertical passages from the top to the bottom collector are obtained, and also straight horizontal passages all the way across the radiator. The process of manufacture was later modified, in that the ends of the tubes were expanded and the tubes soldered together directly, dispensing with the wires.



SKETCH OF A-Z RADIATOR.

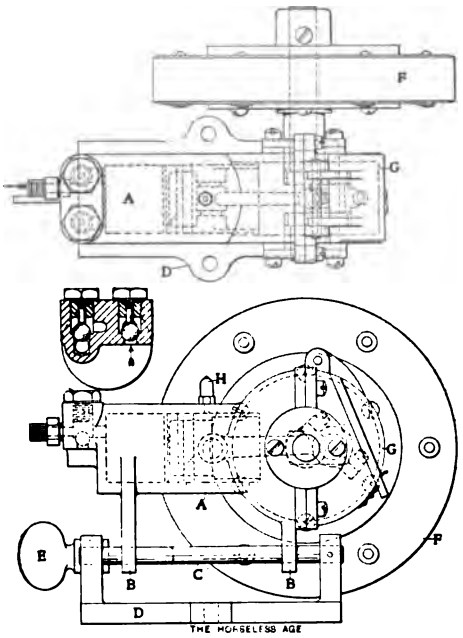
The Livingston radiator is composed of a series of tubes, each tube made of two sheets of metal folded into a series of large and small square corrugations, the small corrugations fitting into the large corrugations of each sheet. The edges of these sheets are swaged down to meet each other, leaving the water space in the centre. The joint is made by locking the edge of one sheet over the edge of the other, thus employing the full strength of the metal to hold the sheets together instead of depending on solder, as heretofore. When all these tubes are assembled together side by side they form square cells between them.

One of the advantages of this form of construction is greater efficiency, derived by employing a fewer number of tubes with the greatest possible length, thus increasing the rapidity of circulation through each tube and without reducing the radiating surface. The rapidity of circulation and the strength of the joints are the advantages claimed by the manufacturers.

The P. T. C. Power Tire Pump.

Inflation of the big tires of a touring car by hand is a very laborious task, and most owners now fit some device for employing the engine power to do the pumping, at least if they keep no hired driver. A rather neatly designed power driven air pump for tire inflation is made by the Pacific Tucking and Manufacturing Company, Brooklyn, New York.

The single cylinder of the pump and one-half of the crank chamber are an integral iron casting, which is formed with two downwardly extending lugs B B, which are drilled at their lower ends to receive the rods C upon which they are a sliding fit. These rods are secured in lugs on the base plate D. The rear lug B is also drilled and tapped to receive a butterfly screw E, provided with a collar on each side of the rear lug on the base D, by means of which the whole pump can be moved along the rods C to bring the sole leather friction wheel F into driving contact with the flywheel of the vehicle engine. The valves of the pump are of the spring pressed ball type, and are arranged in the integral head of the cylinder. A sectional view through the valve box is shown in the drawing. The air is drawn in at the bottom of the valve box through the valve at the right and discharged through the connection at the rear of the valve box on the left. The piston is fitted with two compression rings, as indicated, and is connected to the crank by a forged connecting rod, with separate cap at the crank end, the joint of the head being at an angle to make the screws by which the head is secured more accessible through the opening covered by the aluminum cover plate S. A small oiler H is screwed into the pump cylinder on top. The crank shaft is mounted in bronze bearings flange-bolted to the sides of the crank casing, which latter is made in two parts screwed together. The base plate B is provided with lugs by which the pump can be bolted down to the vehicle frame.



P. T. C. Air Pump.

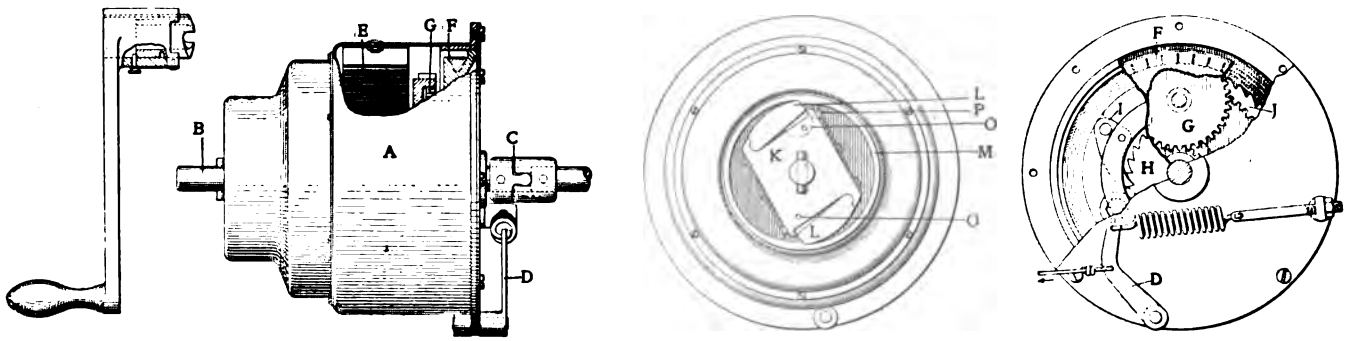
The "Ever Ready" Motor Starter.

The "Ever Ready" automatic starter is designed to start a gasoline vehicle motor by the power of a coiled spring, the device being thrown into operation by a small release pedal. After the engine has been started, the starter is automatically rewound by it, and then automatically disengaged. The spring of the starter will give 29 complete revolutions to the shaft before it is unwound. The releasing pedal by which the starter is thrown into action is operated from the driver's seat. The device is made in two sizes, one suitable for large and the other for small motors.

The No. 1 spring starter is suitable for cars and boats of from 2 to 20 h. p., and contains a spiral steel spring in a dustproof steel casing, the head of which is provided with a band clutch releasing device operated by a small pedal, and permitting the spring shaft to rotate and start the engine. As soon as the engine has begun to operate, pressure on the pedal is released, whereby the spring clutch is locked stationary. The engine, once started, automatically disengages itself from the starting clutch of the starter, and as soon as it has attained a certain predetermined speed (which may be varied between 100 and 300 r. p. m.), it automatically engages, by means of a centrifugal friction clutch, with a winding ratchet secured to the shaft and the inner end of the spring, to rewind the spring. When the spring is fully wound, the winding ratchet is automatically disengaged by means of a screw actuated release.

The No. 2 spring starter is intended for cars of from 20 to 40 h. p., and is provided with two powerful spiral steel motor springs enclosed in a seamless steel drum. The operation of this starter is the same as that of No. 1. This starter differs from No. 1, however, in that it is provided with a sun and planet gear mechanism for rewinding the springs, this gear giving a reduction in speed of 10 to 1, and thus relieving the engine of the heavy pull that would be required if these heavy springs were wound direct. The spring shaft rotates in the same direction as the engine while starting it, but in an opposite direction when the spring is rewound, this reversal of motion being secured by means of the gearing. The casing and the outer end of the springs of this starter are stationary.

In case the motor should fail to start, owing to weak battery, poor carburation, etc., and the starter becomes entirely run down in the attempt, recourse can then be had to special means provided for such a contingency, which consists of a crank for rewinding the starter through the reducing gear, which requires only a very small effort, and does not involve any danger of injury from back kicks, etc. Auto Improvement Company, corner Spring, Hudson and Vandam streets, New York city, the manufacturers, state that it can easily be applied to almost any car, the only requirement being that the engine shaft extend from the front bearing a sufficient length to secure a half coupling to.



The "Ever-Ready" Motor Starter.

A, outside shell or casing; B, extension of engine shaft; C, coupling to allow for flexibilty; D, starting clutch lever connected with pedal release lever on the floor of the automobile by wire cable or otherwise; E, section of starter spring; F, brake or starting clutch disc head and band; G, cycloidical reducing gear; H, starting ratchet secured to starting shaft; I, starting pawl secured to brake or clutch head; J, internal gear and ratchet combined through which the spring is rewound and locked by means of pawls to the disc or clutch head; K, centrifugal or rewinding clutch; L, centrifugal rewinding dogs engaging with external member of centrifugal clutch M; N, front face view of starter; O, holes for releasing pins; M, external member of centrifugal clutch; P. centrifugal clutch spring.

LEGISLATIVE AND LEGAL.

Cleveland Vehicle Traffic Ordinance.

CLEVELAND, O.—An ordinance regulating the use of automobiles on the streets and those offered for hire or livery purposes has been passed by the city council. It holds that the operator of a vehicle shall conform to and observe the following road rules: To drive in a careful manner; to keep to the right side of the street, in passing a vehicle always keep to the left; slow moving vehicles to keep close to the curb; to be sure that turns can be taken in safety; in turning to the right into another street, to stay as near the right hand curve as possible; not to stop in a congested district with left side to the curb; not to take crossings or turns at a greater speed than one-half the regular speed limit; to keep vehicles at least four feet from the running board or lowest step of any street car, and that the driver of any vehicle shall stop from a signal from any police officer.

MARION, Ind.—The Farmers' Institute has passed a resolution against automobiles using the highways and public roads.

NEW ORLEANS, La.—The automobile speed law is being attacked in the Supreme Court of the State of Louisiana on the ground that it is unconstitutional.

SYRACUSE, N. Y.—The common council has passed an ordinance placing a license fee of $10 on each automobile used for rental purposes in the city.

SYRACUSE, N. Y.—Additional costs are asked by the defense in the case of the N. Y. Automobile Company against the H. H. Franklin Company, John Wilkinson, A. H. Brown, et al.

SAN DIEGO, Cal.—E. J. O. Rather has filed a suit for damages to the amount of $16,281.60 against A. S. Heineman, of Los Angeles, for injuries sustained in an automobile accident on November 25, 1905.

COLUMBUS, O.—Tom Paxton, representative from Hamilton County has, on petition of a number of property holders, introduced a bill into the general assembly to authorize the sprinkling of roads with oil, the expense to be assessed against all the property abutting.

DETROIT, Mich.—An ordinance making it a misdemeanor, punishable by fine, for owners or chauffeurs to spill oils on the asphalt payments was recently passed. A movement has been started to have the ordinance reconsidered, on the ground that these fluids cannot be stopped from dripping.

INDIANAPOLIS, Ind.—An answer has been filed in the United States Circuit Court by the National Motor Vehicle Company in a suit filed against them by Thos. J. Lindsay and William Harmon. It is alleged that the company has infringed on certain devices under patent. The defendant denies the charge.

LEBANON, Pa.—Corbin & McCurdy, attorneys for the Hartford Rubber Company, of Connecticut, have brought an action of assumpsit against the Lebanon Motor Company. Siegrist & Moyer will appear for the defendants.

TRENTON, N. J.—State Road Commissioner Edward C. Hutchinson, of New Jersey, in his report to Governor Stokes, says: "If high speed automobiles are to be allowed on our public highways, they should be taxed in proportion to the maximum speed of which they are capable. The automobile is a recognized means of conveyance and as such is entitled to the use of our highways, but there are certain appliances used upon them which are detrimental to our roads. They are the armored tire, the chain tire and the blower. The damage done to our macadam and gravel roads by these appliances is so great that the question of remedy is creating considerable agitation in every county of the State."

Trade Literature Received.

Earl Canedy.—Circular showing and telling about the breech block plug.

The National Tank Company, Dayton, O.—Illustrated booklet on gasoline tanks.

The Peerless Motor Car Company, Cleveland, Ohio.—Catalogue of 1906 Peerless models.

The Post & Lester Company, Hartford, Conn.—Catalogue of chain tire grips for automobiles.

R. H. Smith Manufacturing Company, Springfield, Mass.—Circular describing the Springfield Speedometer.

Pope Manufacturing Company, Hartford, Conn.—Illustrated booklet describing the new Pope-Hartford cars.

The Buick Automobile Agency, 541 Tremont street, Boston.—Booklet containing facsimile testimonial letters.

E. R. Thomas Motor Car Company, Buffalo, N. Y.—Booklet composed of facsimile letters from Thomas car users.

Automobile Trade Credit Association, New York.—Booklet containing constitution and bylaws of the associaition.

Royal Motor Car Company, Cleveland.—Illustrated booklet containing drawings showing various parts of the Royal Tourist car.

Janney, Steinmetz & Co., Philadelphia.—Pamphlet and an illustrated discourse on pressed and seamless drawn steel specialties.

Olds Motor Works, Detroit.—Loose leaf specifications of the various Olds motor commercial vehicles, with a photograph of each.

The Harburg Tire Company, 1777 Broadway, New York City.—A card with a circular opening around which is a table of figures, which allows of determining the speed in miles per minute that a car travels by placing the dial of a watch back of it.

Crouse-Hinds Company, Syracuse, N. Y.—Circular of a double ball contact commutator and distributer.

The White Sewing Machine Company, Cleveland, Ohio.—"The Incomparable White," illustrated pamphlet regarding White cars.

Pope Motor Car Company, Indianapolis, Ind.—1906 catalogue describing the various models of Waverley electric pleasure and commercial vehicles.

The Gordon Tank and Pump Company, Dayton, O.—Booklet describing and illustrating their gasoline pumps and their appurtenances.

Commercial Vehicle Notes.

Three additional cars are soon to be placed in use for the carrying of mail between Torrance and Roswell, New Mexico.

Another commercial use for the automobile has been discovered by the Philadelphia Portable Store Company, who are sending out cars for the vending of groceries.

An automobile stage line for Montclair, N. J., is now under consideration; it is proposed to special stages for the accommodation of school children at a reduced fare.

The Knox Automobile Company, Springfield, have received an order from the Bass Rocks and Eastern Point (Mass.) Motor Car line for two passenger buses, each to contain fifteen seats.

An electric truck has been built at the upper machine shops of the Railroad Company at Altoona, Pa., which will be used for transferring trunks and baggage to and from the station platform.

N. A. A. M. Annual Meeting.

At the sixth annual meeting of the National Association of Automobile Manufacturers in the Victoria Hotel on January 17 twenty-eight active members were present. President E. H. Cutler's report showed the association to be in satisfactory condition, and referred to the status of the industry generally as most promising to those whose affairs are conducted on sound business principles.

W. R. Innis, the treasurer, showed a balance of over $30,000, as compared with $10,000 last year, despite the fact that the association has contributed liberally to road improvements and legislative funds. The retiring members of the executive committee were Windsor T. White, W. R. Innis, A. L. Pope, C. C. Hildebrand and Marcus I. Brock. All were re-elected except Mr. Brock, in whose place E. R. Thomas, of Buffalo, was elected.

Officers were re-elected as follows: President, E. H. Cutler; first vice president, G. W. Bennett; second vice president, A. L. Pope; third vice president, S. D. Waldon; treasurer, W. R. Innis; secretary, Percy Owen, and manager, S. A. Miles.

MINOR MENTION

A good roads mass meeting will be held at Auburn, N. Y., on February 13.

The Ideal Auto Tire Company, Detroit, are putting a spring rubber tire on the market.

It is reported that a large automobile factory is soon to be erected in New Orleans.

Cincinnati has advertised for six automobiles to be used by the street celaning department.

An automobile storage building will be erected by T. C. Witcomb on Ninth street, Cleveland, Ohio.

H. L. Brown has taken over the business of the Standard Automobile Company, of Pittsburg, Pa.

The Dayton Electrical Manufacturing Company, Dayton, Ohio, are enlarging their battery department.

The Hyslop Body Company, Cleveland, Ohio, have moved into their new building on Marquette street.

The Michigan Top Company have moved from Fort Wayne, Ind., to 15 Duffield street, Detroit, Mich.

The Safety Storm Front Company, Toledo, Ohio, will manufacture a patent storm front for automobiles.

The Electrical Chemical Power Company is being formed in Detroit to manufacture electric motor vehicles.

The Auto Brass and Aluminum Company, Flint, Mich., have decided to increase their capital stock to $75,000.

Statistics show that eighty-nine licenses for automobiles were issued at Canton, Ohio, during the year 1905.

The Rushmore Lamp Company will soon open a branch at Chicago, which will be their Western distributing point.

Wm. W. Pope & Sons will build a garage and shop at Stanhope, N. J., where they will deal in second hand machines.

F. A. Ruff, 1150 Fourteenth street, Detroit, Mich., is about to place a new type of pneumatic tire on the market.

The Detroit Auto Specialty Company, Detroit, Mich., have moved into their new building at 909 Greenwood avenue.

Automobile trucks will be used during the coming year for collecting ashes in the street cleaning department of Cincinnati.

The Michigan Automobile Body Company, 1425 Gratiot avenue, Detroit, last week sustained a fire loss of about $10,000.

The Long Manufacturing Company, Chicago, have increased their capital to $100,000, and have built an addition to their factory.

The Croesus Motor Car Company has been organized at Kansas City, Mo. G. W. Curtis and W. L. Bell are members of the company, and it is said that they will shortly start the manufacture of touring cars and runabouts, having engaged quarters at First and Main streets.

The Columbus Automobile Dealers' Association are making preparations for a display by local dealers, to be given in Memorial Hall.

Miller Reese Hutchison, of 1 Madison avenue, New York city, have secured the exclusive sales agency for Mack Brothers' trucks.

Percy F. Megargel and David M. Fasset, the transcontinental motorists, when last heard of were in Winslow, Ariz., on their way East.

The Gerber Carriage Company, Pittsburg, Pa., announce that they have commenced the manufacture of bodies for automobiles.

The Cleveland branch of the Hartford Rubber Works Company are now located at 1831 Euclid avenue, having moved from 77 Bank street.

Blum Brothers Company, Chicago, are making the Illinois eight cylinder, four cycle, air cooled motor, with cylinders set to fire at 90° intervals.

The Detroit Auto Marine Company, Cleveland, Ohio, have erected an addition to their factory, and now have an aggregate space of 30,000 square feet.

We have just issued a lithograph calendar for 1906, which we will be pleased to send to any of our subscribers or advertisers who have not received one.

The Haynes Automobile Company, New York city, have leased the building No. 508 West Fifty-eighth street, to be used as a private automobile repair shop.

The Couple-Gear Freight Wheel Company, of Grand Rapids, Mich., expect to start the manufacture of heavy delivery trucks on or about January 22.

Asa L. Goddard started on a second trip for the Automobile Association of America for the mapping out of good roads on December 30. This trip was to Connecticut and return.

The executive committee of the State Highway Association met at Albany last week and formulated a plan for the apportionment of $47,000,000 of State highway money among the counties of the State.

Harry A. Williams, Akron, Ohio, inventor of a new pleasure car which is run without pneumatic tires, is now negotiating for the organization of a company to manufacture his vehicle.

The New Process Rawhide Company, Syracuse, N. Y., manufacturers of automobile gears, etc., have elected the following officers: T. W. Meacham, president; T. G. Meacham, vice president; A. C. Vosburg, secretary and treasurer.

The Winton Motor Carriage Company, Cleveland, have leased a plot at the northeast corner of Broadway and Seventieth street, New York city, where they will erect a garage and salesroom to be used as their New York branch.

The Aerocar Company, Detroit, have elected the following officers: Alexander Y. Malcomson, president and treasurer; Howard Anthony, vice president, and W. G. Morley secretary. They have temporary quarters at 63 Randolph street.

The Holson Motor Patents Company, Grand Rapids, Mich., elected the following officers at its annual meeting: President, M. B. Church, Alfred Holson and Dr. A. M. Webster, vice presidents; Wesley W. Hyde, treasurer, and M. Clay Church, secretary.

The two photographs of manganese bronze castings which appeared in the article on "Foundry Methods and Productions" in our Engineering Number were furnished us by the Wm. Cramp & Sons Ship and Engine Building Company.

Owing to an error in printing a part of the advertisement of the Light Manufacturing and Foundry Company in our issue of January 10 was made to read "Our aluminum alloys have a tensile strength equal to that of bronze, with only one-third the weight." It should have been "Our aluminum alloys combine maximum strength with minimum weight."

New Incorporations.

The Chalfant Motor Car Company, Lemover, Pa.—Capital, $50,000.

Alexander Elyea Company, Atlanta, Ga.—To sell and repair automobiles. Capital, $50,000.

The Powell-Bacon Automobile Company, Lincoln, Neb.—Increased capital to $100,000.

The B. Webster Company, Detroit, Mich.—Capital, $10,500. Incorporators, Benjamin Webster, R. H. Mockridge and H. R. Mockridge.

Alpy Transfer Company, New York City.—To operate automobile stages. Capital, $100,000. Directors, John Alpy, Jenny Alpy and Felix Alpy.

The Rex Automobile Company, Denver, Colo.—Capital, $10,000. Incorporators, Harrison B. Robinson, Lansford F. Butler and Milton J. Stair.

The Automobile Wheel and Rim Company, Jersey City, N. J.—Capital, $200,000. Incorporators, Isaac Hodgson, F. C. Turney and Edgar J. Hodgson.

Standard Motor Car Company, Inc., San Francisco, Cal.—Capital, $200,000. Incorporators, C. L. Hugson, G. W. Emmons, J. A. Stoner, N. Cowan and J. J. Brown.

The Palmer Automobile Manufacturing Company, Cleveland Ohio.—Capital, $50,000. Incorporators, C. Cathcart, A. P. Fisk, E. W. Savage, J. J. Farell, H. Vider and R. Conrad.

The Safety Storm Front Company, Toledo, Ohio.—To manufacture patent storm fronts for automobiles. Capital, $10,000. Incorporators, A. H. Merrell, John M. Ormond, James York, Jr., N. O. Winter and J. M. Reid.

The Philadelphia Portable Store Company, Trenton, N. J.—To conduct a line of automobiles to be used for vending provisions. Capital, $150,000. Incorporators, H. A. Illman, Frank L. Richardson and Wilfred B. Wolcott.

Club Notes.

PITTSBURG A. C.

The annual election of officers will be held this week at the clubrooms. The question of the club's securing a new club house will be discussed.

A. C. OF AMERICA.

The club will hold its annual banquet at the Hotel Waldorf-Astoria on the evening of January 20. Creswell MacLaughlin lectured at the club on the evening of January 9 on "The Age We Live In."

COLORADO A. C.

President Frank L. Bartlett will deliver three lectures before the club, one at each of the January, February and March meetings. The topic for the January talk is "Ignition."

BROCKTON (MASS.) A. C.

At the annual meeting the following officers were elected for the coming year: President, G. W. R. Hill; vice president, H. R. Burbeck; secretary, Dr. Edward Bryant; treasurer, Albert Leighton.

MINNEAPOLIS A. C.

At the meeting last week it was decided that in cases where any member of the club becomes involved in civil actions, the club will support the defendant as far as possible without becoming directly involved.

PINE BLUFF (ARK.) A. C.

The club was organized last week with the following officers: President, Dr. R. G. Thompson; vice president, J. M. Parker; secretary and treasurer, L. O. Knox. The club will endeavor to obtain better roads in the vicinity of Pine Bluff to facilitate tours to other cities.

UTICA A. C.

The officers elected at the annual meeting of the club last week were: Geo. A. Frisbie, president; Robert McKinnon, first vice president; R. P. Billings, second vice president; Robert M. Hunt, secretary and treasurer; M. W. Van Auken, director to the State Automobile Association.

BERKSHIRE (MASS.) A. C.

The annual meeting of the club was held on January 10 and officers were elected as follows: Franklin Weston, president; S. G. Colt, first vice president; C. F. Bishop, second vice president; Robert T. Parker, corresponding secretary; E. H. Kennedy, secretary, and L. A. Merchant, treasurer.

SYRACUSE A. C.

The club has passed a resolution hostile to toll roads, and will oppose the renewal of the charter of any toll road in the vicinity. The following officers have been elected: President, Willett L. Brown; first vice president, C. A. Benjamin; second vice president. H. W. Smith; secretary and treasurer, Foreman Wilkinson.

CLEVELAND A. C.

eting has been called by the club of tives of the different automobile clubs in the State to be held at the club's room on February 22 at 11 a. m., for the purpose of organizing an Ohio division of the American Automobile Association.

PITTSBURG A. C.

At a recent meeting the following officers were nominated and indorsed: President, George E. Turner; W. L. Smith, first vice president; W. M. Darling, second vice president; C. M. Miller, third vice president; Paul Wolf, secretary; George G. Glass, treasurer; Edward Kneeland, E. J. Kent and C. P. Matheson, members of the board of governors.

CINCINNATI A. C.

The club has decided to send delegates to the State Good Roads Convention, which will be held at Columbus, Ohio, the latter part of this month. Enactment of legislation that will inaugurate a more progressive road improvement in all parts of the State is expected. At the next meeting of the club spring runs will be arranged, and the project of erecting a clubhouse will come up for final consideration.

RHODE ISLAND A. C.

The annual banquet and election of officers were held at the new clubrooms on Garnet street on the evening of January 3. The following officers were elected: President, W. Penn Mather; vice president, R. Lincoln Lippitt; treasurer, Howard D. Wilcox; secretary, Eugene M. Swain; governors (for three years), C. Prescott Knight and Lowell Emerson; (for one year) Chas. A. Russell. The constitution and bylaws were amended to eliminate the office of second vice president.

Agency and Garage Notes.

George Moore, Pittsburg, Pa., will be the local 1906 agent for the Corbin car.

The Maxwell and National cars are represented in Indianapolis by the Fisher Automobile Company.

W. G. Richardson, 514 West 145th street, New York city, has acquired the agency for Lane automobiles for this season.

The Troy and Albany Automobile Exchange will operate a garage at the corner of State and Lark streets, Albany, N. Y.

During the coming season the Hearsey Vehicle Company will represent the Rambler and White cars at Indianapolis, Ind.

Wm. Gilmore, Broad and Race streets, Philadelphia, has acquired the agency for the Rochet-Schneider car for the coming season.

The Missouri Valley Motor Car Company, Fifteenth street and Troost avenue, Kansas City, Mo., are 1906 agents for the White steamer.

The Collingwood Garage Company have leased the Weed property, at the corner of Collingwood and Bancroft streets, Toledo, Ohio, where they will erect a garage.

Sidney B. Bowman Automobile Company, New York city, American agents for the Clement-Bayard car, will move on May 1 into a new four story building at 225 West Forty-ninth street.

Orville Houser has opened a garage at Chillicothe, Ohio.

Thos. B. Dewhurst and others are to erect a garage and repair shop in Lexington, Ky.

Curtiss & Tomlinson, of Ansonia, Conn., have leased the new garage on Atwater avenue, Derby.

A garage is to be erected at the corner of Third and F streets, Marysville, Cal., by W. D. Grow.

A branch of the Blomstrom Motor Company, of Detroit, is to be established on Jefferson avenue, Detroit.

The Auto Rapid Transit Company, La Crosse, Wis., are in search of a location for the erection of a garage.

R. D. & C. O. Britton, 115 Allyn street, Hartford, Conn., have acquired the Maxwell-Briscoe Company's agency for 1906.

The Covey & Cook Motor Car Company, Portland, Ore., are erecting a garage at the corner of Fifteenth and Washington streets.

The Homewood Automobile Company, Pittsburg, Pa., have acquired the agency for Frayer-Miller cars for the coming season.

Geo. C. Boldt, of the Waldorf-Astoria, is to erect a six-story garage at the corner of Broadway and Sixty-second street, New York.

George Monnatt and Joseph Sacher, of Canton, Ohio, have purchased the garage which formerly was operated by S. F. Baskerville.

Morgan & Wright, Chicago, will soon establish a tire agency at 226 Jefferson avenue, Detroit, Mich., with J. W. Wesson as manager.

Goodman & Graham, who conduct a garage at 143 West Fifty-first street, New York, will soon move into new quarters at 53 West Ninety-third street.

The Pope Electric Auto Company have taken a floor in a building which is in the course of erection at the corner of Longworth and Race streets, Cincinnati, Ohio.

Albert Leuey and Minford Green, members of the Bergen & Westside Automobile Company, are erecting a garage at Boulevard and Jewett avenue, Jersey City, N. J.

The Keystone Automobile Company, Pittsburg, Pa., and the Genesee Motor Vehicle Company, Rochester, N. Y., have been made 1906 agents for the Corbin car.

H. L. Brown, with quarters in the garage of the Hiland Automobile Company, Center avenue, Pittsburg, has acquired the agency for the coming season for Pope-Toledo cars.

It is stated that the Ford Motor Car Company, of Detroit, have purchased property at the corner of Brush and Jefferson avenues upon which a new salesroom will be erected.

The Standard Auto Company, Detroit, will move into their new quarters at the corner of Woodward and Alexandrine avenues on February 1, having added the Autocar to the list of cars they represent.

Jan 23 06

...THE...

Horseless Age

VOLUME 17 JANUARY 24, 1906 NUMBER 4

WINTON MODEL-K



MR. CARNEGIE WELL PLEASED.

Mr. Andrew Carnegie purchased a Winton Model K chassis, placing thereon a limousine body. After using the car some weeks, Mr. Carnegie writes:

"I have been twice to the St. Andrew's Golf Links, and wish to thank you for sending me such a satisfactory vehicle. Auto K is O. K. You will have to get up early in the morning to beat your chassis for 1906."

The reason that Mr. Carnegie speaks particularly of his trips to the St. Andrew's Golf Links is that the hill approaching the links is so long, rugged and steep that it is regarded in New York as a terror to motorists.

It has no terrors for Mr. Carnegie and his Winton Model K.

MODEL K WINTON—Four vertical, water-cooled cylinders. Thirty horse power or more. Quiet running. Abundant reserve power. Velvety, non-jar, non-shock, non-breakable transmission. Flexible speed control. Shooting oiler. Exclusive Twin Springs. Easy riding. And every other feature that a real high grade car should have. $2,500 f. o. b. Cleveland.

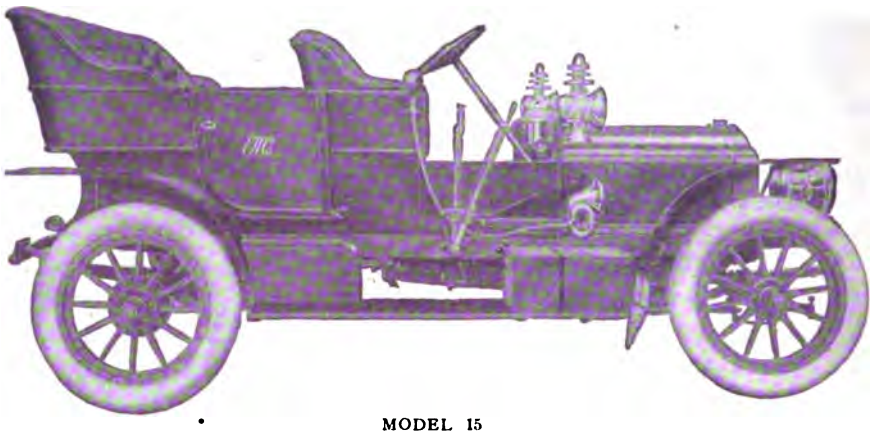
Volume 1 of "The Motor Car Dissected" (limited edition, but free for the asking) gives more "inside information" on automobiles than any other book we have ever read.

The Winton Motor Carriage Co.

CLEVELAND, O., U. S. A.

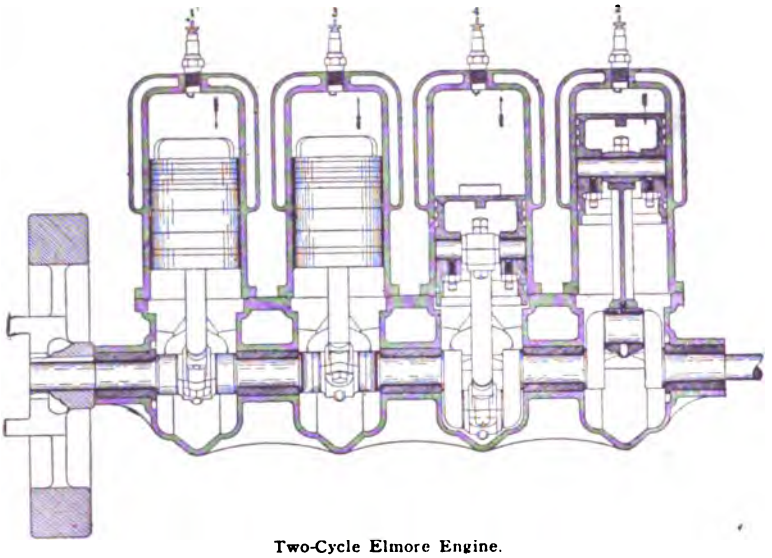
The Two-Cycle Principle Made Plain.

EVERYBODY should understand the two-cycle principle, which has given the **Elmore Car** its motor prominence.



MODEL 15
1906 Four-Cylinder, Two-Cycle Elmore.

A two-cycle engine means a constant, steady application of power, with no interval between the impulses. The expansive force of one explosion is only half-way through when another begins.



Two-Cycle Elmore Engine.

Look at cylinder No. 1. The piston of this cylinder is only half-way down, the force of the explosion is still acting upon it, at the same time that the piston of cylinder No. 2 is just starting down from another explosion, and before the force of the explosion of this piston is exhausted the third cylinder will come into action, then the fourth, and so on as long as gas is fed into the cylinder and there is a spark to fire it.

Simple, isn't it? But listen to this:

All the inlet and exhaust valves have been eliminated and actually from 18 to 20 parts on each cylinder have been done away with.

When actually fifty per cent. of the moving parts have been eliminated it is only natural that the cost of operation and up-keep is reduced fully fifty per cent.

The constant, unbroken application of power, only to be equaled in the four-cycle by the use of 8 cylinders and 16 valves, and the small cost of up-keep have made the **Two-Cycle Elmore** the sensation of the moment.

You cannot fully understand the broad meaning of these points of superiority until you have seen the car. Send for catalog describing the **Four-Cylinder, Two-Cycle Elmore at $2,500** and the **Three-Cylinder, Two-Cycle Elmore at $1,500.** *Show in Chicago at Coliseum.*

ELMORE MANUFACTURING COMPANY

1004 Amanda Street, Clyde, Ohio.

Members Association Licensed Automobile Manufacturers.

The Auto Shows from the User's Standpoint.

By Harry B. Haines.

To the user and to the prospective automobile owner the Madison Square Garden and the Armory shows presented an almost bewildering array of automobiles of all types, prices and styles, and to decide on just what one wanted to buy was at once difficult and perplexing.

Never before in the history of the automobile industry in America—if an industry of such recent birth can be said to have a history—has so great a variety of machines, accessories, tires and the other innumerable things that go to make up the complete automobile, ever been offered for public scrutiny. Last year, when two shows were held and neither conflicted with the other, it was thought remarkable that such large crowds attended, but this year with both the Garden and Armory crowded to their capacity morning, noon and night, it may be seen that interest in horseless vehicles is keeping pace with their remarkably swift development.

Remarkable as it may seem, generally speaking, there were no radical changes either in style or mechanical construction to be seen at either of the shows, but, nevertheless, despite the fact that many of the manufacturers have followed the lines of last year and the designs to a great extent, there are still a large number of minor improvements in engine, ignition and transmission systems, and, furthermore, in the designing of bodies, which will contribute greatly to the comfort and convenience of automobilists.

BETTER MATERIALS.

Pre-eminent among the greater improvements made is the use of better and higher priced materials in cars. Chrome-nickel steel, phosphor bronze, high carbon steel, and other such high grades are replacing the cheaper metals, all of which will mean better and more durable cars and greater value to the purchaser for his money.

Despite the general idea that last year's terrific output would overstock the market and that a slump in prices would occur this year as a consequence, no such condition of affairs has materialized. It seems, on the contrary, that the demand for a cheap car is not so persistent and that most of the manufacturers have gone ahead to make the best possible car, regardless of cost, and have fixed a price on it that will insure them a profit. Cars ranging from $2,500 to $6,000 were common at both shows, and there seems to be no difficulty in finding purchasers for the entire factory output of these. The demand for automobiles of name and reputation as yet exceeds the supply. How long this condition will remain is, of course, problematical, but it was the prevailing one at the 1906 shows.

In many cases the manufacturers have allowed the old prices to remain, and have sacrificed some of their profits in turning out higher grade cars and better machines.

The attention given to detail and finish of machinery parts is remarkable, and has occasioned no little comment. The American cars of higher grade in this respect were equal to their foreign competitors.

PREFERENCE FOR FOUR CYLINDERS.

The tendency of manufacturers has been toward the car with the four cylinder motor in front, the bevel gear drive with selective type of change gears, the propeller or shaft drive to a bevel gear axle, the floating rear axle, make and break spark and magneto ignition, horse power from 20 to 40, smaller and lighter bodies, either limousine or side entrance for touring. This is the popular car and the one that is finding the largest sale.

All along the line there is a demand for the multiple cylinder motor and for more horse power. Of course the two cylinder cars and the single cylinder runabouts still have a market that belongs to them alone, owing to the price they are sold at, but the popular demand is for a car built on the accepted French lines, with a good looking body, motor in the front and the other up to date features of 1906 design. The sale of the single cylinder, single seated runabout will no doubt fall off in view of the fact that so many manufacturers are turning out double and even four cylinder motors in runabouts at but a slightly increased cost.

COMFORT AND LUXURY.

The general desire to use automobiles for family touring has popularized the four and six passenger car, and with these selling at from $2,500 to $3,500, with a luxurious limousine for $5,000, the demand bids fair to continue for some time to come.

It is notable that the American manufacturers have at last awakened to the fact that it pays to give more attention to body finish and detail, and many of them have devised small lockers and carrying compartments for the use of tourists that will add greatly to their convenience and comfort. In some of the monster limousines the American builders have rivaled the French makers, and have fitted cars with electric annunciators, electric light, heating facilities, portable tables for card playing and luncheon service, room for small trunks, hat boxes, manicure sets, mirrors, combs, hair brushes, whisk brooms and those other things which so greatly add to one's comfort in touring, and make the car a small hotel on wheels.

The jump spark ignition with the old time dry cells and coil still remains in vogue in the cheaper priced cars, but in most of the high grade touring cars the make and break spark is being used with magneto ignition. A number still stick to the jump spark with storage batteries and dynamo. In several cars fitted with jump spark ignition provision has been made for the installing of the make and break spark if so desired.



Twenty-sixth Street—Showing Armory and Madison Square Garden.

DRIVING SYSTEMS.

Sliding gears are the favorite type, giving from three to four speeds forward and reverse. These are all encased and run in oil, following the general tendency of the manufacturers to have every bearing possible run in oil and to encase the running parts first in a steel pan and then in separate protectors in order to exclude dust, dirt and other foreign matter that has proven so destructive to machinery in the past. The 1906 car will excel, inasmuch as it will be practically dustproof, with all bearings and gears running in oil. The bevel gear drive will

prove a great feature in eliminating chain troubles and making the car cleaner throughout. Machines so equipped also run smoother and with less friction and loss of power. The old idea that none but the very light cars could be equipped with this type of transmission has been forgotten, and some pretty heavy cars are now turned out with bevel gear drive. The floating rear axle is also a prime favorite, and is replacing the old type. The Hedgeland anti-skid axle, by means of which the same driving power is transmitted to both wheels and one wheel cannot drive faster than the other, as is the case with the present differential, is proving a favorite and promises to revolutionize axle construction.

LUBRICATION IMPROVEMENTS.

Greater care has been taken to perfect lubrication systems, and the result is that these systems have been brought to a higher state of perfection than ever before known. It is safe to say that this year will see less lubrication trouble than has any in the past, with a corresponding decrease in burned out bearings and scored and cut cylinders. Precision oilers, positive splash lubrication and sight feed oilers have all been improved, and the old and unreliable lubrication methods have been discarded. Every precaution has been taken by the manufacturers to see that the oil gets to the bearings and does its intended work. In a number of cars the oil is kept in dustproof tanks, and after being used is allowed to drip back into the original supply tank through a strainer and is used over and over again, which results in economy in oil consumption.

Carburetors have been greatly improved, and a large number of new ones have made their appearance. It has been the general idea to secure a carburetor that would deliver a proper mixture to the cylinders at every temperature and under all weather conditions, and this has been accomplished. It is also maintained that the 1906 carburetors will be simpler and more flexible, efficient and economical than ever before.

Another indication that the manufacturers are beginning to consider the cost of upkeep and to look out for the customer's interest is the fact that a large number of them are casting their cylinders separately. While this is no better for actual service, it is likely to result in a great saving in price in the event of a cylinder cracking, becoming scored or in any other way put out of commission. In the past it has often been necessary to buy two new cylinders to replace one old one, but this year the owner who has the misfortune to put a cylinder out of commission will be able to buy a single one to replace it at a cost of from $25 to $30.

SEAT STARTING.

The effort to get rid of the starting handle with its ever dangerous back kick, has met with as much success as was anticipated. A number of devices for starting from the seat have made their appearance, and will undoubtedly be widely used during the coming year. Most of the manufacturers of four cylinder cars maintain that their engines will hold compression for twenty-four hours, and start after that length of time from the seat by simply moving the spark lever, and that this meets the public demand to a certain extent in this direction.

The six cylinder cars, although new and interesting, are not attracting the attention that it was believed they would. The claims that motors of this type are more flexible, give greater power and speed and run smoother have all been proven, but the general public still cling with affection and regard to the four cylinder type, and for the greater part seem to have arrived at the conclusion that the four cylinder will do the work well enough, and is good enough for them. They also feel that complications enough can be tied up in four cylinders without tacking two more on.

TWO CYCLE ENGINES.

The popularity of the once despised two cycle engine has developed wonderfully this year, and this type is now the centre of attraction and is receiving the public attention that it merits. A four cylinder, two cycle engine is claimed to be equal to an eight cylinder, four cycle one, with less than half the complications. The Elmore Company state that they have sold their factory output to their agents alone, and the other manufacturers who have turned their attention to this type report that the public interest has been phenomenal and has far exceeded their fondest hopes. There is no doubt of the fact that the two cycle engine will enjoy a great sale and boom during the next year or two. Its simplicity, economy and flexibility recommend it to the public.

TIRE SITUATION.

The tire situation is also another interesting one, and a large number of non-skid tires have made their appearance. The manufacturers have at last realized that it is time to give some attention to the dangers of skidding. Seventy-five per cent. of all auto accidents are laid to the credit of the skid, and all sorts of shoes, tire covers and chains are to be had to insure keeping a car under control on slippery asphalt or muddy roads. Finding it impossible to turn out a satisfactory puncture proof tire, the next effort has been to find a tire that would be easily taken off when it is necessary to repair a tire. A large number of these quickly detached rims are being offered, and the claim is also made that tires of 1906 will not creep or rim cut and will give better service in all lines.

Altogether the situation may be summed up in a general refinement of lines, the universal adoption of the side entrance body, the appearance of the cheap four cylinder and the perfection of the higher priced one, the début of the four cylinder, two cycle motor and the six cylinder, four cycle motor, handsomer bodies, more luxurious upholstering and fittings, simpler cars, stronger frames, axles and transmissions, dust and mud proof cars, cars of better material, of improved ignition and of stronger tires, and cars that challenge the world as the par excellence of American manufacture.

The auto shows of 1906, two of them showing licensed and unlicensed cars, foreign and domestic, commercial vehicles and a most complete line of parts and accessories, will go down in history as the greatest exhibitions of their kind the world has ever seen, and this year will witness more automobiles on the roads, running more of the time and running better than ever before in the history of the industry. And this is only the starting point for the future greatness of the automobile business.

The Shows Portray Progress.

By Thos. J. Fay, E. E.

To the critical eye, the beautiful lines of the body makers' creation, and a display of color smoothed down to a piano finish, have absolutely no bearing upon the progress looked for by the automobile builder or the class of purchasers whose experience extends beyond their first car. This year's show is a positive revelation to the expert in a hundred ways, and an indication that time in the hands of American genius is all that is necessary to effect the supremacy of American industrial methods.

Casting about looking for any indication of retrogression in the motor car industry, as it stands today, is as hopeless as finding a needle in a hay stack; for aside from the cost of the products represented, the design features almost without exception are equal to the highest expectations. There are some tendencies, however, rather too hysterical to be commended, and some of the products must have been hastily redesigned after knowing, or better yet, discovering what were to be the 1906 features of certain of the foreign cars. These evidences were only too obvious, for in places requiring the use of steel, of a substantial quality, bronze castings were substituted—bronze castings may be had quickly—and it is feared other quick methods not so easily detected were taken advantage of.

THE DESIGNER IN EVIDENCE.

This year's products, as shown at the Garden and Armory, bring out in a striking manner the advance made in one single year, an advance indeed so marvelous as to be wondered at. Taking the cars at the Garden for illustration—upward of 150 cars in all—but few of them show the glaring faults of last year, whereas all of them exhibit the positive earmarks of the designer's pencil. In last year's products the slipshod methods of attaching accessories and the profuse use

ooked rods, links and levers, only too ly emphasized the entire absence of de- In the products of this year, taken whole, the levers and links are nicely med, neatly finished, and have a place. connecting members are straight, take strains in a straight line, and look as ey surely will perform the service for h they are intended.

iat the question of material has received ast amount of needed attention is ced from the fact that both foreign and erican steelmongers are displaying their es in an elaborate and justifiable way— es, indeed, of a very superior nature e in accord with automobile require- ts.

MOTORS.

aking up the types of cars as they are layed, the four cylinder, four cycle, ver- front motors are supreme. Most of n are water cooled, and all of them look thy. The air cooled motors were well esented, and showed a high order of nuity in design and construction.

he attempts to solve the ignition prob- seem to be settling down to the use of ble systems, with a battery and mag- as the sources of electrical supply.

CARBURETORS.

he question of carburation is one yet be disposed of satisfactorily. All who re willing to discuss the matter away m a purely trade atmosphere seemed agree that we do not now fully appre- te what the needs of the gasoline mo- in this particular are. There is some c of resorting to the use of multiple zzles, as was done by one foreign com- ny, but it is the consensus of opinion t that departure is more of the nature of novelty lacking extraordinary merit. It es seem, though, as if there is some at in the multiple nozzle cocoanut. tomatic carburetors were sprinkled ong the exhibits in sufficient quantity be noteworthy, and in the case of one two exhibitors the carburetor ques- n seems to have assumed a somewhat usual importance.

Strange to say wheels are not very ch advanced in quality. Indeed, our l friend, the machine made wheel, is ll with us, with scarcely any attempt at guise.

Steel castings for important parts are nspicuous by their absence, and die gings have evidently taken their ces, which, in the judgment of the iter, is a step in the right direction. Axles in some cases are made of spe- l alloy steel or of puddled iron. In e or two instances manganese bronze stings are exhibited, and there is a very rge decrease in the use of steel cast- gs. Some axles are of I section, but ost of them are of the octagon section, rged in the block. In this connection may not be out of place to say that of e axles now in use the ones likely to ove troublesome are those with welds, d this point is vastly more important than the question of "section." Indeed, an I section weld will fail just as readily as a welded octagon, square or oval sec- tion.

Side frames, as they were found at the show, are mostly of the cold pressed, mild steel variety, with a sprinkling here and there of special flange steel products, not to mention one or two cases in which nickel-chrome steel is used and some foreign nickel-chrome steel side frames. There is general talk of the development of nickel steel stock for side frames on the part of some designers. The idea is receiving the support of the foremost companies, and it is safe to predict a con- siderable advance of this project during the coming year. It is also proposed to treat side frame stock in such a way as to eliminate "sag."

Universal joints are abhorred by mak- ers of high grade cars, even if some of the makers do use them, while customers look upon universal joints as a source of trouble. On the other hand, it would seem that machinery set upon a frame that sags a quarter of an inch, or even more, must be affected thereby in a harmful way.

Crank shafts for motors in many nota- ble instances are of nickel-chrome steel, and few are of nickel steel. Carbon steel, though well represented, is not being bragged about. It is believed the mak- ers now using carbon steel in crank shafts will have to change to nickel- chrome steel, or at least to nickel steel, to keep in the procession.

The other details of motors in general are vastly improved over last year. Valves, for instance, are larger; direct valve lifts more numerous, automatic inlet valves almost ex- tinct, and valves are almost invariably of some special valve stock. Tool steel is al- most wholly out of use, and bronze for connecting rods is seldom to be found. Cyl- inder castings are universally good this year, whereas last year to procure truly good cylinder castings in America was a hard proposition.

It might also be said about motors that the water pumps and piping are altogether better, larger, more direct, lighter and more substantial.

CHANGE SPEED GEARS.

Transmissions, while representing very largely the sliding gear types, are smaller, lighter and stronger. A few examples of the planetary principle still remain, notably on small cars and on one quite large truck, but in this case the nickel-chrome steel, ac- curately made gears used indicate ample strength. There is a large increase in the number of cars employing the "selective system" of sliding gears, and a general trend toward "direct on the high." Never- theless, the "successive system" of sliding gears is still much used, and for simplicity has much to commend it. The electro-mag- netic clutch system is used on one truck, and as it works automatically should be taken into account.

Aluminum casings for sliding gear trans- missions, as well as crank cases for motors, are almost universally employed, and there is every reason for believing that aluminum alloys are with us to stay. A single year has witnessed the doubling of the strength of aluminum alloys, with every chance of a further substantial advance in the near fu- ture. Moreover, designs are more perfect, and the laws governing the casting of alu- minum are more completely understood.

Ball bearings are in evidence even in crank shafts, and almost to the exclusion of plain bearings in gear cases and other places of importance, such as differential shafts, Cardan shafts, axles, knuckles, etc. Roller bearings are also plentiful.

Before departing from the question of transmission gears it may not be out of place to emphasize that there is a marked tendency to employ bevel gears. In the old days bevel gears were looked upon with disfavor, but they were not accurately fash- ioned, and on that account were very trou- blesome. Motor car practice has tended toward the perfection of the process, and as a result the noiseless qualities of bevel gears may be taken advantage of. In sev- eral examples of "direct on the high" a bevel gear set is employed for both the main and second shafts resulting in com- pactness and a reduction in the total weight of the transmission.

It seems the trend is toward a coarser pitch for gears than heretofore used, and furthermore the face dimensions are in- creasing as a rule. In other words, in the process of standardizing cars, strength and lasting qualities are factors that designers are taking into account.

BRAKES AND SPRINGS.

Brakes have received their full share of attention, and a very decided tendency is shown toward the use of double differ- ential brakes as well as the usual emer- gency brakes, while in some cases differ- ential ratchet "sprags" are employed, and there are one or two examples in which double emergency brakes are to be found. Brake bands are less clumsy and more direct acting than heretofore. Moreover, brake shoes are made of better material and are more securely attached. Cast iron seems to be the favored material for brake shoes, but rolled sheet copper is superior and will be found on fine cars at both the Garden and Armory.

Springs, like every other part of the motor car exposed to view, have under- gone changes of a very radical nature. Some cars have rear springs, as follows: Chord length, 54 inches; bow, 5 inches; width of leaves, 2 inches; thickness of leaves, ¼ inch (tapered); number of leaves, 9. Other cars have springs somewhat shorter, and the range of length might be fixed between 46 to 54 inches, but nearly all cars have spring widths of about 2 inches. The number of leaves ranges between six and twelve for rear springs, and between six and eight for front springs, but front springs are

shorter, even down to 36 inches, while the width of front springs seems to be nearly 1¾ inches in most cases. All of the above figures are for semi-elliptic springs. Full elliptic springs are coming into vogue, and of the cars on view a considerable number are fitted with them. Platform springs are used in a few instances.

BODIES.

The body maker's art is much in evidence this year, but bodies are by far too heavy. Indeed, in this connection 'tis fair to say a revision should be in order. As a matter of fact, some of the bodies exposed to view have wood enough in their framing to build the frame of a garage of respectable dimensions, even in the hands of a novice. On the whole, body work is of a high order, with much less likelihood for needed body repairs than was the case last year.

Tires are still small than they should be from the maintenance point of view, and it is believed wheel diameters on the whole are great enough to satisfy the conditions under which cars must serve. True, the standard touring cars have rear tires 920x120 millimeters, with front tires 910x 90 millimeters or inches equivalent, but the number of cars using 30 inch diameter wheels are by far too numerous.

The smaller sizes of bodies will nicely accommodate five passengers, while the larger sizes are found on the most luxurious creations. The wheel base dimensions for touring cars range between 92 and 124 inches, as they are now exhibited. The lowest dimension stated is too short, while the highest dimension given is as faulty the other way.

The tread of wheels ranges between 52 and 57 inches, but should be 54 inches if car tracks are taken into account. The cars having the maximum tread stated are made that way, because the construction does not admit of a reduction.

COMMERCIAL VEHICLES.

Commercial vehicles took a long stride this year, and the electric truck is still very much in evidence. The battery problem is still with us, although there is promise of a decided improvement, and the gasoline truck or delivery wagon, as the case may be, is a factor in the commercial wagon situation no longer to be sniffed at by Johnny Skeptical or the merchant who wants results. It is now possible to purchase trucks and delivery wagons at fair prices, vehicles capable of competing successfully with animal power, even though skilled attendants are still at a premium.

On Friday, December 29, the Berlin police authorities passed for traffic a number of new motor cabs, built on the pattern of London cabs by the Internationale Automobil-Zentrale. They are elegantly and comfortably fitted up. A simple arrangement enables the fare to close or half open the cab, according to the state of the weather and his own inclinations, and this is likely to secure increased popularity.

Gearing at the Shows.

By Dempster M. Smith.

The radical innovations in change speed gearing, as revealed by the New York shows of 1906, may be disposed of in a very few words—there are none. This statement is based on an examination of every leading make of car on the main floors of the Armory and Madison Square Garden. It is practically impossible in the limited duration of the exhibition, in view of the considerable amount of time required to properly study each vehicle, to make assertions which shall be true in every instance. It can be stated, however, that every car examined shows either a continuation of the principles embodied in the last year's model, or a tendency toward more conventional constructions.

THE METHODS OF TRANSMITTING POWER from the motor to the driven wheels, and for changing the relative speeds of the two, which are represented in sufficient numbers to justify attention, may be classified as follows:

GEARING.

Systems:

1. Positive (through toothed gears)—
   - A. Sliding gear; operated by
     - A^1 Direct method.
     - A^2 Selective method.
   - B. Constantly meshed gears (individual clutch system):
     - B^1 Shaft and countershaft (spur gears).
     - B^2 Planetary.
2. Frictional (frictional discs).
3. Combination (combined frictional and positive).

THE INCREASED USE OF THE SLIDING GEAR is probably the most notable feature of the shows. In point of numbers, today it reigns supreme, with all other forms in an apparently hopeless minority. It was stated by the writer in the Engineering Number that the sliding transmission was being adopted on many of the new cars. Had the statement been made of all new models it would have been a more correct prediction. No instance was noted of the abandonment of the sliding form in favor of the individual clutch or planetary system. The converts have all come from the latter classes. Among these are the Knox, Matheson and Haynes, and the Olds and Rambler (new models). The change is made the more noticeable by this year's prominence of the large, high powered car. The runabouts are put in the backs of the stands, and nobody seems to miss them. Since these little fellows are practically the only ones on which the planetary gear is retained, the reader may easily appreciate the predominance of the sliding system.

SELECTIVE CONTROL.

The word "direct" is here used to briefly designate the sliding gear having a single shifting group, and the method of control used with this type, consisting of a lever having forward and back movement only, as distinguished from the selective system, employing two or more groups and a lever having movement two directions. The number of ge these two types has not been tabula the writer, but the direct system is be to be still in the majority, especial American cars. The selective system however, made a great gain, and it is prominent. A number of selectively ated gears of 1906 models have been completely described in The Horseless Age, and they are fairly represent of the system.

Whether the selective system is creased in numbers because of an ex expressed preference for it on the p American users, or simply as a res the present wholesale adoption of fo ideas, cannot be determined. It permits use of a smaller gear box than the sl method, but compels the provision of s additional parts, frequently of a very c plicated nature, and imposes upon the ator a manner of control which is tainly illogical and complex. By the s method it is not possible to shift from a specified gear to any other by simply m ing the lever forward or back a co distance. Instead, the lever must in many cases (first), moved forward or ba to the cross slot in the "H" sector; (se ond), shifted sideways through the cr slot, taking care to stop opposite the pro longitudinal slot, and (third), moved ward or backward in the new slot, often a direction opposite to the first.

The physical effort required to do may be negligible, but the three separa operations obviously impose as m mental processes upon the operator a make the liability to mistakes three t as great as in the direct system. It not be disputed that, other things be equal, the simplest control system is best. In view of its complexity, both structure and method of operation, and only slight advantage in reducing the s and weight of the gear structure proper, is fair to suppose that the rise of the lective system in this country is only te porary, and principally due to the follo ing of "fashion," which, in the automob industry, as in millinery, is now dictated Paris.

THE DIRECT METHOD

of control is still apparently in the le and should be considered most typical the American sliding gear. It requires a straight forward and back motion of controlling lever, and enables the conn tions between the lever and the slidi member to be very simple and direct. He tofore a great majority of sliding gears both systems have been so designed t one or more sets of gears run in mesh the high speed. This year a good deal attention has been given to the eliminati of this unnecessary source of friction, w and noise, and a number of cars can said to be truly "gearless" when runni direct connected to the motor.

A very interesting example of this c

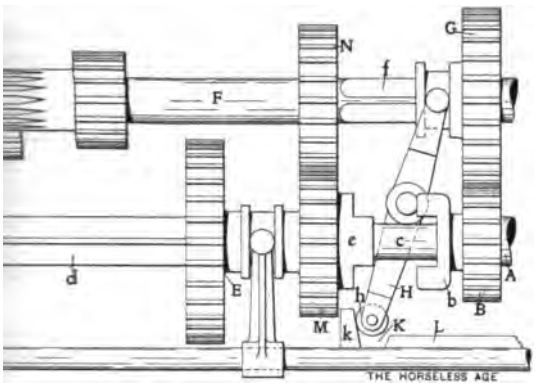


FIG. 1.—SKETCH OF ORIENT TRANSMISSION.

ıction is found in the Orient. As shown Fig. 1, A is the driving member of the ring, connected with the motor and car- ıg pinion B. The sleeve A is revoluble the round portion *c* of the main shaft which also has the usual squared part *d*. is the sliding member, shifted by a rod ı fork in the usual manner. Pinion B ·ries a jaw clutch *b*, which corresponds th a similar jaw clutch *e* on the sliding :mber. The countershaft F has also a uared front end *f*, on which is slidably ɔunted gear G, the latter being provided th a shifting groove.

The lever H is pivoted in the bottom of e crank case, and at one end bears a ·ller entering the shifting groove of gear . At the other end it extends up and :ars a roller adapted to enter a notch K ·rmed in a flat plate L secured to the shift- g rod. The operation of changing speeds similar to the usual practice. In the ɔsition shown the gears are just leaving ıe intermediate position, and the high ɔeed is about to be engaged. When the ıifting rod is moved farther to the right, ıe gear M becomes disengaged from the ear N on the countershaft, and at the same ime the roller *h* strikes the projecting ıember *k* of the plate L. Further move- ıent causes roller *h* to fully enter notch K, ınd also throws the lever H so that gear G is moved to the left, out of mesh with ɔinion B, and at the same time the jaw ·lutch member *c* engages the jaws *b*, giving a direct drive from the main driving mem- ber of the gearing A to the driven shaft C, with no gears in mesh.

It will be noted that the desired result is here accomplished without the use of any springs. The mechanism is also very positive, since contact of the roller *h* with the guide K at all times holds the gear G in mesh with its pinion B.

It is interesting to note that in this gear the roller bearings used last year have been abandoned in favor of plain bearings, which, it is stated, cost more to make, but are found by this company to give better results. The top half of the gear casing comes off by removing the cap screws, leaving the gears fully exposed and the bearing caps in place, these being held by separate studs. This gear is very well worked out, and it is difficult to see how much more can be accomplished along the lines of the conventional sliding gear.

The Haynes car shows the only notable departure from the customary practice which was observed. As shown in Fig. 2, the gearing at first glance is the same as in ordinary practice. A is the main shaft and B the first driving member of the gearing. C is the countershaft. Pinion D meshing with the gear E on the countershaft serves to give motion to the latter. As shown, the sliding member F is in the intermediate position. Suppose it is now desired to go to the low speed. The sliding member is moved to the right until the jaw clutches *d* and *f* engage. Ordinarily if the clutch were then let in immediately with the car still moving quite rapidly, the entire weight and momentum of the vehicle would be thrown against the motor. To avoid the unpleasant shock thus experienced and the undesirable strain upon the motor and all parts of the car, a ratchet connection has been interposed between the gear E and the countershaft. This ratchet operates so that when the gear E is driven by the pinion D, the first gear positively drives the countershaft, but when the countershaft tends to run faster axially than the gear, the ratchet permits it to do so. It will thus be readily seen that under the conditions above referred to the countershaft will free itself from the gear, and the car will be subjected to no sudden shake; but as soon as the car speed falls to that of the motor, the ratchet will again take hold, and the drive will be positive. While this is an innovation, as compared with standard sliding gear systems, it is in the Haynes car a move toward the conventional, since last year an individual clutch system was used, comprising five friction clutches and two "free wheel" members. It should be noted that in the new gearing, while desirable results are attained in reducing speeds, the action of the gear in increasing speed is the same as the usual type.

INDIVIDUAL CLUTCH SYSTEM.

The Winton Company still adhere to the form of shaft and countershaft, individual clutch gearing which has been used by them for a number of years, with but few changes. There is no indication that they intend to abandon this type, for this year they have made many improvements in its detail, evidently at considerable cost. This gearing is compact and simple, and while its method of control might be criticised it is far less complicated than the selective sliding gear system. Besides Winton, the Welch car was the only one noted which adheres to the constantly meshed spur gears and individual clutches. In the Welch car the different speeds are engaged by a hand lever, and the emergency brake pedal serves at any time to throw out whatever gear combination is effective and apply the brake. No gears run in mesh on high speed. This gearing seems to be well worked out, although it involves some little complication in the controlling mechanism.

PLANETARY GEARING.

As is above stated, the use of the planetary gear is confined practically to the runabout, and many makers have abandoned it even in that style of car. The notable exceptions are the Ford, Duryea and Cadillac. The faithfulness of these well known concerns to the planetary gear may be taken as an indication that its merits are still entitled to serious consideration. None of the models of any of the cars referred to have any other form of gear; in each instance the gearing is practically the same as last year. It is noticeable that in each of these cars the gearing and control system form a very neat and compact group, and that controlling members are connected with the clutches by simple and direct mechanism. In the Ford car the gearing, reverse and running brake pedals are carried upon a single aluminum casting which extends from one side of the main frame to the other, forming a kind of horseshoe in which the gearing is suspended. As a self contained group, it seems to fully equal anything in the sliding gear line which was shown.

It would be difficult to apply the sliding gear transmission to the Duryea car without entirely remodeling it, but there is no indication that it is considered less desirable by its makers this year than at any time previous. The Cadillac gearing shows no important change from last year in any of the models, and may be assumed, therefore, to be satisfactory to its designer. It takes up slightly more room in the car than the Ford transmission, but it must be remembered that it provides an additional speed ahead as compared with the latter.

It is, in the writer's opinion, a matter of congratulation that these three standard makers adhere to one of the original principles of the typically American car.

FRICTIONAL TRANSMISSION.

The only example of the purely frictional transmission found on the main floor at either building is in the cars of the Buckeye Manufacturing Company. There are a few other cars shown having this system, but it has not yet attained any great popularity.

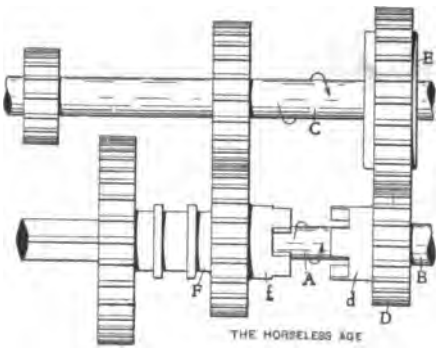


FIG. 2.—SKETCH OF HAYNES GEARING.

COMBINATION SYSTEM.

The Gearless Transmission Company exhibited a car which provides an infinitely variable frictional gearing, which is used for high power or slow speeds to bring the car up to its maximum speed, when a clutch is thrown in direct connecting the motor to the propeller shaft, after which the discs are retracted, giving a straight drive without any frictional elements in motion. The general scheme is shown diagrammatically in Fig. 4, in which A is the engine flywheel within which is a clutch drum B having an expanding clutch operated upon the swinging arm principle. C is the driven disc mounted on the splined propeller shaft D, and moved forward and backward for varying speeds by the rod *c*. Intermediate discs *d d* are supported in the frame E, which also has a bearing for the propeller shaft. The discs *d d* are drawn toward the shaft and into engagement with the disc C, and at the same time into en-

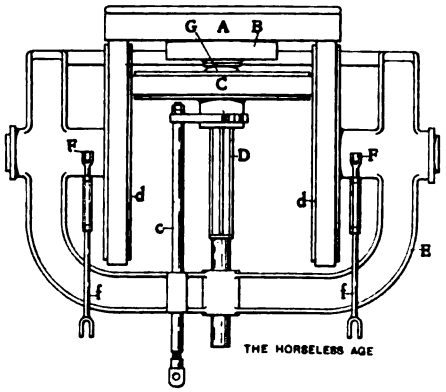


FIG. 3.—GEARLESS TRANSMISSION.

gagement with the flywheel, and impel the driven disc at a speed corresponding to its distance from the axis of the intermediate discs. The disc C may be moved either while the intermediate discs are in engagement with it or while they are free from it. The motion of discs *d* is effected by arms F, which operate on slotted sleeves within the hubs, the exact construction of which cannot be given. The arms F are connected together to a pedal by links *f*. When the driven disc C reaches the position shown in the cut, the swinging arm of the clutch B is engaged by a cone G carried by the disc C, engaging the clutch and positively connecting the motor to the propeller shaft D. Thereupon pressure upon the pedal is relieved, and the discs are all automatically retracted from each other so that there is no frictional contact of the discs.

This transmission may be adapted to any car. There was no other example of this style of transmission observed, but it is thought to be worthy of mention because of its peculiar features, and it is predicted that by next year, unless some obstacles to its adoption develop which are not now apparent, there will be other examples of the combined frictional and direct drive.

SUMMARY.

As a whole, although improvements in detail are noticeable all along the line, and many of the change gears shown are fine examples of design and workmanship, the absence of any attempt to solve the difficulties of the gearing problem along original lines is somewhat disappointing. It is generally acknowledged from an engineering standpoint that the sliding gear is not theoretically suited to motor vehicle work, despite the fact that it is the predominant type.

The writer believes that within one or two years, when the tendency to slavishly follow foreign practice shall have run its course, more earnest efforts to evolve the final form or forms of motor vehicle change speed gearing will be made.

Features of Four Cylinder Cars.

BY ALBERT L. CLOUGH.

In order to gain a general idea of what constitutes average practice in the design of the prominent 1906 four cylinder cars, data relative to certain important technical points were collected in regard to thirty-five of these vehicles. The cars were selected entirely at random, and, while the number considered is not large enough to furnish facts which are perfectly conclusive, it is believed that the results show tendencies which may be applied, with a fair degree of safety, to this type of car as a class.

CYLINDER CONSTRUCTION.

As regards the vertical, forwardly mounted, four cylinder engines employed upon these vehicles, it is to be remarked that the practice of casting the cylinders in separate units is slightly more common than that of casting them in pairs—53 per cent. of the engines considered having individual and 47 per cent. the twin type. As three of the cars in the list are air coolers, which almost necessarily make use of the former method, it may be said that one practice is just about as common as the other with water cooled engines.

The employment of individual cylinders renders the engine somewhat longer and perhaps a little less rigid; but they are regarded as somewhat less liable to internal stresses, owing to their relatively simple and symmetrical form; they permit of less costly replacement and their use makes the employment of five crank shaft bearings rather more convenient than when the twin cylinder construction is adhered to. It may at least be said that individually cast cylinders are not losing ground. There is not one example in the list of a water cooled engine with separately cast heads.

VALVE ARRANGEMENT.

Placing of the valves in valve chambers or side pockets is general, but their location directly in the cylinder head is quite common even in water cooled motors. In 67 per cent. of the engines considered the former system is employed, and in 33 per cent. the latter method is adopted. Three of the engines which use valves in the head are of the air cooled type, however. Two of the motors employ automatic valves, in both cases placed in the he of larger area. Of the engines carry their valves in side chambers, 58 per cent. have their inlets and ex located upon opposite sides, operated separate cam shafts, and in 42 per ce valves are located upon the same sid situated from a single secondary shaft former arrangement allows of the em ment of larger valves, but necessitates additional half time shaft and its g Among the engines having valves i cylinder heads are examples in whi valves are actuated from a single shaft, although the use of two sha more usual. Quite commonly, the en having separately cast cylinders emplo crank shaft bearings; but, on the th three bearing crank shafts are used extensively, being employed upon 6 cent. of the cars.

It should be mentioned that the v of these engines are almost generally in changeable, and their ready renewal i most always provided for.

Cast aluminum crank cases are practi universal, and, in the great majority cases, the crank shaft bearings are entir in the upper half, allowing of the conve ent removal of the lower crank case s tion. Pumps and timers are almost alw gear driven, and the latter access placed. The gears are well housed in m cases.

COOLERS.

The cellular cooler appears to be mu more popular than the flanged tubul type, the former being employed upon per cent. of the cars which were studied while the latter is employed on about 9 per cent. The remaining 10 per cent. mak use of the flattened tubular type of coole These coolers are built up of thin tubes connecting an upper and a lower tank header. The tubes are very much fla tened, so that the water flows through them in a very thin sheet. Two of the cars listed make use of a gravity circulation sys tem, and three, as previously stated, are "air coolers." Of the remainder, a slightly larger proportion employ a positive circulating pump (generally of the gear type) than make use of a pump of the centrifugal variety. It is hardly necessary to say that an air fan in the rear of the radiator is practically universal. All radiators, of whatever type, are so designed as to conform to the contour of the front of the hood. The pipe connections of the water circulating systems are usually of brass, flexible rubber hose having nearly disappeared. The water piping of the 1906 cars shows an improvement in regard to its planning and execution.

CLUTCHES.

As to clutches, these cars exhibit considerable diversity, the leather faced cone type mounted on the flywheel being most used. It seems to be very little used in the inverted form, but is generally provided with

springs under the leather to allow of gradual engagement. Great care is evidently employed to render the engaging portion of the clutch as light as possible, in order to reduce its momentum and minimize the stresses upon the gear teeth during changing. In one instance only the cone engages with a special flywheel flange of reduced diameter, in order to reduce the size and spinning tendency of the engaging portion. Upon one car a cone clutch with metallic surfaces only is adopted—the whole being operated in an oil bath. The multiple disc type of clutch is increasingly represented upon these 1906 cars, and it is evident that this form of clutch is appealing more and more strongly to the manufacturers, owing to its inherent easy engaging qualities.

Both the internal expanding and the external contracting types of band clutch are well represented upon the cars under consideration, both metal to metal and leather to metal frictional surfaces being used. The leather faced cone type is employed upon 50 per cent. of the cars studied, the disc clutch upon 28 per cent. and some form of band or strap clutch upon the remaining 22 per cent.

A universal joint is in almost every instance employed between the engine and the change speed gear, but in a few cases an integral construction of engine base and gear case or a special frame arrangement allows of its being omitted.

Practically all the change speed devices of these cars are of the sliding gear type, two only out of the thirty-five are of the individual clutch variety, and one is a two speed planetary.

CHANGE SPEED GEARS.

Twenty-seven of the thirty-five cars are provided with three forward speeds, six with four speeds and one with two speeds. It is evident that the four speed gear is gaining favor with the builders of this type of car, and equally obvious that the two speed gear is very exceptional.

The double sliding pair or selective system of gear changing seems to be gaining favor over the single sliding system, as it is found in use in nearly half of the cars employing the sliding gear method of speed changing. It is much more convenient for the operator, and possesses some mechanical advantages. In two of these cars which employ the side chain drive, the new Mercedes type of sliding gear, which employs a double bevel gear pair, is employed. The side shaft of a few of the change speed gears is automatically immeshed when the high gear is engaged, but the practice has not become general, the noise and idle friction and wear of the side shaft evidently not being considered serious enough to warrant the added complication of a disconnecting device. It is needless to say that every one of the sliding gear speed changing combinations provides for a direct drive on the high gear. The gear boxes are, in almost every instance, of cast aluminum and arranged with a view to accessibility. One notable change is in regard to the gear shaft bearings. The use of imported ball bearings has become very widespread, although plain bearings of bronze or babbitt are still most used. Fifty-two per cent. of the gear boxes upon these cars, concerning which data could be obtained, employ plain bearings, 38 per cent. ball bearings and 10 per cent. roller bearings. Ball or roller bearings are thus employed in about half of them. This is quite a remarkable growth in the use of bearings of the "anti-friction" type.

DRIVING SYSTEMS.

The shaft drive to a divided live rear axle is employed upon 68 per cent. of the cars studied, and the double chain drive from a jack shaft upon the remaining 32 per cent. Some of the heaviest cars in the list are provided with the shaft drive. The tubular rear axle casing with "floating" shafts is much in favor, and the shafts and the driving wheels are most often carried upon ball bearings, although bearings of the roller type are nearly as frequently employed. Ball bearings are used upon half of the axles concerning which data were obtainable. In two instances plain bearings are employed, and in the remainder either rollers entirely or a combination of rollers and balls. The propeller shaft in almost every instance is supported upon ball or roller bearings—the preference seeming to be for the former.

FRONT AXLES.

As to front axle construction, the solid forged type seems to be in high favor, although the tubular construction is still very largely employed, probably through economic reasons. Among the forged axles a few are of square section, but the I section is very much more common. It would seem to be the only logical form of construction for this member of a car. Fifty-nine per cent. of the cars here considered employ a forged front axle, and 41 per cent. a tubular construction. The proportion of a tubular and I section forged axles is exactly the same. On the side chain driven cars the front and rear axles are usually of the same type. The worm and worm sector steering device is very much more popular than the screw and nut form—in the ratio of 3 to 1—while the pinion and rack and pinion and sector types are still employed in a few instances.

RUNNING GEAR FEATURES.

The sizes of road wheels employed on these cars range from 30 to 36 inches in diameter. Wheels of 32 inches diameter, often shod with larger tires in the rear than in front, are most in vogue, with the 34 inch wheel only slightly less popular. The figures are: 42 per cent. use 32 inch wheels; 36 per cent., 34 inch wheels; 13 per cent., 36 inch, and 9 per cent., 30 inch.

To carry the front wheels, ball bearings are most commonly employed, although the conical roller bearing is much used. Among the cars listed they are found in the ratio of 3 to 2. Plain wheel bearings are used in two instances. The wheel bases of these cars are very long, and range from 93 inches to 119 inches. The average is about 105 inches. Two seasons ago 84 inches was regarded a very respectable wheel base for a touring car. The present average practice is an increase of 25 per cent. over that figure. Semi-elliptic springs, front and rear, are employed upon these models, to the practical exclusion of all other types of suspension. In a very few instances full elliptics are provided either in front or rear, or all around, and in two cases a platform spring is employed, but semi-elliptics are almost universal. They are of great length, as compared with earlier practice. The models listed are fitted with front springs ranging from 32 to 50 inches in length, and rear springs the lengths of which range from 38 to 55 inches. A fair average length of this year's front springs cannot be far from 40 inches, and that of the rear springs 46 or 47 inches.

BRAKES.

The brake practice embodied in these cars is rather interesting. There is not a car in the list which is not provided with at least one set of hub brakes, usually of the internal expanding, encased type. The most common arrangement is an internal expanding brake on each rear hub and a band brake upon the propeller shaft. The former is, in almost every case, operated by the side lever, and interconnected with the clutch, the latter is operated by a pedal, usually without any clutch connection. The next most common arrangement is that of an external band and an internal expanding brake upon each hub, the two sets being independent, one being lever operated and the other pedal applied. In quite a number of instances the new practice of two independent sets of internally expanding brakes upon each hub is followed. In two instances only is a foot operated brake band upon the differential casing still employed in connection with the lever operated hub brakes. The chain driven cars employ, as a rule, one set of internally expanding, lever operated hub brakes and double band brakes acting upon the cross shaft.

WEIGHT PER HORSE POWER.

In not every instance could a reliable figure be obtained for the weights of these cars. In those cases in which it was obtainable the pounds of total vehicle weight per rated horse power were figured. This varies very widely, and is probably of very little actual value, as some engines are undoubtedly underrated, many more perhaps overrated, and weights are suspected to be generally understated. The average car weight per rated horse power appears to be 78 pounds, and the figure may be accepted for what it is worth. Many of the features of 1906 practice in four cylinder cars have not been even touched upon, such as the almost universal use of pressed steel frames, the tendency toward a standardization of the control mechanisms, the use of some form of force feed lubricator on all the cars, and many other similar points.

Body Design and Construction as Seen at the New York Shows.

By W. E. Decker.

In an evolution such as the automobile has been passing through the less important features must necessarily be neglected for a time until the more important problems have received a satisfactory solution. Up to a short time ago automobile builders were devoting their attention almost entirely to the improvement of the power plant. Careful observation at the two large automobile exhibitions just closed gave one the impression that the propelling mechanism is now approaching standard forms, and that strong and satisfactory designs have been reached, so that more time and study can be given to the other portions of the automobile. The first requisite of a power vehicle is, of course, reliability, but in a pleasure vehicle comfort is also a very desirable feature. There are now so many cars offered in the market, the propelling mechanism of which is so nearly alike, that the purchaser frequently makes his decision in favor of the car which appears to him to be the most comfortable. The extremely long springs that are now being fitted and the increase in the use of shock absorbers are indications of the demand for comfort.

STYLES OF UPHOLSTERING.

Most of the upholstering noticed at the shows is of the thick tufted style, with large rolls over the sides and backs of the seats. Very few cars are seen with the upholstering flush with the sides and back. Brass beading has almost disappeared, one of the reasons for which is probably that it required considerable polishing, which was ruinous to the upholstering. A leather cording is sometimes used, but more frequently the flat blind nailed leather welt. The tufted upholstering is open to the objection that it collects dust, and is difficult to clean. For this reason there is a demand for plain upholstering, or the vertical corded type. Such upholstering can be sponged off and perfectly cleaned with little trouble, and it is claimed that it can also be made equally comfortable as the tufted upholstering, because with the latter the rolls must be pulled down so tight that they are rather hard. The plain upholstering also keeps its shape better, and the plain seats do not seem to be objectionable and are becoming quite popular.

Some builders, following horse vehicle practice, are using broadcloth, Worcester cord or corduroy for upholstering automobiles, not realizing the different conditions in the operation of motor cars. The self propelled vehicle not only gathers the dust of others, but on account of the suction created it is constantly enshrouded in its own dust, and the cloth upholstery becomes thoroughly saturated with dust and cannot be properly cleaned. For this reason leather is an all round more satisfactory material for the upholstering of a car. The finest goatskin is frequently used for the tonneau seats of the most expensive cars.

CONSTRUCTION OF SEATS.

The larger tonneaus fitted with folding or jumper seats or revolving chairs are still open to improvement. Many of the mechanical folding devices have been well worked out, but the seats are mostly rather uncomfortable. Most of the rear seats are now made so wide as to overhang the wheels. The backs are now generally built quite upright. Many of the tonneau doors are now hinged in front, which seems to be more convenient.

Front seats of bucket form are less common. The divisions have become very small, usually only in the back of the seat. These are not so hot and give the arms freer movement.

A great many more regular and extension limousine and landaulets were displayed than formerly. They are constructed with from two windows to an entire glass enclosure. The glass above the dash for wind and dust protection is almost a necessity, both on these and touring cars. On the latter it is combined with an extension Cape cart top, which, with the boots and side curtains, affords complete protection from rain. The celluloid fronts are also used.

BODY MATERIALS.

The question of whether bodies shall be built of wood or metal is still undecided. Aluminum bodies are rapidly becoming more numerous. A careful investigation of all the exhibits led to the compilation of the following figures:

	Per Cent.
Wood bodies	64
Aluminum bodies	28
Steel bodies	5
Combination wood and metal	3

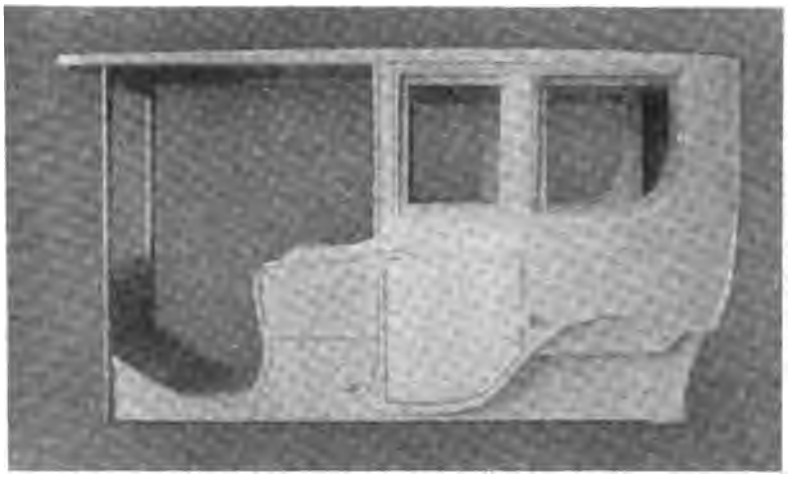
Aside from these the Marmon and Pierce companies use cast aluminum bodies. There were also a number of cast hollow dashes to be seen. Several manufacturers exhibiting wood bodies stated that their cars would be fitted with aluminum bodies, their exhibits being wood only because aluminum could not be obtained. Therefore there will be in use slightly more than one-half as many aluminum as wood bodies.

The Brewster Carriage Company feel that the tendency is strong for much better bodies than have been built in this country heretofore. It seems the foreign carriage builders recognized the automobile field for body building sooner than our home builders. The latter were reticent to believe that the automobile had come to stay, and in consequence some of the finest productions have come from abroad. The above concern has carefully studied the problem and believes thoroughly in the excellence of wood bodies. They consider that any of the graceful curves that are now to be seen on automobile bodies can be made of wood.

The A. T. Demarest Company, who are building wood bodies, state that on cars of about 30 horse power or more, carrying seven passengers, they consider the



Haynes Limousine, With Natural Aluminum Finish.



HOOKER LIMOUSINE BODY.

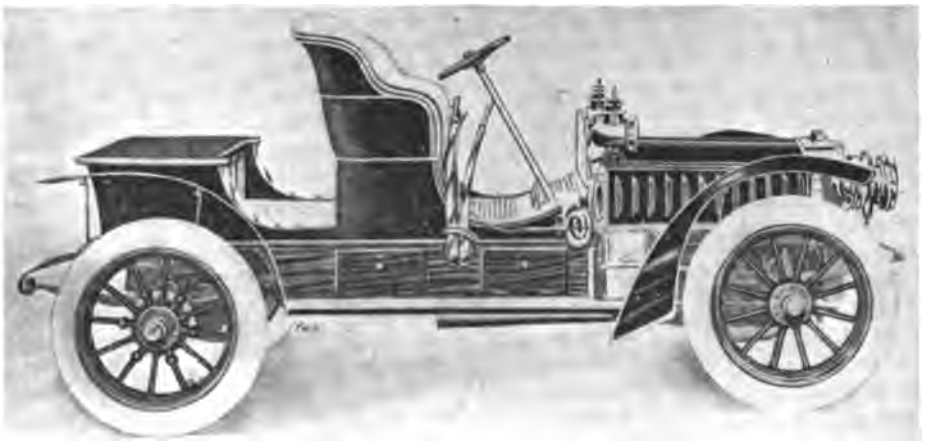
ossible saving of 150 pounds not suffi-ent to warrant the use of aluminum. ut in the lower powered cars the light eight may be an advantage. For some f the compound curves, however, they equently use aluminum. J. M. Quinby : Co., although old carriage builders, refer to use aluminum. Their average ize touring car body weighs 350 ounds. The unfinished limousine body isplayed at the Haynes Company stand eighs 600 pounds. In all these alumi-um bodies, aluminum angles are used n place of angle irons, and all parts are olted or riveted together. No solder s used. The brass decorative molding s first brazed together, then riveted on he body from the inside, thus affording dditional strength. In cases of ordinary ents the repair is a simple matter. The pholstering is loosened and the dent ammered out. This firm considers the dvantage in painting aluminum bodies ery great. The same finish that is pro-luced on a wood body with fourteen oats can be obtained on aluminum with bout half that number, there being no illing coats necessary on the metal. How-ver, it has first to receive a chemical treat-nent to remove all traces of oil from the netal.

A number of the aluminum bodies in the different exhibits were built by Cole & Woop. The backs are braced inside by either aluminum bars or wood. The bead-ing or molding is sometimes formed in the metal, or it may be of wrought iron riveted on. From 12 to 16 gauge sheet aluminum is used. The following are the pros and cons for wood and aluminum. In case of acci-dent a dent is usually easier to repair than a broken panel. If the wood is not thor-oughly seasoned it will crack or open seams in the course of time. The automobile body is subjected to far more severe conditions than that of the horse drawn vehicle. The weight, speed and self contained power ne-cessitate a much stronger body.

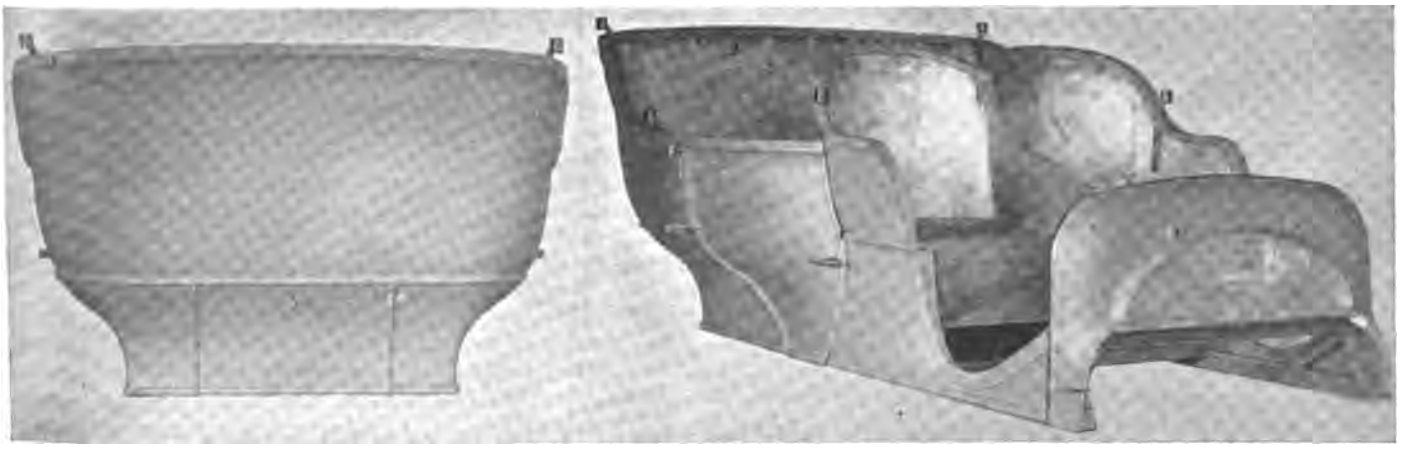
At first the wood body was constructed too light, as its builders followed the prac-tice of other carriage lines, and because the small powers of the cars demanded light-ness. Both these conditions are passing, and the bodies will better stand the racking and twisting. The parts of the aluminum body, being bolted or riveted together, are very firm, lending strength to the whole. With it there is little chance for opening joints or squeaking.

Sheet steel, not being as malleable as aluminum, is more difficult to form and is not much used, except for straight work.

The Pierce and Marmon exhibits con-tained some excellent specimens of cast aluminum bodies. These are said to weigh the same as wood bodies, but possess the advantage of greater strength. It is said to be quite impossible to break up a de-fective casting with a 2 pound hammer. A heavy sledge is always used. Decorative moldings are cast on the parts, as are also the lips by which the sections are bolted to-gether. Bosses for the tail lamp, etc., and pedestals for hinges, locks and various han-dles are cast with the parts, thus making simple and very strong attachments. Screwed



AUSTIN BODY DESIGN.



TWO VIEWS OF THE MARMON CAST ALUMINUM BODY.

to cast bosses are strips of wood to which the upholstering is attached.

In the accompanying illustrations of Marmon parts these attachments can be seen. These castings are most uniform in thickness throughout. They can, of course, be made to take any curves or angles desired. As the art of casting aluminum advances this type of body must become much more popular.

THE ARTISTIC ASPECT.

When considering the artistic aspect of the exhibit it was noted that there were but few changes. The only radical one is the adoption by some of the long, sweeping victoria curved backs. The White, Cadillac and St. Louis cars are the most pronounced of this type.

The King of the Belgians type is seen much less frequently. The straight backs are the most numerous. Although the latter are cheaper to construct, many of the expensive cars employ them. Tulip curves come next. The newer convex back is gaining in popularity. It makes a very rich appearance, and gives a little more room and comfort to the tonneau.

In the more expensive cars there are all sorts of conveniences, such as pockets and portfolios for parcels, racks for smelling salts, purses, clocks, etc., electric lights and annunciators to signal the chauffeur, small drop tables, and even a buffet provided with an ice chest.

COLORS.

The large majority of cars are now painted dark, the yellows having quite disappeared and the reds are few. There were several pretty shades of light greens. There were also golden browns and a few light and dark olive browns. These latter shades are very attractive. Pure white, with trimmings of various colors, is gaining in favor. The Austin car gives a most artistic color effect. It is white, with heavy golden brown stripes and trimmings. The thick leather upholstering and the extension Cape top were also golden brown.

Steering Systems Seen at the Shows.

By Forrest R. Jones.

The steering wheel has come into universal use on all the larger cars, and with few exceptions on the smaller gasoline cars, but the radial arm for steering is retained on the majority of the electric vehicles.

TYPES OF STEERING GEARS.

Dealing with the steering wheel for the gasoline cars there is in most cases an arm swinging in the direction of the length of the car, and connected at the bottom to the rear end of the reach rod leading to the steering knuckle. This swinging arm is swiveled on a pin which extends in a direction across the length of the car. The devices for transmitting motion from the steering column to the swinging arm are numerous. That most generally adopted, however, is the worm and worm wheel. It usually consists of a segment of a worm wheel, but in some cases the complete wheel is put in place with the advantage that adjustment can be made for wear by turning it to different positions on the swinging arm. The worm is usually of a type whose pitch surface is cylindrical, corresponding to a short length of an ordinary screw with beveled sides to the thread.

A few machines have adopted the Hindley worm and wheel, in which the worm has something of the shape of an hour glass, that is sometimes referred to as the corset shape worm. This embraces a considerable arc of the wheel, and has the advantage of a greater area of contact between the thread of the worm and wheel, and consequently less lost motion by wear.

Next in favor of selection is the screw and nut, in which the nut travels up and down along the threaded portion of the steering column as the latter is rotated. The nut engages with a pin or other device on the swinging arm and transfers the required motion to it.

In a few machines a bevel gear is placed at the lower end of the steering column, and meshes with another bevel gear which forms part of the swinging arm member. This device has been applied in at least one car where the direction of swing of the arm is nearly at right angles to the length of the car, the reach rod extending across the car to the steering knuckle on the opposite side.

In one or two cars only an ordinary bell crank is used at the lower end of the column, and the reach rod extends across the car to the knuckle on the opposite side. While provision for taking up wear is not generally used in this plan, it can be provided for, of course.

In the above devices only partial

ADJUSTMENT FOR WEAR

is provided for, and lost motion or play is certain to come after use, yet not to such an extent as to be serious when good materials and ample proportions are used. It is possible to provide for taking up this wear completely by using a divided worm wheel, nut or gear, as the case may be.

One maker brings out a special design, in which the enlarged bottom of the column has both an outside and internal thread, each engaging with the nut, so that when the column is rotated one nut moves up at the same speed that the other is lowered. A projection on each nut presses against a pin on the swinging arm member, the pins being equidistant on opposite sides of the swivel joint. In this design complete adjustment for wear is made by taking up the play with one nut somewhat in the form of a gland nut around the steering column.

Many of the reach rods, especially in the heavier cars, are provided with springs where connection is made with the swinging arm, in order to give some elasticity and relieve the steering mechanism of heavy shocks when one wheel strikes an obstacle. An important improvement has been made in the connection between the reach rod and the parts to which it joins by either altering the design or providing a safety device which does not permit the rod to come off in case the adjustments become somewhat loose. This was a serious defect in many of the earlier cars.

POSITION OF IMPORTANT PARTS.

The arm of the wheel knuckle to which the reach rod connects is placed behind the axle in the majority of cars, but nearly half of them have it above, where it is less liable to injury by striking an obstruction. The distance rod extending across the front of the car between the two wheel knuckles is placed before the axle as a tension member in about the same number of cars as it is placed behind the axle as a compression member. When in front it is more exposed to injury by striking an obstacle, but it is a safer member otherwise on account of being in tension than when in the rear of the axle in compression. Taking things into consideration, there seems to be no choice on the question of safety between the two positions. In most of the cars the knuckle arm for the reach rod is an integral part of the knuckle, but several have it as a separate piece bolted or keyed to a knuckle.

In practically all the cars, except some of the very small ones, the steering system approaches closely to non-reversibility, certainly near enough to be entirely safe for the purpose as long as the hand rests lightly on the wheel. Probably all would move without some resistance of the hand when running with one wheel in heavy sand and the other on a smooth track.

While nearly all the knuckles are of such construction as to be rigid, one or two of the usual designs have the reach rod arm long and light enough to give some flexibility, not enough, however, to interfere with steering.

On a whole this highly important part of the car has been much improved in the matter of strength and safety.

Ignition Systems at the Shows.

By Harry E. Dey.

The ignition systems used on the different cars seen at the shows indicate that few changes have been made during the past year. The single coil with high tension distributer has made considerable progress, however, while automatic spark advance by governor has apparently lost in popularity, there being only one car that the writer noticed on which it is used. In the four cylinder car made by the same company the spark advance is controlled from the seat. The reason assigned for not having the automatic advance on these cars is that the cars cannot be stopped as quickly, or more properly speaking slowed up, with it, as the spark when retarded acts as a very efficient brake.

The magneto appears to be almost uni-

rsally used abroad in both the high and w tension form, while with the do- estic cars the case is exactly reversed, e jump spark with batteries being pre- ominant. The few that are using the agneto are in nearly all cases almost xact duplicates of popular types of for- gn cars. A prominent manufacturer of oth coils and magnetos stated to the riter in no uncertain terms that it is his inion that the American adoption of he magneto, so far as it has gone, is nly a sop to a portion of the public who re not satisfied with anything that is not oreign, and he believes even these will oon come back to the jump spark with atteries. The old type of make and reak with battery seems to have com- letely disappeared. One would think his system might be used as an auxiliary o the low tension magneto.

Of the magnetos used the low tension ype appears to be in the majority in the proportion of two to one, there being eighteen cars with low tension magnetos and nine with the high, not including those with which auxiliary systems are used. In addition to these there were thirteen having a double system, five of them using high tension magneto to- gether with four coils with battery, each system having an individual set of spark plugs so that either one or both of the systems can be used at a time, while the other eight have a similar double system using only one set of spark plugs. Two cars used a double system of magneto and single coil with battery, with distribu- ter common to both. Eight cars were equipped with a single coil and high ten- sion distributer; sixty had a coil for each cylinder; one had a combined high and low tension system, the first being operated with four coils, while the sec- ond makes use of magnetic plugs operat- ed by magneto.

The storage battery appears to be the favorite source of current for coils. The location of the spark plugs seems to be about evenly divided between placing them in the plugs over the inlet valves and in the centre of the top of the cylin- der heads. Occasional departures are to be noticed.

In dividing the ignition systems on the foreign and domestic it is found that there are seven double systems used on cars from abroad and five on cars from this country. The high and low tension magnetos on American cars were evenly divided, there being seven of each, while on foreign cars there are five high ten- sion and eleven low. There are four for- eign cars and sixty-three domestic with jump spark ignition.

The Automobile Club of Germany have withdrawn for 1906 their suggestion that the European clubs should agree to hold one big international contest only during the year. They propose, however, to re- vive this suggestion for later years.

Notes on 1906 Brake Design.

By Charles Tailleur.

The 1906 models of nearly all prominent European builders indicate a better realization on the part of their designers of the engineering factors of brake design, and of the vital importance of the entire subject of brakes. American cars bear evidence of much inventive skill and study in their brake design; but the advantages of dura- bility and high safety factors in these mem- bers do not seem to have been so thor- oughly appreciated as they have been by our foreign competitors.

The tendency abroad has been to en- large all braking surfaces by increase in both diameter and width, and to provide means for quick and easy brake adjust- ment, in some cases without the use of tools. A second brake acting through the differential is also gaining in favor. In Mer- cedes, Fiat and Westinghouse there is one small diameter, wide jaw brake on the for- ward end of the secondary shaft in addition to the usual brake carried by the differential housing. Both brakes are of the same type and face, but the latter is larger in diameter to compensate for its lower speed of rota- tion.

In these three cars the brake torque is taken on studs carried by the aluminum crank case. This arrangement has the ad- vantage of preventing cramping stresses on the brake members and shafts, which might result from the eccentricity of the jaw and drum surfaces where the brake jaws are carried by the frame members. In the Fiat cars both these brakes are operated simul- taneously by one pedal, while Mercedes and Westinghouse provide an independent pedal for each. Mors, Rochet-Schneider, Martini and Berliet place two brakes upon the dif- ferential housing, each operated independ- ently by pedals. In these foreign cars which are equipped with but one brake act- ing through the differential, this single brake is of very large dimensions. In the 35 horse power Hotchkiss a brake 12 inches in diameter and 4 inches face is placed im- mediately behind the gear box, and the 20- 30 horse power Renault has a brake 15x3 inches similarly placed, and provided with air cooling flanges. The brake practice of the Westinghouse Company should be par- ticularly interesting, in view of the enor- mous experience of this firm with high speed vehicle brakes. It is therefore sig- nificant that the 30 horse power Westing- house chassis is provided with the greatest total braking surface of any car of the year. The chassis weighs about 2,300 pounds, and has approximately 375 square inches total brake surface, of which about one-half acts through the differential. This quantity and distribution correspond close- ly with the writer's formula:

$$S = 2\,H.\,P. + \frac{W}{12}$$

where S = total brake surface; W = total weight of loaded car.

In the above case this formula would give

$$2 \times 35 + \frac{3300}{12} = 340 \text{ square inches.}$$

The smallest brake surface observed upon any Continental chassis shown in New York is that of 220 square inches for 30 horse power and 2,000 pounds weight. A well known English car lately imported, of nearly 50 actual horse power and about 2,200 chassis weight, is equipped with but 120 square inches, none of which acts through the differential. The average fig- ures for European chassis are 290 square inches, 36 horse power and 2,100 pounds weight.

DOUBLE HUB BRAKES.

No tendency has shown itself among the better class of foreign constructors to place a double set of brakes on the hubs to the exclusion of the differential brake, as is being done to some extent in this country. Two reasons for this are apparent: The impossibility of equalizing the retarding in- fluence of the two wheels where the ad- hesion between the tire and the ground is different from any cause, such as unevenly divided load, crowning of the roadbed, un- like conditions of the road surface, etc.; the difficulty of obtaining accessibility and adjustability combined with proper dirt and mud protection for the second set of hub brakes, which must be used constantly in the absence of a differential brake.

The new Mors brake design is of inter- est because of its novelty. There are two brakes on the differential shaft, arranged one on either side of the gear box. The band of the right hand one is not anchored rigidly, as is usual, but is connected with the hub brake equalizing beam in such a way that the torque due to applying the former also applies the hub brakes. Though this device will probably be largely copied, to the writer it does not seem to be tech- nically correct. Analysis shows it to be in principle a coil brake of two or more con- volutions, and as such its action will vary rapidly with the frictional coefficient of the operating differential brake.

The single differential shaft brake of the Delaunay-Belleville car is provided with a very neat cooling system. The two jaws are built up with water jackets, which are flexibly connected to a small special water tank attached to the frame close by. When the brake becomes warm a thermo-siphon circulation through the jaws is induced, which should thoroughly cool them for a considerable period without loss of water or wetting of the contact surfaces.

Owing to a growing tendency to sup- port the differential shaft by means of a continuation of the shaft casing, internal differential brakes are coming more into fa- vor. The casing is built out around the brake and continued out to the side frame members. In this way much weight is added and the accessibility of the brake and its adjustments is considerably diminished.

Coming to

THE AMERICAN CAR,

the brake surfaces as indicated above are much smaller, even in cars of equal weight

and power, than in the imported vehicles. The average of some sixty cars observed, mostly of the four cylinder, medium powered type, gave 46 square inches for the brakes acting through the differential, and 87 square inches for the hub brakes, giving a total brake surface of 133 square inches for 23 horse power and 1,800 pounds weight. The largest brake surface observed was that of 230 square inches in a car of 50 horse power and a chassis weight of about 2,500 pounds. In this case all brakes acted on the hub drums. The minimum in cars rated above 18 horse power was found to be 109 square inches, divided into 31 square inches on the differential and 78 square inches on the hubs. This car is rated at 24 horse power and the chassis weight is in the neighborhood of 1,800 pounds.

In American cars the use of expanding and contracting hub brakes seems to favor the former strongly. Owing to the use of standard "ready to use" bevel drive axles, few cars of this type have contracting hub brakes, except where a second set of brakes is applied to the hub. In several side chain cars double internal enclosed hub brakes are fitted, one foot and the other hand lever operated. The absence of a differential brake is, in the writer's opinion, a serious error, although much is said of the advantages of applying the braking effort as close to the tire as possible. From a purely mechanical point of view this argument is correct, but hub brakes are quite ineffective in controlling a car under some not infrequently met conditions, under which the differential brake, skillfully handled, will give the desired control.

Differential brakes are almost invariably of the contracting jaw type. The abandonment of the simple hand brake by nearly all builders is due principally to the difficulty of adjusting this type to prevent "dragging." The jaw is rigid and not subject to distortion, and a much smaller clearance movement of the operating linkage is sufficient to perfectly disengage it, whereas the converse is true of the band. The linkage can therefore be so designed as to take up a greater amount of wear automatically without requiring readjustment, and at the same time give the required leverages for easy operation. On the other hand the band brake is much lighter and usually cheaper to manufacture. In the writer's opinion a well designed band brake is superior to one of the jaw type.

An unusual brake arrangement was seen on a high powered car of new make. The hand lever operates both the differential and hub brakes simultaneously, while the brake pedal acts only on the differential. As to the materials employed for the friction surfaces many practices are current. Steel, various bronzes, brass, cast iron, fibre, leather and wood are used in almost every possible combination. The most common practice at home seems to be bronze against cast iron or steel, while abroad the tendency is toward cast iron against steel, though bronze on steel is much used.

One prominent air cooled car uses a specially prepared canvas fabric as a liner for its brake bands.

Water cooling for brakes does not seem to have found any favor with American constructors, as the writer was unable to find a single example of it at either show. This is the more remarkable in view of the smaller braking surfaces provided in our cars, and the severe conditions of brake service in the Eastern and far Western States. Experiments have proven it to be an effective means for reducing wear during long or very steep descents. Little attention has evidently been paid to the protection of the differential brakes from dust and mud. Except in those cars which have underpans extending to the rear of the transmission, special brake protection is seldom provided, though this might easily be done, and would add much to their durability.

How It Impressed One Amateur.

By Blank, M. D.

An amateur is one interested in and working on a question from love of it, and with no pecuniary motive. The term is not synonymous with "immature" nor does it imply any deficiency in ability. Again, the opinions of any one man should be taken by others for their suggestive value, and not as authoritative. Consequently, I offer no apology for the following hastily written and ill-considered record of my mental condition at the end of the Show Week.

I came home and examined my store of remembrances. I found a friction drive on top of a patent lock nut, and both hiding a new carburetor. Transmissions hobnobbed with spring suspensions and motors with rubber faced lugs. My thoughts were a hodge-podge, and I decided that probably my impressions were mixed. However, as my precious time flew by one or two things began to separate themselves from the mess, and I fastened on to them with a pencil.

For the first time (and I've seen all the New York shows) there came to me a hint of that uniformity of design and material which leads to that regularity of size which we call standardization. It was only a hint. I do not expect such absolute uniformity as has come about in the cycle trade. I couldn't substantiate it to save my life. Yet I think it was there. It may have been suggested by the harmony of the decorations. If it wasn't there, my brethren, it ought to have been. So pray for it, for standardization means specialization in manufacture, and that means prices cut to fractions of those current.

SHOW NOT THE PLACE TO BUY.

There were many bona fide buyers present. Amateurs, I mean. Some bought. Some will buy. It strikes me that the Show is the last place to go to buy a car. In spite of the fact that these exhibitions prove that a man stands a poor chance of not being suited, no matter what he buys, they make a choice very difficult. If I bought a car there I would be sure, for a while at least, to wish I had purchased another. I did buy a new car last summer. Bought it as I try to make a diagnosis—by elimination. First I asked and answered these questions:

1. What work must this new car of mine do?
2. What quality of motive power must I have to do such work best?
3. What quantity of motive power, considering that a car lasts longer when it can do its regular work without exertion?
4. What form of body is best for my purpose?
5. What can I pay for it?
6. What can I spend for "upkeep"?

Then with the trade lists before me I eliminated those cars which were obviously unsuitable. You would be astonished to see how short a list remained.

Then I proceeded to study in detail the lone half dozen. This was to find the car which most nearly suited my personal equation. Questions of reputation, reliability, general excellence, etc., you notice are all included under No. 6. I took it for granted that my half dozen were good. I saw them all. I managed to see and study the drawings of three. This reduced the number by four. Then I had demonstrations over routes of my own choosing. But upon these I put little stress. A smart man can demonstrate any old car to anybody's satisfaction, while a poor man will make a poor impression with the best car made. But I did get the sort of demonstration I wanted. The cars were dissected for me, and the extreme simplicity and accessibility of one won out. I took eighteen months to do this, and the result is eminently satisfactory. I couldn't do it at a show.

AN INCOMPETENT JUDGE.

One incident I observed has a lesson in it. A smart young man took a casual glance over a light car, most beautifully designed and executed, upon which I had spent two hours, and with a laugh characterized it as a "freak." I'll admit that its outer aspect was not quite orthodox, but in principle it was absolutely conventional. Many visitors, both amateur and professional, made like mistakes all over the room. But they were not offensive about it. The exhibitor of this car overheard the remark and turned away with a pained look upon his face. He evidently believes in this child of his brain, and hands and loves it like a son. That's the kind of a man to buy from. No shoddy material nor unskilled labor tolerated by such a man. I couldn't resist temptation and butted in. I took great pleasure in calling the young man down, and take satisfaction in the remembrance. After a while I found he had never even ridden in a motor car, and didn't know a needle valve from a cotter pin. A freak, a real genuine freak, did not meet my eye. There were many departures from the conventional in shape, color, etc., but no such radical differences in mechanical

iciple as to warrant the term. There one rather dubious looking electric, but not sure that it wasn't all right. Fric- drive is one of the oldest and most ily established mechanical propositions. car which uses it is no freak. I happen know that some of our oldest and most iservative engineers are now experiment- with it, and I expect to see it become ndard practice in certain well defined ds. The car mentioned above was chain iven.

EXHIBITORS' ENTHUSIASM.

I found that most of the exhibitors were nest and enthusiastic believers in the oposition that their cars were the best ies for the price. You had to boost most them a thousand before they would ad- it any superiority. Some few were not en- usiastic, and one was cynical. I don't lame him. He was showing a big, 50 orse, $3,500, not much advertised car, hich was finished in a disgraceful man- er. A certain $500, four cylinder, was an ridescent dream in comparison. This big ar showed marks of absolute neglect and lovenliness. Others of equal size and price howed care. It may be that this manufac- urer spends all his time and money on the nside of his motor. Personally, I don't be- ieve it. I know he spends more on the outside. High tension wires floating around loose, marks of the cold chisel over every- thing. Oh, it was a nightmare! I claim that the man who makes a thoroughly good motor will love it and spend his own money if need be to send it out looking well. You couldn't give me that car, for its maker doesn't believe in it.

I was glad to see so many big wheels. One little car had 36 inch drivers. And I was not glad to see the preponderance of the jump spark. I suppose the ease of ad- vancing it is accountable. I think a spark should be big enough and hot enough not to need advancing.

So far as one is able to judge by in- spection, the best made, the finest finished, the most conveniently designed, the car which in every way showed the maximum of knowledge, care, pains and attention with the greatest degree of practical luxury, was an American car in the Armory Show. One can't form much opinion as to material from an inspection, but as I stood over that car by the hour and imagined myself with it in all the exigencies suggested by five years' experience and observation, they seemed very unlikely to occur, and if they did the remedy was obvious and easily applied. It was the most "prophylactic" car I ever saw. It was proof at any rate that in refinement of design our American manufacturer leads the world.

But one impression of these two shows overshadows all the rest. There is born in every one a new sense of the dignity and importance of the industry. No longer does it cater to sport alone. Pleasure is not now the only thing considered. Utility, the lightening of the world's labor is the present object.

Additional Exhibitors.

Owing to the fact that many exhibitors at the two shows were not listed in the catalogues, or that their exhibits were not in position during the first few days of the show week, as well as owing to oversight on the part of our reporters, we were not able to print descriptions of all of the ex- hibits in our first show number. Those which were omitted there are mentioned below.

COMPLETE VEHICLES, A. C. A. SHOW.

CAREY MOTOR COMPANY.

This concern exhibited a touring run- about equipped with a five revolving cylin- der engine of 10 horse power placed in front of the dash, and in such a position that the shaft runs across the car. The power is delivered to the change speed gear, which is located at about the middle point of the frame, by a roller chain. The gear box includes a differential and a change speed group, which provides two speeds and reverse by an individual clutch system. The drive to the rear wheels is by countershaft and side chains. Steering is effected by hand wheel, and the speed of the motor is controlled by throttle and spark regulation.

DAIMLER MANUFACTURING COMPANY.

At the stand of this company were to be seen two of the new American Mercedes 40-45 horse power cars, a polished chassis and various disassembled parts. A num- ber of changes are noted in the detail con- struction of this year's product. Hess- Bright ball bearings are used on the crank shaft, and the half time gears are moved to the front part of the crank case and are entirely enclosed. The low tension ignition make and break device has been moved to the corner of the admission valve ports, and is now made so that the anvil may be unscrewed from the cylinder without dis- turbing the hammer or moving part. The anvil is in the form of a plug with porce- lain insulation. A compression release de- vice, which consists of an extra set of cams on the exhaust valve cam shaft, so fitted that they may be moved beneath the exhaust valve tappets, and thereby prevent the ex- haust valves from completely closing, is operated by means of a pull rod extending through the front of the crank case. The change gear box now provides for single reduction on the full, second and third speeds, and a direct drive on the fourth by means of a set of double gears and an in- ternal gear clutch.

THE CRAWFORD AUTOMOBILE COMPANY

showed their Model C touring car, Model A and D runabouts. The touring car has a seating capacity of five passengers, a four cylinder vertical motor, having cylinder di- mensions of 4½x4½ inches and being rated at 24 horse power at 800 revolutions per minute. The jump spark system of ig- nition with four coils is used. The clutch is of the inverted cone type provided with ball thrust bearings, and is made dustproof by a leather diaphragm. The gear box gives three forward speeds through a system of sliding gears operated by means of a change gear lever in an H slot sector. The drive to the rear axle is by countershaft and side chains. Ball bearings are used throughout, including the change gear box and the countershaft. The Model A run- about has a seating capacity of two per- sons; a two cylinder vertical engine with 4x4½ inch cylinders; a two speed planet- ary change gear and a single chain drive to the rear axle.

THE DETROIT AUTO VEHICLE COMPANY

exhibited Crown touring cars, runabouts and delivery wagons. The first mentioned are equipped with four cylinder, 24 horse power, vertical motors, having the valves located in the cylinder head and operated by rocker arms and tappet rods located all on one side of the engine. The planetary change gear used on these cars gives two forward speeds and one reverse, and is en- closed in an oil tight, dustproof aluminum case. The drive to the rear axle is by means of a propeller shaft and bevel gears. The Crown runabout has a two cylinder opposed motor of 12 horse power, set crosswise in front under a hood. A frictional speed changing mechanism is used, in which the initial drive is transmitted to an inter- mediate friction disc set at 90 degrees with the former and driven by it through a 45 degree contact. The driven friction mem- ber is placed with its axis running length- wise of the frame, and the power is trans- mitted to it by the intermediate member through a face and rim contact. The drive to the rear axle is by means of a double universal shaft and bevel gears. The Crown delivery wagon has a two cylinder vertical motor placed under the seat and rated at 1 horse power; a planetary two speed gear and a single chain drive to the rear axle. Hyatt roller bearings are used on the rear axle and ball bearings on the front.

THE DUQUESNE CONSTRUCTION COMPANY,

of Jamestown, N. Y., showed their four cylinder, 16-21 horse power, air cooled car. The cylinder dimensions of the engine are 3½x4 inches. The admission and exhaust valves are arranged in the cylinder head, and in addition to this auxiliary exhaust valves are used. The change gear box gives two speeds forward and one reverse. The pinions are hardened and run in oil. Bevel gear drive is employed, the pro- peller shaft being enclosed in a tubular torsion housing which is bolted to the rear axle case and is mounted in a uni- versal bracket, the fixed member of which is bolted to the change gear case. The rear axle is of the floating type and runs on roller and Hess-Bright ball bearings. The car weighs 1,750 pounds.

THE PREMIER MOTOR MANUFACTURING COM- PANY

showed in addition to their well known air cooled touring cars and runabouts in which the motors are placed with the crank shafts running across the frame, their new four cylinder Model L, in which the engine crank shaft runs lengthwise of the chassis. The

motor has cylinders 4¼x4¼ inches in dimensions, and is rated at 20-24 horse power. A three speed, selective system, sliding gear, change speed group is used, and propeller shaft drive to the rear axle. The wheel base of this model is 104 inches; 32x3½ inch wheels are used, and full elliptic springs. A variety of bodies of the side entrance tonneau and enclosed type are fitted to this chassis.

THE CHADWICK MOTOR CAR COMPANY.

The Chadwick cars, which were to be seen at the stand of this company, were fully described in a recent issue of THE HORSELESS AGE. It will be recalled that they are equipped with 40 horse power four cylinder vertical engines, leather cone clutches, four speed sliding gear transmissions and double chain drive.

PITTSBURG MOTOR VEHICLE COMPANY

appeared at their first show with a line of electric delivery wagons. They employ the underslung battery system, motor suspended in swinging brackets from the frame, and driving rear wheels by means of a chain. Full elliptic springs are used in front and platform springs at the rear. Their Type A light delivery wagon, which was on exhibition, has a capacity of 700 to 1,000 pounds.

THE AEROCAR COMPANY

displayed a 24 horse power touring car, with Cape top, of 2,000 pounds weight. The four cylinder, air cooled Reeves engine is used and a Brown-Lipe sliding gear. A shaft and bevel gear transmit the power to a floating rear axle. One inch Hess-Bright ball bearings are used at the rear hubs. The clutch is a leather faced cone. Aside from wide cast flanges on the cylinders a 15 inch fan, made of six brass blades, runs on Hess-Bright bearings in front. The steering column is of the worm and nut type in an oil tight case.



MATHESON FIVE TON TRUCK DEMONSTRATING OUTSIDE THE SHOW.

THE M'CREA MOTOR TRUCK COMPANY

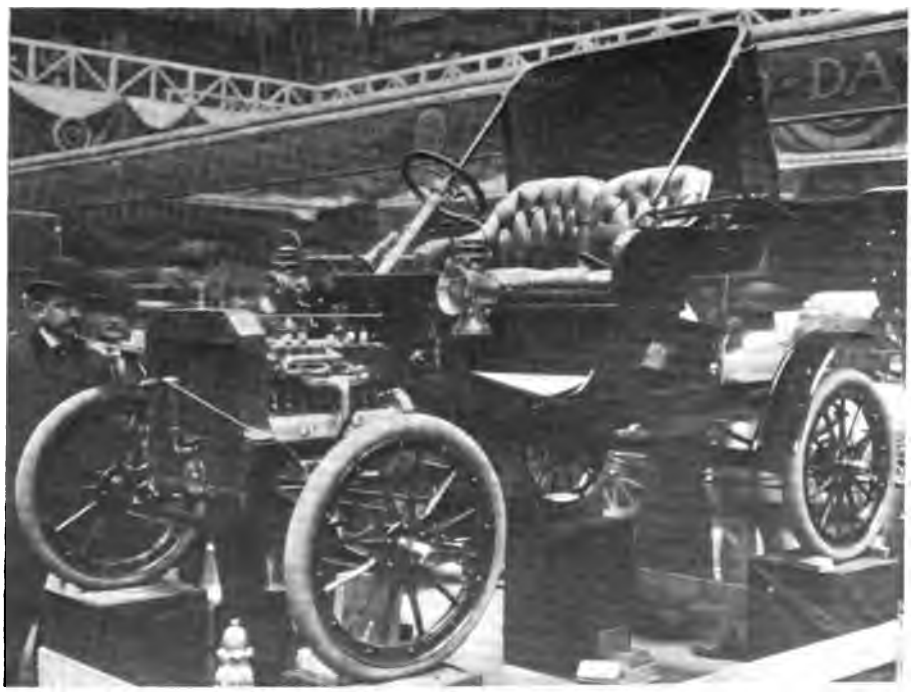
exhibited one Champion electric truck, with a canopy top. It is a duplicate of one used at the United States Naval Academy at Annapolis. The capacity is 4,000 pounds, and it has a speed of 8 miles per hour and a mileage on one charge of 40 miles. The simplicity of the electric truck is its strong feature, and eliminates much repair work. The storage battery and the two motors are suspended midway under the truck. Between the two are the jack shaft and differential. Side chain drive is employed. The company builds various types, with from 500 pounds to 10 tons capacity.

THE BLOMSTROM COMPANY

have extended their line of Queen cars this season by adding a new four cylinder touring car and a two cylinder runabout. The touring car and an exhibition chassis were displayed, also one of the 18 horse power models. The latter has been improved by increasing the length of the motor bearings and using Parsons white bronze, the substitution of a two pinion circulating pump for the sliding piston arrangement and a running board in place of steps. The larger car has 4¼x4¾ inch cylinders, cast in pairs, and is rated at 26-30 horse power. It weighs 2,000 pounds. A formed sheet steel pan extends under the motor and flywheel. The front springs are perched 5 inches forward of the centre.

THE AUSTIN AUTO COMPANY

exhibited a limousine, a touring car and a runabout. The touring car has a very rich appearance, with the pure white panels and light chocolate brown trimming and upholstering. The seat and back of the tonneau of this car are removable, which allows of using the car as a runabout. The company build their cars entirely in their own factory. The motor carries high compression, and is said to run very smoothly at 120 revolutions, giving 60 horse power at 1,200 revolutions per minute. The cylinders are of 5½ inches bore and stroke. The inlet valves consist of three light automatic valves of seven-eighth inch diameter, grouped in a removable nest. The speed changing lever is operated by lightly pressing down, then forward or back, or lifting up and moving forward or back. The side members of the angle steel frame converge forward, retain-



THE FORD FOUR CYLINDER RUNABOUT.

ng the narrow front and eliminating the ›gee curves at the dash. The reverse is ›btained by dropping a small gear from ıbove into mesh with the two other gears.

THE IROQUOIS IRON WORKS,

›f Buffalo, N. Y., exhibited a substantial looking motor stage, built to carry sixteen passengers. It is fitted with a four cylinder, 6x6 inch vertical motor mounted in front under a hood. The cylinders are cast separately, with integral heads, valve chambers and water jackets. A Buffalo float feed type carburetor is used, and the fuel consumption is claimed to be 1 gallon per 6 miles, so that the tank capacity of 36 gallons is sufficient for upward of 200 miles. The car is fitted with a double radiator, part of which closes the front of the bonnet space, and part of which is located beneath the frame in front. Through this radiator the water is circulated by means of a positive rotary pump. The engine speed is controlled by means of a spark and throttle lever which are mounted on the inclined steering wheel. The clutch is of the metal disc type, enclosed and running in oil, and the sliding pinion type of change gear is fitted, giving three forward speeds, viz., 4, 8 and 20 miles per hour, in addition to the reverse. The drive to the rear wheels is by side chains. Timken roller bearings are used throughout. Both axles are solid forgings, while the frame is of channel steel construction. The body is carried on long semi-elliptic springs. The wheels are 36 inches in diameter and fitted with solid rubber tires, 4½ inches at the front and 5 inches at the rear. The car has a wheel base of 132 inches.

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of 4 East Forty-second street, New York city, exhibited a 3 ton gasoline truck, a photo of which was shown in our last issue. This vehicle has a frame built up of structural steel, which is supported upon semi-elliptic springs at both front and rear. The motor is a four cylinder one, and is located underneath the driver's seat and footboard. At the front of the car is arranged a very large tubular radiator, through which the cooling water is forced by a pump. The steering wheel in this car is mounted on top of a vertical column. The engine throttle is controlled by a pedal, and the change speed gear by a hand lever, while braking is accomplished by means of a foot lever. The drive to the rear wheels is by side chains. The wheels are shod with non-skidding sectional tires which allow of renewing individual sections in case they are damaged. At this stand was also shown the Adams transmission gear, in which the individual driving gears are provided with pawls by which they are locked to the shaft. The pawls are pressed into position to engage the gears by coiled springs, and are disengaged by means of a sliding wedge.

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THE ROBINSON FUR COMPANY,

of New York, featured a new line of gray fox robes, stoles, caps, gloves, muffs, etc., in addition to a complete line of other furs designed to afford comfort to the motorist in winter weather.

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The Duplex spark plug, which was to be seen at the stand of this company, embodies a feature out of the usual in that by removing a switch at the top of the plug any accumulation of soot will be blown off without removing the plug from the cylinder.

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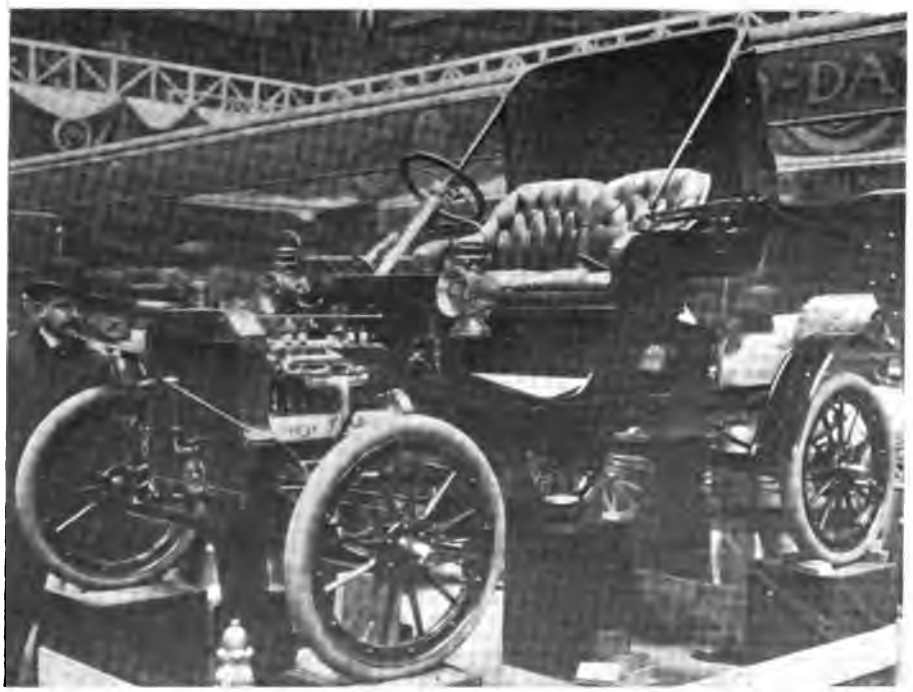
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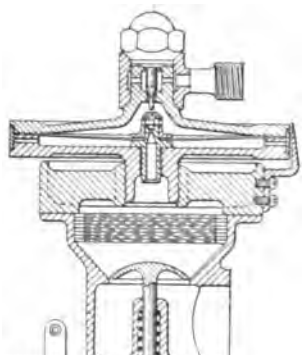
with thumbscrews and straps, the hood being locked whether current is on or not. One turn of the key releases the hood and makes the circuit.

F. A. GOEBEL,

Marietta, Ohio, showed the "Snapit" lock switch, consisting of a brass base and cap, all mechanism being on a block of fibre, so that it cannot short circuit. The contact is on the approved knife principle. The knife is the lock, and when current is turned off the cap is securely locked. Access to the mechanism can be had by turning on the lower current.

THE IMPERIAL AUTO STATION,

52 West Sixty-seventh street, New York, showed the Newcomb carburetor, which is simple in design and adapted to be applied on any engine. When the engine is cranked in starting a partial vacuum is produced in the carburetor proper. This vacuum is communicated through the small hole in the gasoline nozzle to the space above the diaphragm. The atmospheric pressure acting below the diaphragm forces it upward, opening the gasoline valve. The flow of gasoline past this valve fills up the space above the diaphragm and starts to depress the diaphragm. This compression continues until the flow past the gasoline



THE NEWCOMB CARBURETOR.

valve equals the flow downward through the gasoline nozzle. If the demand is reduced the gasoline pressure through the gasoline valve depresses the diaphragm, closing the valve a little and reducing the supply.

LE NONPAREIL MUFFLER COMPANY,

286 Taafe place, Brooklyn, N. Y., showed a muffler and a steam water pump. The muffler contains an expansion chamber of about five times the cubic contents of one of the cylinders of the motor, into which chamber the motor exhausts. This chamber is fitted with a valve to the atmosphere, which is opened and closed in time with the engine, so that it is closed when the exhaust port of each cylinder opens, and the delivery of the products of combustion from the cylinder into the expansion chamber takes place. In the pump exhibited stuffing boxes have been discarded and in their place a ground sleeve is used, one in each



DEWES SOLID TIRE.

of the distance pieces which separate the two cylinders.

THE ELECTRIC RUBBER MANUFACTURING COMPANY,

of Rutherford, N. J., in addition to exhibiting a full line of their pneumatic and solid tires, called particular attention to the Dewes solid endless double locked tire, for use on commercial vehicles. Besides being fastened by a flange attached to the wheel, this tire has an extra fastening consisting of a screw passing into the hydraulic packing of the tire, between each spoke, this centre lock preventing creeping under heavy draft. They also showed their inner tubes, which have a specially prepared, expansible cloth covering, permanently applied, which increases the strength, and thus prolongs the life of the tube without impairing its elasticity.

PETO & RADFORD, LTD.,

of Ashtead, Surrey, England, with a New York office at 253 Broadway, show a line of portable batteries for lighting and ignition purposes. Especial attention is called to their celluloid and dry paste batteries. The latter are filled with a semi-solid persulphated patent electrolyte which not only prevents spilling but increases the capacity of the battery and prevents sulphation of the plates. The "celluloid batteries" are composed of celluloid cells, containing pasted plates and ribbed celluloid separators.

THE THERMALITE COMPANY,

161 Elm street, New York, show a line of rubber bags and carriage heaters filled with a granular heat imparting composition, being a salt solution in glycerine. The particular virtues claimed for this preparation are that it retains the heat for hours and never needs renewing.

THE RANDALL-FARCHNEY COMPANY,

Boston, Mass., show a line of B-line motor oilers. At the inside of the gun is a metal plunger which is ground to fit the cylinder so tightly that gasoline or oil cannot leak or come back. These oilers have detachable tips, a straight and a curved tip accompanying each oiler. Three sizes are shown, also a primer of similar construction.

Madison Square Garden Show.

STEEL BALL COMPANY

were exhibiting a line of Hill precision oilers, constructed of aluminum and iron, brass plated. These are made with any number of feeds, one pump being required for every eight or less feeds.

BROWN-LIPE GEAR COMPANY,

of Syracuse, N. Y., showed equalizing steering and transmission gears. Their new model steering gear is operated by a segment of an internal spur gear and a pinion.

ADAM COOK'S SONS

displayed Albany Grease, which is used for packing transmission gear cases and grease cups, and is packed in five different size cans.

J. G. JUDSON COMPANY'S

exhibit consisted of a line of lamps and searchlights, Woodworth detachable tire tread, auto jacks, foot warmers, car heaters, Skinner pumps, Scott's neck, ear and face protectors and other accessories.

THE CONSOLIDATED MANUFACTURING COMPANY

had on exhibition the 1906 model Yale-California motor cycle. This machine is equipped with a 2 horse power motor, 2¼ inch bore, 3 inch stroke, 20 inch frame and a Corbin coaster brake, and weighs 110 pounds.



NORTHERN FOUR CYLINDER CHASSIS.

IRONCLAD MANUFACTURING COMPANY

hibited gasoline barrels and a pump ıich connects with an underground tank, ɔm which it pumps gasoline. The fluid fore entering the vessel into which it is ımped flows into a glass tank which car- es marks showing the purchaser the nount and the charge.

VACUUM OIL COMPANY

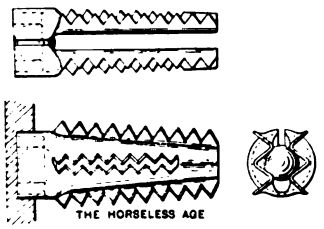
ıowed Vacuum Mobiloil, which is made four grades and used for automobile ıbrication.

WHITNEY CHAIN COMPANY,

f Hartford, Conn., were exhibiting auto- ıobile chains of four types, ¾, 1, 1¼ and ½ inch, which are made wider and strong- r for 1906. They offer twenty-nine styles f block, fifteen styles of Wizard and twen- y-two styles of roller chains.

POLYPHASE IGNITION COMPANY

:xhibited a magneto which is said to be of nedium tension. With this device it is :laimed the motor may be started from the seat by moving the spark lever to the last notch of retard. This gives a range of about 110 degrees, and by pushing the lever back with a quick stroke the armature



SAGER'S AIR COOLING SYSTEM.

turns a sufficient number of degrees to give a spark and start the motor.

IMPERIAL BRASS MANUFACTURING COMPANY

displayed a compound pump, Wixon hand pumps, Lyons lamp adjusters, centrifugal pumps, priming cups and other brass and aluminum automobile specialties.

F. H. WHEELER

showed a general line of Schebler carburetors. A new feature for 1906 is a gasoline intake valve, having a screen on the inside of the cap thread, and which is so constructed at the top of the carburetor as to furnish more leverage for the check, which is equipped with a universal joint so that it will seat at any angle without leaking.

AUTO TOP AND COVER COMPANY,

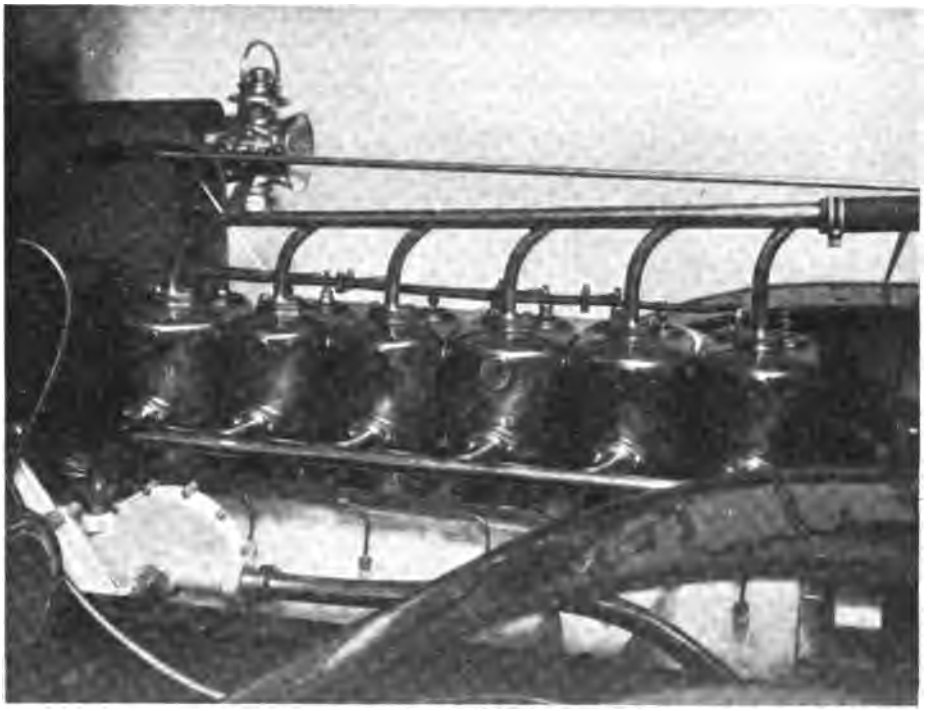
of New York, exhibited auto tops, lined and unlined. For this season they are making the color of the bows, straps, seat covers, lamp covers and horn covers to match that of the top.

WILLIAM M. POZ

had on exhibition a Rubba-silk, a waterproof material, which comes in all colors and is used for making automobile coats. This comes in two grades, woolen silk face and all silk face.

NATIONAL CARBON COMPANY

exhibited a line of dry batteries, electric light carbons, generators and motor brushes, and the Columbia "Ignitor" dry battery.



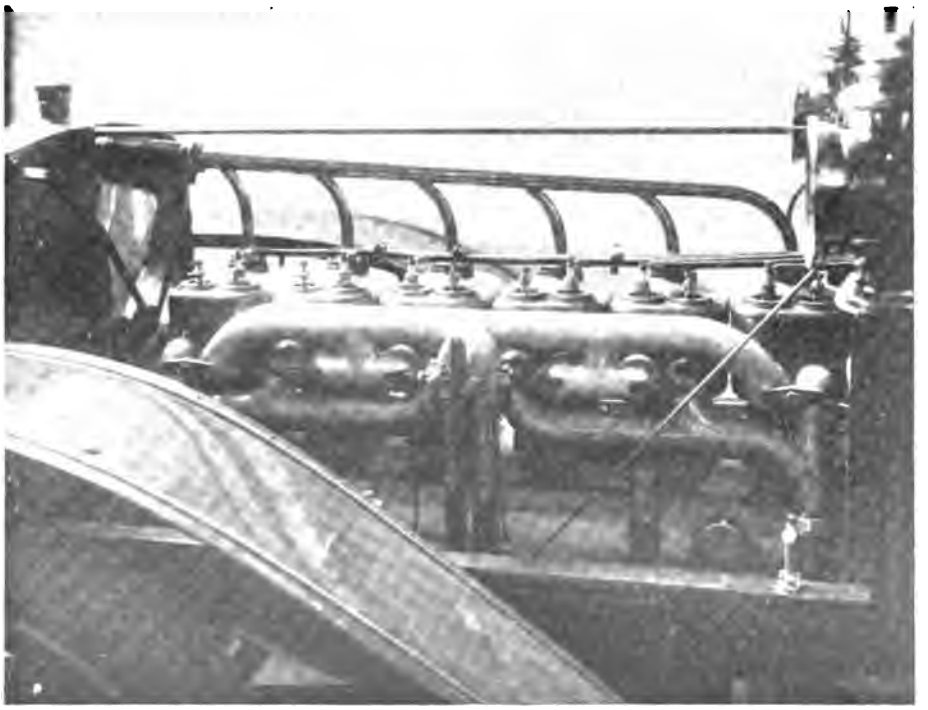
RIGHT HAND SIDE VIEW OF SIX CYLINDER STEVENS-DURYEA MOTOR.

J. H. SAGER,

of Rochester, N. Y., showed the Sager equalizing spring, which is a simple coiled spring of the barrel pattern, with an eye at each end. One end is fastened to the axle, while the other end is fastened to the body or upper framework. The spring is so designed that it acts both as a compression and a tension spring, changing automatically with the up and down movement of the body of the car. This firm also showed a system of air cooling. Holes of about three-eighth inch diameter are drilled into the outer surface of the engine cylinder, and into each of these holes are inserted two copper stampings, with a semi-circular base, being securely fastened in place by a split ring placed between the copper stampings in the hole in the cylinder wall and a steel ball driven into the split ring. This insures a very intimate contact between the copper stampings and the cylinder wall. Each copper stamping is formed with four rows of V points, which insures rapid radiation of heat.

C. COWLES & CO.,

of New Haven, Conn., exhibited at the show a new type of annunciator for use



LEFT HAND SIDE VIEW OF STEVENS-DURYEA SIX CYLINDER MOTOR.

on closed vehicles, to notify the chauffeur of the direction the occupants desire him to take. The annunciator is fastened to the dashboard within range of the driver, it being a cylindrical brass box with a dark red glass top, which is divided into eight sections, each of which bears one of the following words: Faster, stop right, right, home, turn round, left, stop left and slower. A bell rings to attract the driver's attention.

H. & F. MESINGER MANUFACTURING COMPANY,

1801 First avenue, New York, have recently placed on the market a new tire known as the Mesinger pneumatic leather tire. The tire is constructed entirely of heavy oil finished chrome tanned leather, the different layers being cemented together with a waterproof cement. The tread is formed of leather discs cut from heavy stock, each disc being fastened with three screws of special design, which are screwed into the solid leather. A specially constructed rim is furnished with these tires. The tire is fastened to the rim by a steel band inside of the casing. This band is contracted or expanded by manipulating a nut on a toggle spanner. The steel band is covered with leather, making a smooth flat bottom for the base of the inner tube.

Automobiles in the English Elections.

Shortly before the general election in England the A. C. G. B. and I. called a meeting of delegates from the provincial clubs, in order to discuss what action should be taken by motorists in connection with the general election. It was decided that when an owner was asked by a candidate for the loan of his car for the purposes of the election, he might with justice ask in return that the candidate should give certain pledges as to his attitude in regard to future motor legislation. Certain test questions were proposed and discussed at length, and the following were finally approved by the meeting:

1. When the motor car act of 1903 comes before Parliament for renewal, will you vote for the abolition of all artificial speed limits, as such limits are calculated to relieve drivers of their responsiblity to drive at all times and under all conditions with caution and consideration?

2. Will you vote for an amendment providing that the indorsement of licenses shall be confined to serious offences, and be within the discretion of the magistrate?

3. Will you support a measure requiring the universal lighting of all vehicles after dark, so that they show a white light in the direction in which they are traveling, and a red light in the contrary direction?

4. Will you support a bill giving effect to the principal recommendations of the departmental committee on highways, and establishing a central authority to advise and assist the local road authorities?

Statistics of the Paris Show.

An interesting statistical compilation regarding the forms of construction employed by French manufacturers was published by Lucien Perisse in a recent issue of the Paris daily *L'Auto*. The information on which these statistics are based was furnished by the manufacturers themselves. Of 326 French touring cars exhibited at the recent Salon by fifty-five manufacturers, 148 vehicles were fitted with bodies, and 178 were shown without bodies. The 326 vehicles represented 150 different types.

NUMBER OF CYLINDERS.

	1902. Per Cent.	1903. Per Cent.	1904. Per Cent.	1905. Per Cent.
Single cylinder motors	12	15	6	8
Double cylinder motors	37	26	15	20
Four cylinder motors	48	55	76	71
Miscellaneous motors	2	4	2	1
Automatic inlet valves	55	33	3	6
Mechanical inlet valves	45	67	97	94

CYLINDER ARRANGEMENT.

	1904. Per Cent.	1905. Per Cent.
Individual cylinders	35	33
Twin cylinders	65	63
Quadruple cylinders	..	4

VALVE ARRANGEMENT.

	1904. Per Cent.	1905. Per Cent.
Valves side by side	24	28
Valves on opposite sides	66	64
Valves in line	7	8

COOLING SYSTEM.

	1904. Per Cent.	1905. Per Cent.
Thermo-siphon circulation	14	12
Centrifugal pumps	70	67
Other pumps	16	21

FAN ARRANGEMENT.

	1904. Per Cent.	1905. Per Cent.
Fan back of radiator	70	69
Flywheel fan	20	19
Both types of fan	10	12

FRAME CONSTRUCTION.

	1903. Per Cent.	1904. Per Cent.	1905. Per Cent.
Pressed steel	46	76	82
Armored wood	32	16	14
Tubular	14	5	4
Miscellaneous	8	3	..

CLUTCHES.

	1902. Per Cent.	1903. Per Cent.	1904. Per Cent.	1905. Per Cent.
Direct cone clutch	74	80	60	51
Inverted cone clutch	13	10	17	15
Metallic clutch	..	..	20	32
Miscellaneous	13	10	3	2

CHANGE SPEED GEARS.

	1905. Per Cent.
Single sliding sets	50
Double sliding sets	38
Treble sliding sets	12

DRIVING SYSTEM.

	1901. Per Cent.	1902. Per Cent.	1903. Per Cent.	1904. Per Cent.	1905. Per Cent.
Chains	50	62	53	49	48
Shaft	44	35	47	51	52

HUB BRAKES.

	1903. Per Cent.	1904. Per Cent.	1905 Per Cent.
Expanding	44	82	91
Band	56	18	9

BRAKE COMPENSATING DEVICES.

	1903. Per Cent.	1904. Per Cent.	1905 Per Cent.
Steel cables	37	38	24
Balance lever	8	15	28

TRANSMISSION BRAKES.

	1903. Per Cent.	1904. Per Cent.	1905 Per Cent.
Expanding	9	21	55
Contracting	91	79	75
On change gear shaft	38	44	34
On differential	46	48	54
Miscellaneous	16	8	12

BRAKE SURFACES.

	1903. Per Cent.	1904. Per Cent.	1905 Per Cent.
Steel on steel	33	30	13
Cast iron on steel	26	36	51
Bronze on steel	17	17	32
Miscellaneous	24	7	4

Motor Ambulances for London.

In the first session of the new Parliament the London County Council propose to apply for powers to enable the council "to provide and maintain, or to aid in providing and maintaining, an ambulance service to deal with street accidents." The general purposes committee of the council, which has charge of this scheme, intends, provided the necessary powers are granted by Parliament, to equip the two stations which it is proposed to establish with ambulance vehicles propelled by mechanical power, instead of the old type drawn by horses. At present the ambulance service of London is in a somewhat primitive and antiquated condition. There has been no advance or development for many years and practically the only available means of conveying injured persons to hospitals is the old-fashioned stretcher placed on a two-wheeled carriage, propelled by hand. Every police station is provided with one or more of these appliances. The various hospitals are also equipped with similar appliances, and in addition there are special ambulance stations adjoining the hospitals. To obviate the various drawbacks of the present system of transporting injured persons by the police stretchers or ordinary four-wheeled cabs, the London County Council propose to establish two experimental ambulance stations, equipped with motor ambulances, each capable of carrying several stretchers. Whether electric or gasoline cars are to be used is a matter still in abeyance, but it is probable that the former will be adopted, in view of their greater silence and smoothness in working. A staff of fifteen men, it is anticipated, will be required for the two stations. These men, in addition to being skilled in driving and attending to the cars, will be trained in rendering first aid to the injured.

THE HORSELESS AGE

...EVERY WEDNESDAY...

Devoted to Motor Interests

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The Shows.

The two New York shows of 1906 have certainly been highly successful, so far as attendance is concerned. Both exhibition buildings were jammed every afternoon and evening, and the total attendance must have far exceeded that of any previous year. The weather was fair throughout the week, and never before have the demonstrating cars been kept so busy. As regards sales effected at the shows, it is, of course, extremely difficult to obtain any reliable information, as no exhibitor cares to let it be known that his expectations in this regard were not fulfilled. Perhaps the agency deals have been less important this year, because most of the larger manufacturers had already closed most of their agency contracts beforehand. On the other hand sales to private owners have probably been considerably greater than in former years, owing to the earliness of the season. The prospective purchasers were already familiar with most of the new cars shown, and required only a look at the machines to decide them which to buy. Besides, in most instances deliveries could be made in a few months' time, or even immediately, so that purchasers were not confronted with the prospect of waiting long, weary months for their cars, as in former years. That sales have been fairly good and exhibitors were satisfied may also be inferred from the fact that there has been no talk of one faction interfering with another on the ground of patent infringement, etc., as has been the case at several previous national shows, and also at the last Paris Salon. In brief, the atmosphere seemed to be one of general contentment.

Since this season started about September 1, the opinion has been repeatedly given expression that the date of the shows would have to be advanced in consequence. This question of Fall vs. Winter shows has been a topic of discussion each season, but less was heard of it this year than ever before. It is simply a question of trade vs. popular shows. If there is need of a show to effect agency arrangements, then the fall show is the right thing; whereas, if the show is wanted for introducing the new models to the public, then it should be held at this time of year. Show organizers are naturally inclined toward the popular show, which to them is undoubtedly the most profitable.

In our editorial on the shows in last week's issue it was stated that the practice of placing mirrors underneath chassis, to enable visitors to see the under side comfortably, was passing out of use. This impression, which was obtained from a visit to the shows on Saturday night, was premature, as numerous mirrors were installed later on. Chassis were seen on almost every stand, and no attempt was made to conceal features of construction.

The Armory Show had a star attraction in the Ford low priced four cylinder car, which arrived on Tuesday afternoon and was the centre of a crowd almost continuously from that time on. The car is naturally of small dimensions, but appears to be well designed throughout, even the planetary gear being entirely encased, a feature which is absent in many relatively much higher priced cars. The one objectionable feature revealed by a casual inspection is that the gear is too high, as the running gear does not appear strong enough to withstand a speed of 40 miles per hour, which is claimed and which the little car is undoubtedly capable of. It may be argued that the user need not drive the car to its limit, and this is, of course, true, but we believe that a little lower gearing would have been advisable, as rendering the car more durable. It is never wise to

make any predictions, but we are convinced that the appearance of this car will have an important effect on the runabout market the coming season.

In the Madison Square Garden Show the Northern car received perhaps more attention from technical men than any other vehicle exhibited. It embodies a number of radical departures from standard practice. The use of the cam shaft gears as a water circulating pump seems to be a happy idea, while there is room for a difference of opinion as to the advantages of using compressed air for operating the clutch and brakes.

Taxation of Automobiles.

It is rumored that plans for the taxation of automobiles will be submitted shortly to the legislatures of several States, notably that of New Jersey, and unless an intelligent and active opposition movement is inaugurated by the interested associations the further development of the automobile movement may receive a severe check at the hands of legislators. The reason advanced in New Jersey for the attempt to impose a special tax on automobiles is that they destroy the roads, and consequently put the State to great expense for road maintenance. Now, all traffic has a destructive effect on roads, and periodical road repairs were necessary even before the automobile arrived upon the scene; it is still to be shown that an automobile fitted with wide pneumatic tires, when proceeding at legal speed, is more destructive to the highway than a heavily laden horse wagon, for instance, with narrow steel tires. We are strongly inclined to doubt this, and a recent inquiry among road surveyors in England adds the weight of competent authority to this opinion. It has been observed that when cars with metal studded tire treads are driven over the roads at great speed, so that the driving wheels constantly leave the ground and slip a great deal, there is produced a sort of furrowing action which is very detrimental to the road surface; but this does not occur at speeds of 20 miles per hour or less, and it is evidently irrational to place a tax upon any illegal action. At any rate, it remains to be shown that automobiles under the normal conditions of use produce any abnormal destructive effect on roads, and until this is definitely proven there is no justification for special automobile tax, as every automobile owner contributes both directly and indirectly to the State and county treasuries, out of which the roads are built and maintained.

In considering the question of taxing automobiles it is to be remembered by the lawmakers that such taxation is likely to have a far reaching effect upon the further development of one of the country's latest and greatest industries, which is beginning to revolutionize the entire system of short distance transportation. The automobile is not so much the object of a sport—an article for the diversion of the "classes"—as may appear from observation on the principal boulevards of the large cities, and from reading the automobile columns of the daily newspapers. It is now being employed for business purposes by thousands of persons throughout the country, and in the majority of cases the reason of its employment is simply that, all things considered, it offers an economical advantage over the horse. By imposing an annual tax of $50 or thereabouts on the automobile its economical advantage may be greatly reduced, and the growth of the automobile movement correspondingly checked.

Oil Circulation.

One of the writers in our Engineering Number passes some rather severe criticism on the method of lubrication in which the oil is drawn from the bottom of the crank chamber and circulated through the engine bearings by means of a force pump. The gist of his criticism is that the oil in passing through the bearings accumulates a certain amount of metal dust, which acts as an abrasive, and therefore destroys the bearing surfaces.

It must, of course, be admitted that the particles of metal worn off from the bearing surfaces mingle with the oil and render it eventually unfit for lubricating purposes. The lubricating qualities of the oil are also impaired by its exposure to the atmosphere, which results in modifying its chemical structure. These two disadvantageous conditions are present wherever the lubricant that works through the bearings is collected and used over again, and are therefore also inherent in the splash system. The fact that there is hardly a car on the market which does not employ the splash system to some extent is a fairly good indication that with proper care the danger of serious damage from metal chips in the oil is not very great.

Wherever a supply of lubricant is carried at the bottom of a machinery case or in an oil well below a bearing, it must be periodically renewed, and the case must occasionally be thoroughly cleaned of metal dust. When these conditions are observed, both the splash and the forced circulation system of lubrication give satisfactory results. The force circulation system, which must be regarded as an improvement on the splash system, is rapidly gaining in favor among manufacturers. It insures a copious supply of lubricant to all the bearings, the pressure and rate of feed of the oil increasing with the engine speed. Every effort should, of course, be made to eliminate the metal dust from the oil that is pumped to the bearings. To this end it is advisable to provide the crank chamber bottom with overflow standpipes through which the excess of oil drains off to a well below the crank chamber from which the pump draws its oil. The metal dust will then have a tendency to sink to the bottom of the crank chamber, and the oil overflowing into the well will be comparatively uncontaminated. The same precaution can also be taken in the well by extending the pump suction pipe parallel with the bottom of the well, inside, closing its end and perforating it on top or at the side only. Further measures of precaution consist in winding a fine mesh wire gauze around the suction pipe inside the well and placing a gauze strainer in the delivery of the pump or at the outlet of the reservoir, if one is provided. Both of these strainers should be so arranged that they can be readily removed for cleaning.

One well known manufacturer recommends that the crank chamber oil supply be renewed every 300 miles. If the oil is changed as frequently as this and the proper attention is given to the strainers the user need hardly anticipate any trouble from cutting of the bearings by metal dust. It seems also reasonable to suppose that with a very copious feed of oil under pressure a little metallic dust will do much less damage than if the bearing is run comparatively dry.

Much opposition has developed in German automobile circles against the proposed new automobile taxes, a part of the general increase in taxation to allow for building a big navy, and, if possible, do it without incurring a large deficit annually. At a recent meeting of the German Automobile Club it was decided to urge that the tax be limited to strictly vehicles de luxe.

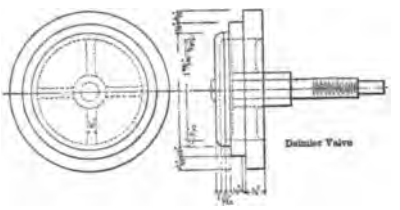
The Pressure Drop Through Poppet Valves.

(Abstract from a paper by Charles Edward Lucke, read before the December meeting of the American Society of Mechanical Engineers.)

Although pressure drop through the valve is necessary to secure any flow whatever, such pressure drop is detrimental to the machine, causing as it does undesirable piston resistance and reduced volumetric efficiency of the cylinder. Pressure drop is reduced to a minimum in designing by allowing proper valve area to minimize fluid velocity; but too large a poppet valve for a given gas, or too large a lift for any given valve, introduces features of design equally as bad as too small a valve opening. The designer is thus forced to follow a middle course, admitting some pressure drop through the valve, but not reducing fluid velocity so low as to require valves of excessively large diameter or excessively large lift.

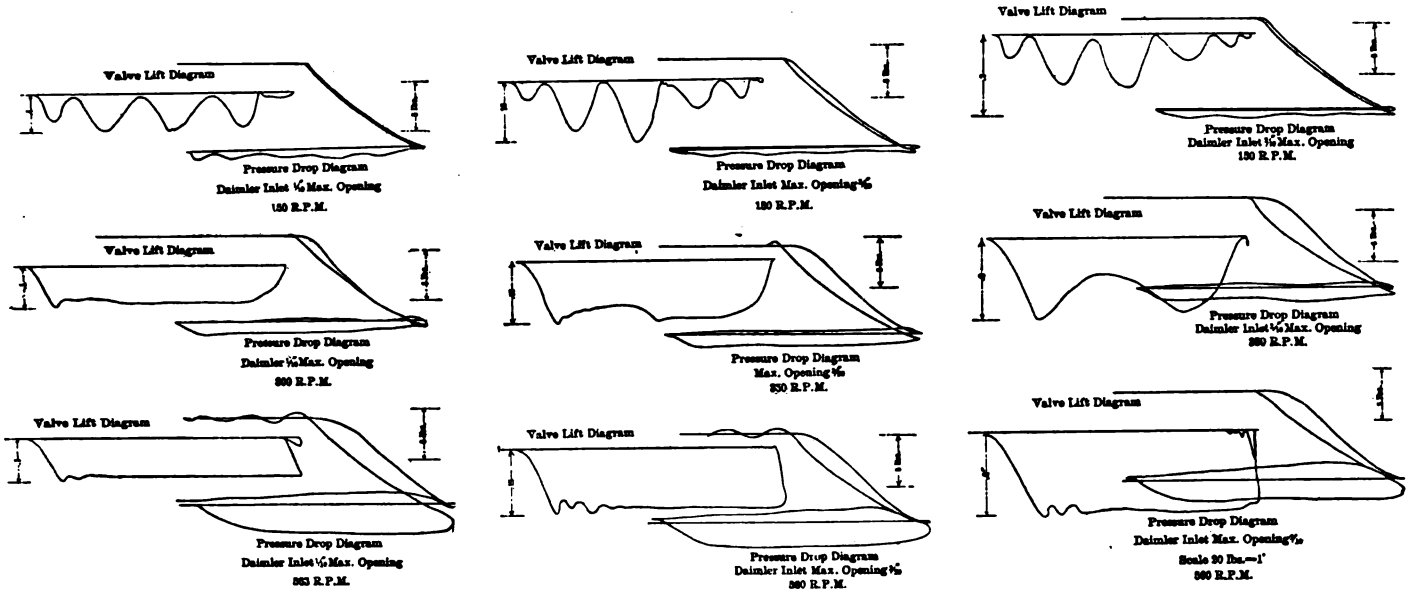
The tests reported here had for their object the determination of experimental data on the relation between pressure drop through a poppet valve and the condition of flow, form of opening, etc., that give rise to the pressure drop observed. For any given velocity of flow the pressure drop will be greatest and most easily measured with a less dense fluid; for this reason atmospheric air is used.

The flat seat valve used was one from a Daimler engine, 1.58 inch inside diameter, arranged as shown in Fig. 1. For steady flow runs it was held open by small copper wedges carefully ground to size, three being used at a time, inserted at the outside edge of the valve, so that the valve opening, which is measured by the inside edge of the valve, would not be restricted by the wedges. These wedges were of such size as to allow four different lifts, 0.05, 0.10, 0.15 and 0.20 inch respectively. For each opening that the valves held rigidly between the valve and its seat air was blown through the valve at varying rates with varying resulting pressure drops up to 30 inches of water.

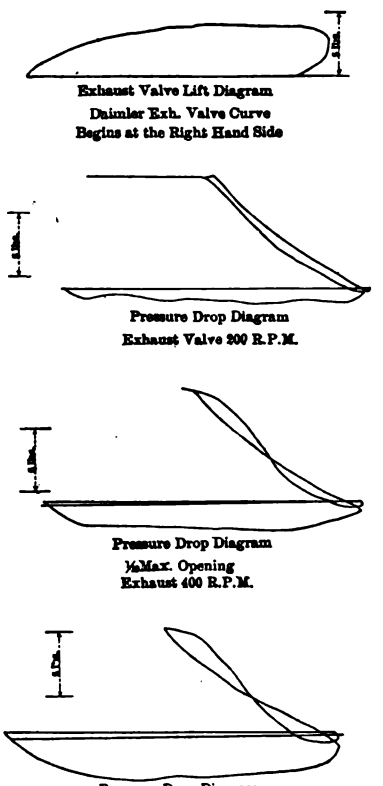


VALVE ON WHICH TESTS WERE MADE.

Another series of runs was made with the valves located on the engines as they ordinarily operate. For this purpose a Daimler engine was piped to a meter so that it caused a slight back pressure. The meter therefore measured the discharge of air after exhaust. The engine was then driven by a belt from a steam engine, and runs were made covering a range of speeds. The valve being automatic it was provided with stops so that the greatest openings corresponded to those for the steady flow of runs, 0.05, 0.10, 0.15 and 0.20 inch. The actual lifts were drawn by an indicator, the piston rod being fastened to the valve stem. Pressure drops were measured by indicators on the cylinder carrying a 10 pound spring. After the readings for this valve were obtained, the meter position was changed so that the engine would draw air through the meter before it reached the cylinder. In this case the pressure drop was from atmosphere to something below, while in the other case it was from something above atmosphere to something less, but still above atmosphere. As before, the engine was operated at a number of different speeds, and the pressure drop through the exhaust valve was measured by the 10 pound spring indicator on the motor cylinder. This indicator card in fact, gave the pressure drop through both valve courses on one diagram. The exhaust valve on this engine is mechanically opened by cams, so that no stop could be used to adjust the openings to any desired limit. The actual lift of this valve was measured at any point of the stroke mechanically by causing a pencil fastened to the stem to draw a line on the indicator drum, so that the lift is given for every point of the stroke and having different actual piston speeds.



INLET DIAGRAMS FOR VARIOUS SPEEDS AND MAXIMUM LIFTS.



EXHAUST VALVE DIAGRAMS.

The actual lift of this valve was measured at any point of the stroke mechanically by causing a pencil fastened to the stem to draw a line on the indicator drum, so that the lift is given for every point of the stroke and having different actual piston speeds.

The Daimler engine had a bore of 3 15-16 inches and a stroke of 5 9-16 inches, giving a crank pin velocity of 145.6 feet per minute at 100 revolutions per minute. The results of the tests are given in the form of tables and curves, some of the latter of which are here reproduced.

INTERMITTENT FLOW.

As actually used in the engine the detrimental effect of suction pressure drop is,

first, lost work measured by the mean suction pressure taken by the planometer from the pressure drop diagram, and, second, a lost volume or decreased volumetric cylinder efficiency shown by the fraction of stroke at which the compression line crosses atmosphere.

Similarly for exhaust or discharge the first effect is one of resistance measured by the mean pressure above atmosphere on the pressure drop diagram. In gas engines, however, the terminal exhaust pressure measures the dilution of fresh charge by hot burnt gases. This is also given from the indicator cards. The Daimler engine had a conical exhaust valve of 1¼ inches clear diameter and a mean lift of .333 inch. Some exhaust curves for this engine are also shown herewith, and in connection with them is shown an exhaust valve lift curve.

"Warming Up"—The Causes of Power Loss in a Cold Car.

By Albert L. Clough.

It is a matter of common knowledge that gasoline cars, as a rule, operate more powerfully after having been driven for a short time than they do when first started after a period of disuse. This "warming up" process is familiar to most operators, and with some cars its results are very noticeable, a marked increase in speed and hill climbing power being attained after the vehicle has been run a few miles. During cold weather especially the "warming up" process is required before a car begins to do its very best work.

LOSS OF COMPRESSION AND EXPLOSION PRESSURE.

In the case of a motor the cylinders of which are somewhat worn and the piston rings slightly reduced in size or of imperfect fit, there is likely to be a serious escape of the charge during the compression stroke, with the resultant lowering of the pressure of explosion, and also a considerable escape of the burning charge during the power stroke. This is particularly the case when the engine is first started when cold and the power output is thereby sensibly reduced. The cylinders themselves are maintained at a comparatively low temperature by the cooling action of the jacket water; but the pistons and their rings have much less opportunity to give up the heat imparted to them by the explosions, and consequently are at a higher temperature than the cylinder walls. After being run a short time the pistons and their rings become expanded more than do the cylinders and fit the bore much more tightly than when the engine is cold, thus reducing the escape of gases during the compression and power strokes and adding somewhat to the useful output of the motor. Allowance is made in the fitting of gas engine pistons for this change in relative diameter between the piston itself and its bore.

Sometimes the improvement in compression, incident to the heating up of the motor, can be distinctly felt upon cranking the engine when cold, and again when it has become fully warmed by running. If an engine is started when extremely cold the oil film between the piston and the cylinder may be so stiff as temporarily to absorb considerable power that would otherwise be usefully available and also to prevent the free action of the packing rings. It is only when the motor has been run long enough properly to thin the oil and distribute it over all portions of the cylinder wall and rings that the proper packing effect is obtained, and excessive loss of power through friction obviated.

THERMAL LOSSES.

The chief losses of thermal energy, incident to the operation of a gasoline engine, are the heat discharged in the exhaust and the transfer of heat from the burning charge to the walls of the cylinder and through them to the jacket water. The smaller the total value of these two losses the greater will be the remaining heat energy to be connected into useful work, and the larger will be the output of the motor. The loss of heat energy to the jacket water is quite closely proportional to the difference in temperature between the inside walls of the cylinders and the jacket water, and thus it happens that when a motor is started with its cooling water at ordinary air temperatures the loss of heat through the cylinder walls is much greater than if the water had previously been heated by the running of the engine to 180° or 190° Fahr., for instance. When first started when cold the useful power of a motor may be perceptibly less than its normal, owing to the waste of an excessive proportion of the heat value of its charges to the abnormally cold jacket water; but after it has been in operation long enough to bring the water in the system up to its customary temperature, this unusual source of loss ceases to exist, and the engine begins to have its normal amount of heat energy available for useful purposes.

PROPER TEMPERATURE OF COOLING WATER.

There is undoubtedly such a thing as habitually running an engine too cool. Sufficiently large radiating surface and a pump of such great activity might conceivably be provided as to maintain the water in the jackets at all times at so low a temperature as to entail an unreasonable loss of heat through the cylinder walls, with a consequent diminution in the engine's output. The radiator and pump should be so proportioned that the actual temperature of the water in the jackets may be as high as is consistent with the continual maintenance of the inside walls of the cylinders at a temperature just short of that at which there is danger of interference with lubrication (particularly the carbonization of oil upon the pistons), or of raising any portion of the gas space to a temperature which might cause premature firing of the charge. Practically, the water in the jackets should never quite reach the boiling point, even when the motor is doing its hardest work.

THE EFFECT OF A COLD CARBURETOR.

Most cars are provided with carburetors which depend for their best operation upon heat derived from the engine. Either the carburetor float chamber is jacketed with water from the motor cooling system or the supply of air to form the mixture is drawn from near the muffler or exhaust pipe. Until a car has been running for a little time these sources of heat to be supplied to the carburetor do not materialize, and not quite so perfect a mixture is at first delivered to the engine, which has a corresponding effect upon the motor's output. Under certain conditions, when a motor is started very cold, there may be more or less recondensation of gasoline in the mixture pipes and inlet valve chambers, preventing the development of full power, but this condition is soon overcome by the running of the motor.

"STIFF" BEARINGS.

When a car is first started when in a cold condition all the bearings of the engine, the change speed gear and the transmission are likely to be full of "frozen oil," and the car is said to be stiff. An abnormal amount of energy is required to overcome these unusual bearing losses, and it is only when the heat from the engine or frictional heat has raised the temperature of all bearing parts to that corresponding to a fluid condition of the oil that the car runs with its usual freedom and "life."

New Petroleum Company in Germany.

Consul Harris, of Chemnitz, reports that a joint stock company, under the name of Sirium-Werke, is to be established in Germany for the purpose of refining and bringing petroleum onto the German market. It is expected that during the next ten years this company will be able to do a flourishing business, for the reason that an enterprise of this kind has been wanting in Germany during many years past. The refineries are to be built in Silesia, and the raw materials drawn from the oil fields of Galicia, where a considerable territory containing oil has already been acquired. The capital of the company will be $1,023,400, and it is expected that the dividends will amount to about 15 per cent. per annum as soon as the enterprise gets well under way. After the United States, Germany is the largest consumer of petroleum in the world. The amount the empire imports from abroad every year is valued at $23,800,000. Galicia holds third place among the oil producing countries of the world.

During a recent reliability contest in Australia a telegram was received from the local authorities of a town on the route, requesting that all the cars would go through at full speed, so that the residents might see what pace was like, and they would promise that the streets should be cleared.

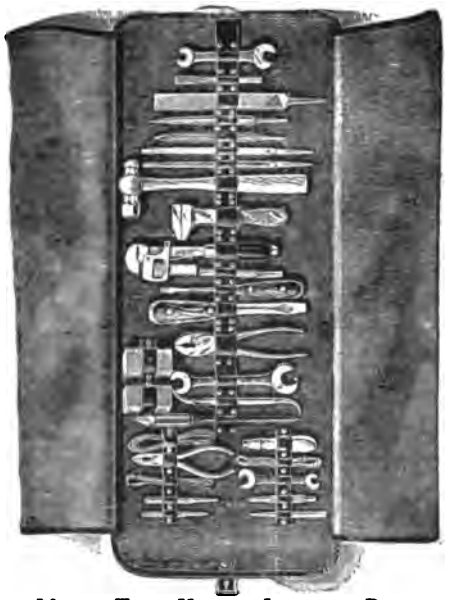
New and Useful Tools.

By W. E. D.

One sometimes hears the remark, "When the automobile is perfected so that it is always ready to go and needs no repairs on the road, then I will buy one." It is hoped these expectants have unlimited patience, or will change their terms somewhat. Rapidly improving conditions will come part way to meet them. However, it must be borne in mind that an automobile is a machine, and one operated under conditions that are more severe than usually met with, and like all mechanisms it will always require some adjustment and repair.

The adjustment and repair of a car can be greatly facilitated by a good supply of the best tools. A proper variety often prevents misuse. For instance, a monkey wrench should not be used for a hammer. Some drop forged monkey wrenches are purposely designed without a hammer head because the pounding is destructive to the wrench.

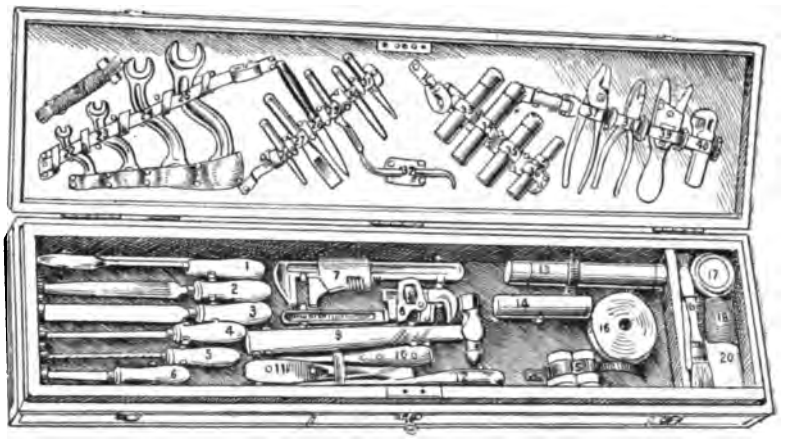
The quality of the tools is as important as the variety. All wrenches should be made of drop forged steel and properly



Motor Tool Kit in Leather Roll.

hardened. Automobile repairing cannot be well accomplished with bicycle outfits, from which many of the inadequate kits have been evolved. Tools should also be accessibly and systematically arranged in the car, and not scattered in any corner.

Appreciating these needs one concern has just brought out a very convenient tool box that is to be placed on the left side running board. It is 3 feet 6 inches long, 10 inches wide and 3¼ inches high, completely covered with corrugated rubber and neatly brass bound. The increase in the height of the step is not objectionable, nor is the appearance of the case. It contains a most generous supply of tools, each held firmly in place by a steel clip. Even a torch for soldering is supplied. The illustration herewith shows the assortment.



Willis Automobile Tool Kit.

There is also a tool kit containing twenty-three tools, soldering wire, a box of split washers and a box of cotter pins, each under a strap on leather. The last two articles are new. The split washers, from one-quarter inch to three-quarter inch in size, and the assorted cotter pins have been much needed. This kit is arranged to roll up snugly when not in use. A variety of round, square and pointed chisels are sometimes badly needed.

The new Bullard adjustable pipe wrench, recently described in The Horseless Age, will be appreciated by motorists, as the novice does not always readily catch the adjustment of the simple Stilson wrench.

The Essex Manufacturing Company's new scraper, illustrated herewith, possesses some valuable features. The blade is made on a slight curve with the cutting side ground slightly concave. This shape enables one to easily reach the high spots in the babbitt. The scraper is made in three sizes, with blades 2½ inches, 3½ inches and 4½ inches long, the longest one being three-quarter inch wide and the others a little narrower. It is said to be of the best steel, carefully tempered, and ought to be more useful than the home made instrument for the purpose—a converted file.

An ammeter should be selected the indicator hand of which comes to rest quickly, as a long contact deteriorates the battery rapidly. Great improvement has been made in this line.

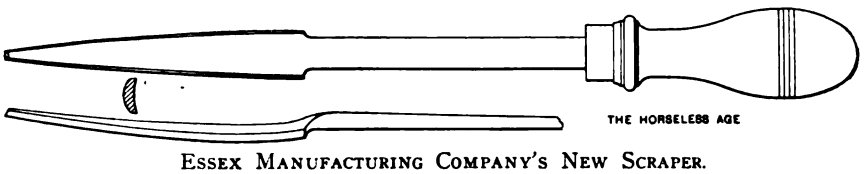
The absence of a jack in the car tempts a driver to ruin tires by continuing after a puncture. Select a simple jack. It is apt to be more positive.

Tire pumping was a laborious task before the advent of compound and power pumps. These new pumps are not only easier to operate, but will also materially lengthen the life of tires. With their use the tires will be more fully inflated. Nothing will wear a tire out quicker than to run it with the air pressure too low. The proper pressure is difficult to determine without a gauge. Frequently by a gauge test a tire will show only 35 pounds when the user supposes he has 60 pounds.

Partial inflation causes heat and blowouts. The constant moving about of the air and the rapid compression and expansion create heat. Tire manufacturers are just recognizing this point, and will this year advise from 60 to 80 pounds pressure by gauge in various size tires. The smaller the tire the higher the pressure that should be used. In 4 inch and 4½ inch tires about 60 pounds pressure is required. In 3½ inch tires 70 pounds.

A new compound English pump has a ball and socket rest at the base and a pressure gauge. It is constructed of two barrels side by side. On the up stroke a light compression is produced, the air being forced through a connection at the top from the larger barrel to and past the piston of the smaller one. On the down stroke this partial compression is forced on by the gauge to the tire. Packing boxes are provided around the stems.

The Stapley is a new, powerful compound pump. It has a smaller cylinder inside a larger one. The piston of the larger one points downward, that of the smaller one upward, and at the top of this cylinder is the delivery to the gauge and tire. Three small rods connected to a triangular yoke just underneath the handle are attached to the piston of the large cylinder, and a central rod direct to the small piston. The two cylinders connect at the bottom. The opening to the air is at the top of the outside cylinder. On the upward stroke of the pump air is delivered from the small cylinder to the tire, and the piston of this



Essex Manufacturing Company's New Scraper.

same cylinder at the same time draws air down past the large piston into the large cylinder and in the lower part of the small cylinder. On the downward stroke the air in the large cylinder is forced past a check valve in the piston of the small cylinder and a small amount into the tire, the principal delivery to the tire being on the up stroke, which yet requires the least effort. A check valve is placed just back of the gauge and a plunger in the end of the tube holds the check in the tire valve open, so that the pressure in the tube leading to the tire is the same as in the tire, and the gauge stands at the maximum pressure until this tube is disconnected. The pump is about 19 inches long.

The Lea tire pump is a double opposed pump operated from a crank in the centre. This crank is adjustable to give greater leverage as the pressure rises, which is indicated by a gauge.

The pistons approach very close to the ends of the cylinders, expelling all the air to the tire. If much clearance is left in that part of a pump the air only expands at the next suction stroke and prevents the pump taking in so large a volume.

There are other power pumps to be carried close to the flywheel against which the friction wheel of the pump is brought when in use. The P. T. C. power pump will this season have one cylinder of 1⅝ inches diameter instead of two smaller ones as formerly. This pump weighs about 6 pounds and is tested to 150 pounds pressure.

There are several new sets of tire irons for removing the clincher shoe, any of which will remove a shoe in a few minutes after one becomes thoroughly familiar with them. Some have the objection of injuring the paint on the spokes. The adjustable tire iron shown herewith is practical for holding one part of a shoe while loosening another from the T iron, and is very strong.

Tire repairing is a vexatious problem. It can be done at home or on the road by the Stitch-in-Time or the Pig vulcanizer. Either of these light devices generates heat enough to vulcanize a shoe or a tube. The delicate part is the thermometer, which is easily broken. Vulcanizing substitute consists of cement and an acid which chemically changes soft rubber to semi-hard. This is now supplied in a tourist's kit.

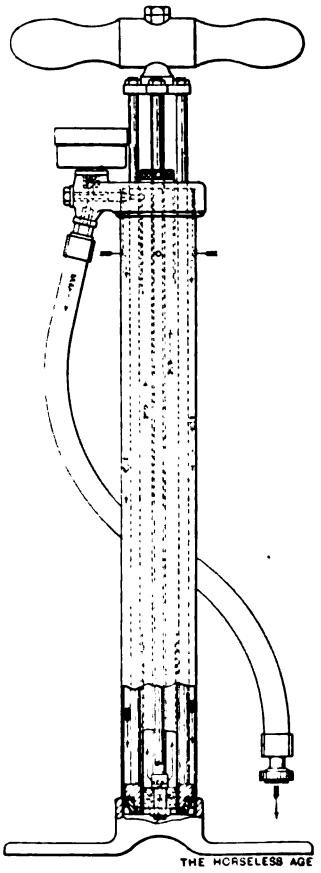
The new Giant silver medal ratchet wrench has eight square and nine hexagonal socket attachments, drivers, drill holder, T socket and extension attachments for inaccessible places.

The Crane puller is particularly valuable for removing wheels from the axles. Pounding mutilates the end of the axle or the wheel, and yet is the method in most garages.

In purchasing a vise for home use select one with an attachment for holding pipes.

Where space is limited, as it usually is when the automobile is kept at home, the Handy Auto truck is useful in turning the car around. A truck is placed under each front wheel. Each truck has three pairs of wheels connected in a triangle, with each pair mounted on a swivel, the swivels also having a roller or wheel thrust turning directly over the floor wheels, so that they revolve very freely.

A portable electric light is almost a necessity when working in obscure



BRIDGEPORT COMPOUND PUMP.

places. In grinding valves it is even better than the regular electric light, as it is so constructed that the light does not shine in the eyes when looking through a small opening. Unfortunately it seems that a good and reliable lamp is not to be had. It is hoped some manufacturer will break away from the present cheap and flimsy construction, and produce a dry battery and lamp that will not short circuit when packed next to metal, will have good contacts and reasonable life.

The general meeting of French and foreign automobile clubs for the purpose of settling fixtures for 1906 took place at the Grand Palais, Paris, on December 19, Marquis de Dion presiding. It was decided that in future provisional dates shall be chosen by the clubs before the beginning of December each year, so as to facilitate the work of the annual meeting.

The Design of Mud Guards.

Now is the time of year when one is able to gauge the efficiency of the various types of mud guards which are patronized by the different car builders, and when one comes to make comparisons it must be admitted that one is impressed with the inefficiency of many of the patterns which are at present in use. In nearly every case it will be noticed that it is the front guards which fail to effectively carry out their function, and it is to these especially that certain makers have paid attention. The objects of mud guards are to protect the passengers, car and road users from the mud, and to a certain extent the dust thrown up by the tires. How far are these objects attained by the average type of guard fitted to present day cars? To answer this question one has only to note the condition of the average car after a long run on a muddy day—the bonnet thickly pasted with mud, the passengers besprinkled, and, if high speeds have been attained, even the tonneau well splashed. In designing a mud guard, in addition to the objects mentioned above, lightness, strength and appearance have to be borne in mind, but these latter points need not in any way interfere with the efficiency of the guard, as, in fact, is witnessed by one or two improved patterns which are on the market. In order to protect the bonnet it is obvious that the guards should commence at the side members of the frame in a similar manner to that adopted in the Argyll and one or two other cars; in order to protect the tonneau they must not be splayed too much, and, while for preventing the spread of mud it is desirable that they should be extended as much as possible, it must be remembered that projections close to the ground tend to increase the dust distributing qualities of a car, and are therefore to be avoided. By enclosing the wheels from the top to the side members of the frame, as mentioned above, complete protection is afforded to the bonnet and front passengers in whatever position the wheels may be, and a failing of many of the patterns at present in use is removed.—*The Motor.*

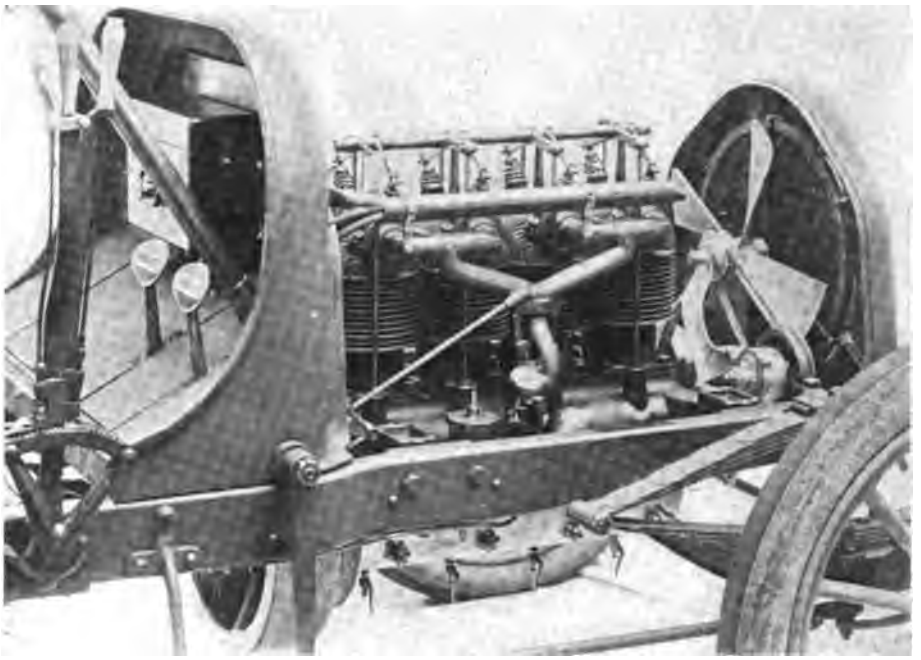
At a recent meeting of delegates from the German, Bavarian and Austrian automobile clubs, it was decided to make the next Herkomer touring competition an event for amateurs exclusively. The tour will start at Frankfort-on-the-Main, proceed to Vienna by way of Munich, and return to Munich. Whereas in 1905 all tire defects were taken into account, this year each car will have two changes of tire free, the defects being reckoned from the third. The representatives were unanimous as to the advisability of accentuating the sporting character of the event, fully believing that Professor Herkomer had no intention whatever to put up a prize for a chauffeur competition of factories.

New Vehicles and Parts.

Premier 1906 Models.

The Premier Motor Manufacturing Company, of Indianapolis, Ind., will manufacture during the coming season two chassis models, one of 16 and the other of 20-24 horse power, both of them fitted with air cooled motors. Each of the two chassis is fitted with different types of bodies, and altogether the company will have nine distinct types of vehicles to offer, as follows: Model L touring car, four cylinder vertical, 20-24 horse power motor; Model L de luxe touring car; Model L limousine; Model F, four cylinder, 16 horse power touring car; doctor's special, four cylinder, 16 horse power motor, two passengers; coupé, four cylinder, 16 horse power motor; light delivery wagon, 16 horse power motor, open body; light delivery wagon, 16 horse power motor, closed body.

The distinctly new car of the Premier Company is the Model L. The motor of this car has four air cooled cylinders of 4¼ inches bore and stroke respectively. The cylinders are cast with deep circumferential cooling flanges on the cylinder walls, and vertical cooling ribs on the heads. The valve bonnets are bolted to the heads, and the valves open directly into the cylinder, both valves being placed at an angle of 25 degrees with the vertical. The valves have cast iron heads and steel stems, and are operated by rock levers fulcrumed on a rod extending centrally across the top of the cylinders, to which levers a push rod is pivoted. The push rods at their lower ends carry case hardened steel rollers, which are operated upon by the cams on the half speed shaft. The cam shafts are driven by helical gears enclosed in an aluminum housing at the forward end of the crank case. The gear housing is cast with a bracket on which the fan journal is supported.



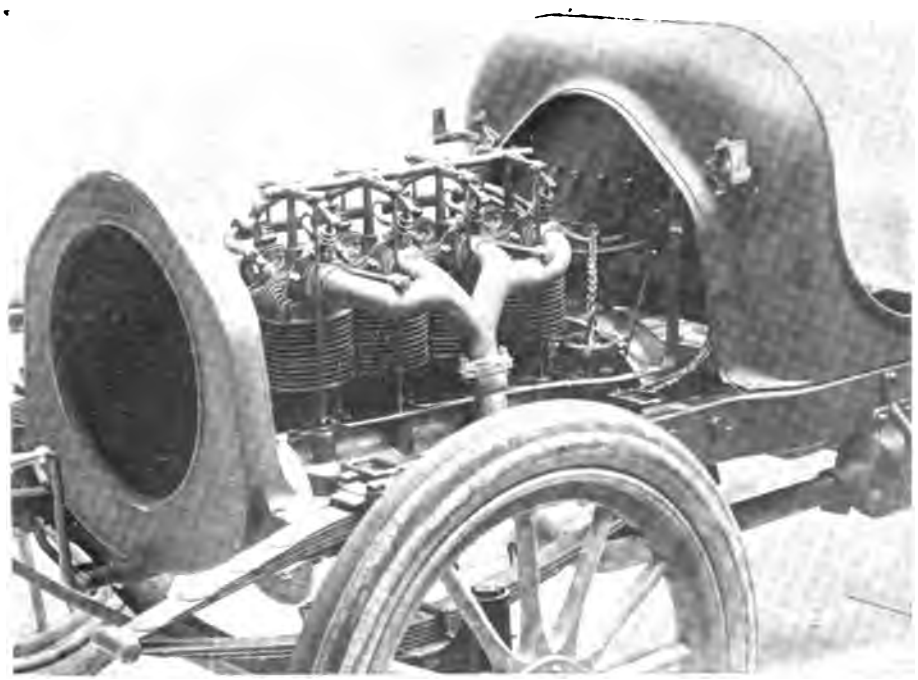
INLET SIDE OF PREMIER MOTOR.

The cylinders, pistons, valve bonnets and top half of the crank case are cast of a tough gray iron. The pistons are provided with four rings, three above and one below the piston pins, the rings having a width of 5-16 inch and a 45 degree diagonal joint, and being held in place by being pinned to the pistons. The wrist pins are of steel, of ¾ inch outside and ⅜ inch inside diameter, hardened and ground. The connecting rods are I section drop forgings, the crank pin ends being split and fitted with removable Parsons white bronze bushings, while the wrist pin end is fitted with a phosphor bronze bushing. The crank pin end can be adjusted by means of eight thin sheet iron liners on each side, placed between the rod head and cap, the latter being held by cap screws which are securely fastened by a lock plate. The liners provide for ⅛ inch wear, and may be easily removed for making any desired adjustment.

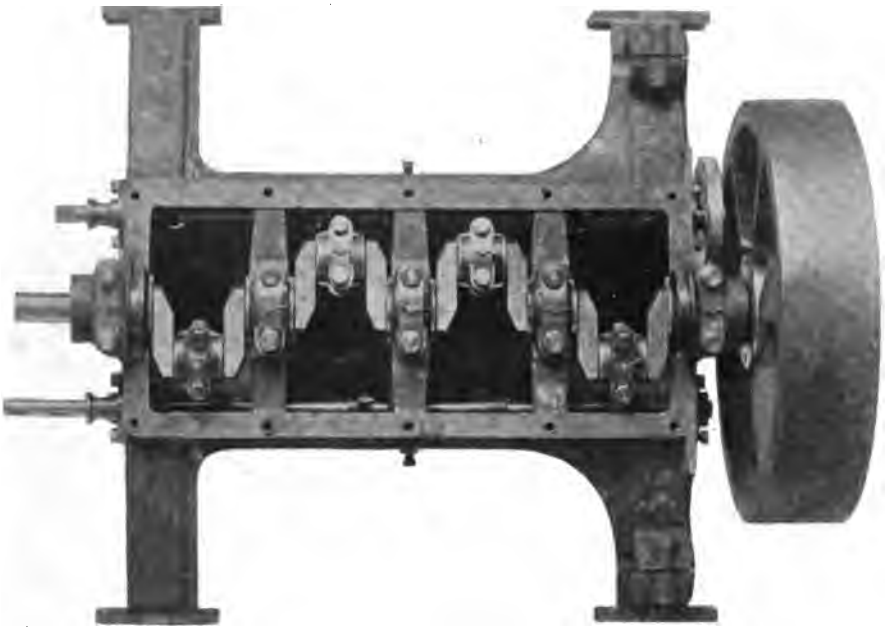
The crank shaft is of the five bearing type, with 1⅜ inch crank pins and 1½ inch main journals, except the journal at the flywheel end, which is 1⅝ inches in diameter. The crank shaft has forged integral with it at the flywheel end a disc 6 inches in diameter, to which the flywheel is bolted.

The upper half of the crank chamber is cast integral with four hollow supporting arms, the ends of which rest in the channels of the main frame side members, to which they are secured by bolts. This is claimed to give a very rigid construction. The openings in the supporting arms communicate with the crank chamber, and vent openings covered with wire gauze screens are provided in the wall of the arms. The lower half of the crank case is an aluminum casting, and serves as oil well; it is so arranged that it can be readily removed when it is desired to gain access to the crank shaft and cam shaft bearings. None of these bearings are disturbed by the removal of this part, as all of them are hung on the upper half of the casing.

The commutator is of the Premier Manufacturing Company's own design, and is carried at the right hand side of the motor, fairly low down, so that it can be fed from the gasoline tank in the front seat by gravity. It is of the usual float controlled spraying type, provided with a supplementary air valve and combined with a throttle which is operated by a finger lever on the steering wheel. The ignition is by jump spark, a special feature of the igni-



EXHAUST SIDE OF PREMIER MOTOR.



BOTTOM VIEW OF PREMIER MOTOR.

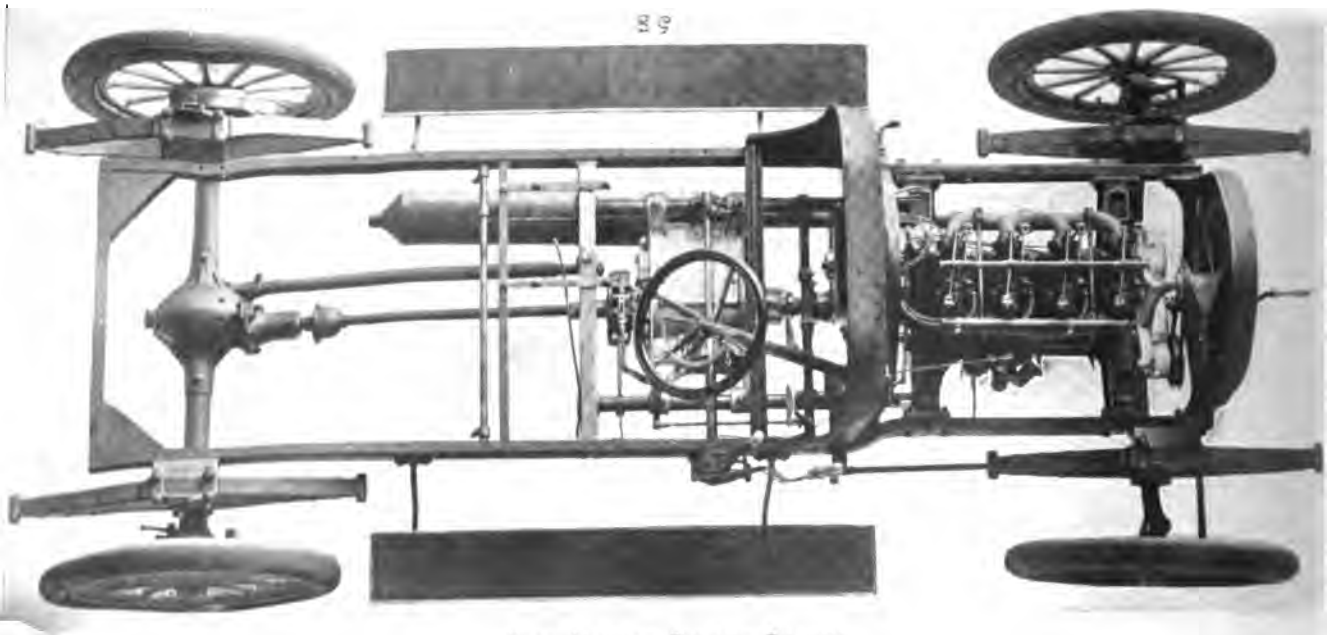
tion system being the commutator, which is of the company's own make. It is located at the upper end of a short vertical shaft driven by bevel gears from the rear end of the inlet cam shaft. The spark plugs are screwed into the cylinder heads between the two valves, and the quadruple coil with switch is fastened to the hollow dashboard. Lubrication of the engine is effected by means of a Hill precision oiler, which is arranged under the footboard and forces the oil through sight feeds on the dash to the individual cylinders. A fan is mounted in front of the cylinders, drawing a blast of air through the screen front and forcing it against the cylinders; it is driven by a flat belt from a pulley receiving motion from the cam gears.

The clutch is of the multiple disc type, comprising a total of seven discs, four of which are carried by the flywheel and three by the triple splined clutch shaft. The friction discs are pressed together by means of clutch dogs pivoted on a three armed spider, the other end of the dogs being provided with rollers with which a conical sliding sleeve is adapted to engage. The change speed gear gives three forward speeds and one reverse by means of two sets of sliding pinions, which are controlled on the selective system by means of a side lever moving on a gridiron quadrant. All the gears and pinions of the change speed gear are claimed to be of liberal size, and are case hardened. The sliding gears move on a squared shaft. The entire change speed gear is enclosed in an aluminum casing in two halves, which is supported upon a tubular subframe, the tubes being secured at their forward ends to the supporting arms of the engine, and at the rear end to a cross member of the main frame by means of bolted on caps.

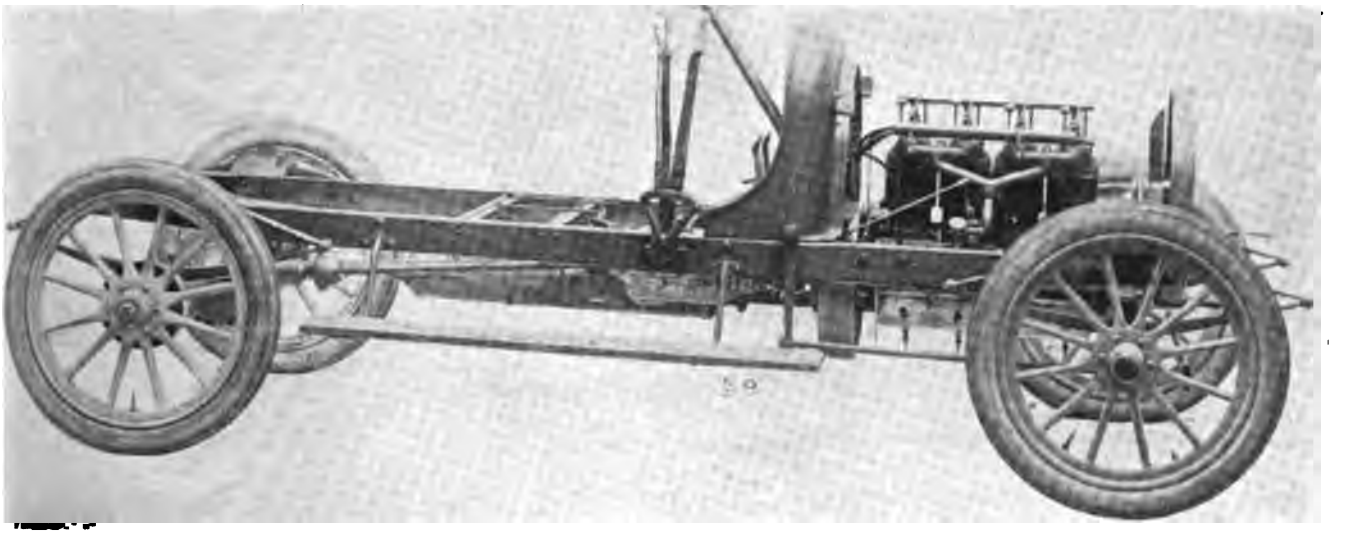
The transmission to the rear axle is by means of a propeller shaft comprising two Spicer universal joints. The driving bevel pinion shaft is mounted on Hess-Bright ball bearings, and the pinion and gear are both of steel and case hardened. The differential is of the bevel pinion type. The rear axle is of the customary live axle construction, two seamless steel axle tubes being riveted into hubs on the driving gear housing, which is a steel casting. The rear axle driving shafts are carried on annular ball bearings at their inner ends, and on roller bearings at their outer ends. The driving wheels are keyed to tapered ends of the driving shaft. The front axle is of I beam section, and is claimed to be of very substantial size, having been loaded to 7,000 pounds without showing any noticeable deflection.



VIEW OF CHASSIS.



PLAN VIEW OF PREMIER CHASSIS.



ELEVATION OF PREMIER CHASSIS.

The running gear frame consists of chan-el section pressed steel side members nited by a rear end cross member of annel section, which is securely fastened the side members by gusset plates. There also one cross member at about the iddle of the frame, which carries the ar end of the tubular subframe, and to ich is hung the forward end of the bular rear axle torsion brace rod. The me is supported on full elliptic springs roughout, all springs being swung out-le the frame. The wheels are 32 inches diameter and fitted with G. & J. clincher es. The weight of the car complete is 00 pounds.

The steering is by hand wheel through inclined steering column, the motion of ich is transmitted through a worm and tor back lock mechanism. The steering n of the worm and sector mechanism arranged outside the side frame member. ie steering heads and knuckles are of Lemoine type, and the tie rod of the ering mechanism is located forward of front axle. The car is fitted with two lependent brakes—a band brake on the nsmission shaft directly back of the gear x and a double internal hub brake on rear wheels, which is operated by a side er that also controls the clutch. The nsmission brake is pedal controlled.

The body of the touring car is of tulip sign, upholstered in black hand buffed ter grained leather, hair padded, and is ished in dark Brewster green, the same or being given to the running gear. e tonneau is detachable and is claimed afford ample room for three passen-s. The dash is of cast aluminum and ved in such a manner as to fully protect spark coil and other dashboard attach-nts from rain. The car is also fitted th a cast aluminum bonnet front with circular opening containing a wire net-g. The experimental car of this type been completed for over a year, and n given very exhaustive tests. The new del is claimed to be very speedy, pos-sessing much more speed than can be used under normal touring conditions. The equipment furnished with this car consists of two Gray & Davis side oil lamps, two gas headlights, one oil tonneau lamp and generator, a tube horn and a full repair outfit.

The 16 horse power model has only been slightly modified from last year.

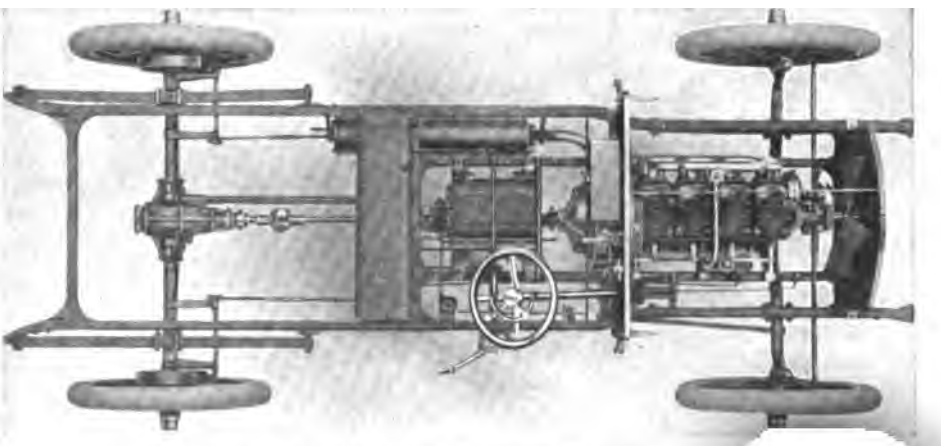
Waltham 1906 Models.

In addition to their 4 horse power, friction driven buckboard, the Waltham Manufacturing Company, of Waltham, Mass., are offering to the 1906 trade five models of air cooled cars. The various bodies are mounted upon one or the other of two chassis—a 16 horse power chassis of 82 inch wheel base and a 20 horse power chassis of 96 inch wheel base. Model K, a semi-racing runabout, is a two passenger car with torpedo stern, mounted upon the 16 horse power chassis. Model L is a 16 horse power five passenger tonneau vehicle with entrance to the rear seats by swinging the front seat. Model M has a removable rear entrance tonneau, seats four persons and is of 16 horse power. Model N is a 20 horse power car designed for five persons and fitted with side entrance tonneau body. Model R is also of 20 horse power, with a King of the Belgians, side entrance, tonneau body, fitted with double side doors to the front seats.

A description of the 20 horse power chassis answers very well for that of the 16 horse power models, the latter differing from the former in dimensions only. The following differences between the two may be noted: The four cylinder, 20 horse power engine has a bore of 4 inches and a 4¼ inch stroke, while the 16 horse power motor is of 3¼ inch bore and 4¼ inch stroke. Semi-elliptic springs are employed upon all of these models, those of the larger chassis being 40 inches long in front and 43 inches in the rear, while the smaller chassis has 34 inch front and 42 inch rear springs. Thirty-two by 3½ inch wheels are employed upon the 20 horse power chassis, and 30 by 3½ inch wheels on the 16 horse power models.

THE 20 HORSE POWER CHASSIS.

The frame used in these cars consists of tapering side members of pressed steel, slightly drawn together in front and carrying integral spring hangers. They are joined by front and rear cross members and carry a pressed steel sub-frame, upon

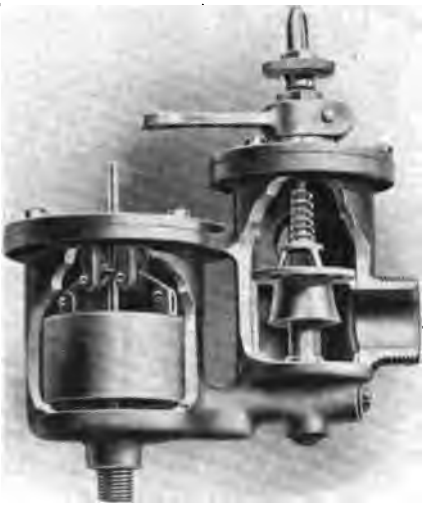


WALTHAM FOUR CYLINDER CHASSIS.

which the motor and gear case are mounted, instead of being hung from the main frame. This arrangement is considered to insure permanency of alignment between motor and gear shafts, and no universal joint is provided between them. The front axle is tubular, dropped at its middle portion, and carries steering pivots of the Lemoine type. Two sets of ball bearings are used in each steering wheel. The steering knuckles are tapered in form and of specially toughened steel. Adjustable connections are provided in the steering linkage and the steering device is of the screw and nut type. The column is brass plated, with a 15 inch mahogany heel and stationary sector for spark and throttle levers. The live rear axle is bevel gear, driven with 2½ inch tubular casing and 1¼ inch axle shafts, running on roller bearings at their outer ends and on ball bearings next to the bevel differential, which resist the thrusts. All gears are of hardened steel, with planed teeth and run in heavy lubricant. A torsion rod extends from the differential case to the frame and resists the heavy, twisting stresses of starting and stopping. The propeller shaft is carried upon two adjustable ball bearings placed well apart and capable of resisting the thrust of the bevel gears. Two universal joints intervene between the gear case and the driving gears. The rear wheel hubs carry the emergency brake drums, upon which act external bands operated by a hand lever, the movement of which also releases the clutch. A powerful foot brake is provided, which consists of a bronze faced steel band, which is constructed upon a 5 inch drum carried by the driving shaft just at the rear of the change gear case.

MOTOR.

The four cylinder vertical air cooled engine is secured upon the sub-frame by means of six brackets projecting from the

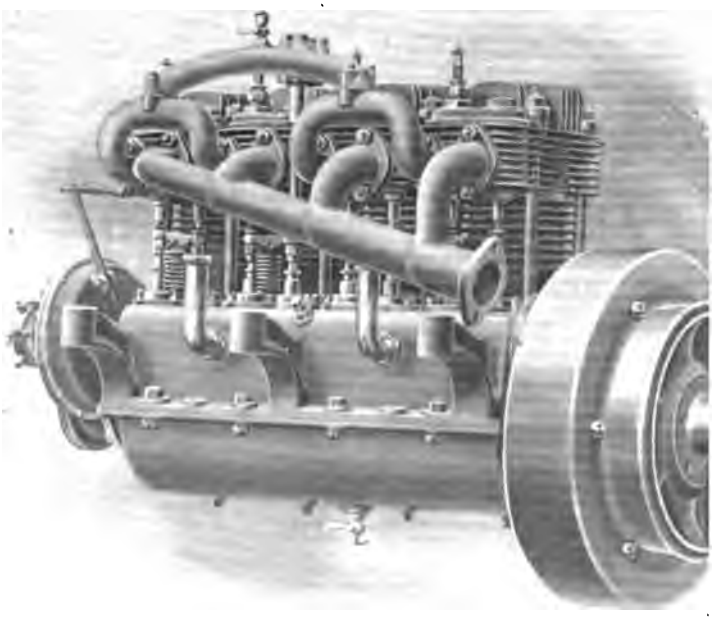


WALTHAM ORIENT CARBURETOR.

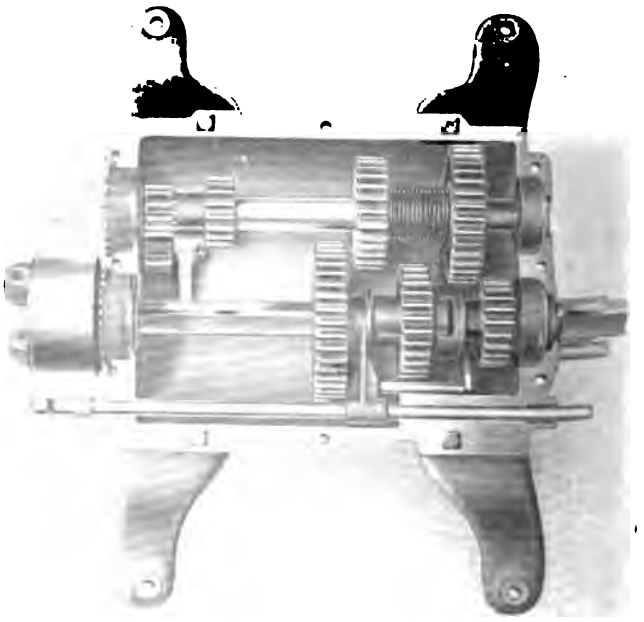
crank case. Each cylinder and its separable head is fastened to the upper half of the crank case by means of 4½ inch steel through bolts. All five of the long, bronze bushed crank shaft bearings are in the upper half of the crank case, so that the lower section may readily be removed and the working parts thus fully exposed.

The cooling flanges, which surround the cylinders circumferentially and cover the heads, are extremely thin and of a generally square contour, so that the cylinders, viewed from above, appear of a square section. The flanges upon the heads are vertical, and all run fore and aft. They are fully 1¼ inches in depth, while those of the cylinders proper are at least an inch deep. The aggregate extent of these connecting surfaces is very large indeed, and it is to be noticed that the flanges are so placed as to form air channels, all of which run in an exactly fore and aft direction, thus offering a minimum of resistance to the cooling blast. The manufacturers of this motor fully realize that one of the most important considerations in air-cooling is the facilitation of the rapid movement of air over the convecting surfaces. A bonnet of the Mercedes type, completely closed at the sides and finished in front with a very neat aluminum grating of square mesh, in imitation of a honeycomb radiator, encloses the motor, and an 18 inch four bladed ball bearing fan, driven by a round belt from the crank shaft, delivers its blast directly against the front of the cylinder heads. The hot air escapes under the slanting footboard. All valves are mechanically operated from a single cam shaft, and are placed side by side on the left of the heads. They are interchangeable, made of specially selected stock and removable through apertures in the head, closed with screw plugs. As both the suction of the charge and the exhaust is through the same passages, the port surfaces, it is claimed, are maintained at a safe mean temperature, the excessive heating effect of the exhaust being counteracted by the cooling effect of the fresh charge. The valves are opened by the ordinary roller tipped push rod mechanism, the cams being specially shaped to reduce noise to a minimum. A single spring is used for each pair of valves. This spring has its lower extremity fast to the crank case, and its upper extremity is attached to the middle of a rocker, one end of which bears down upon the inlet valve stem and the other upon that of the exhaust valve. It thus acts to seat both of them, and still is removed from the action of conducted heat.

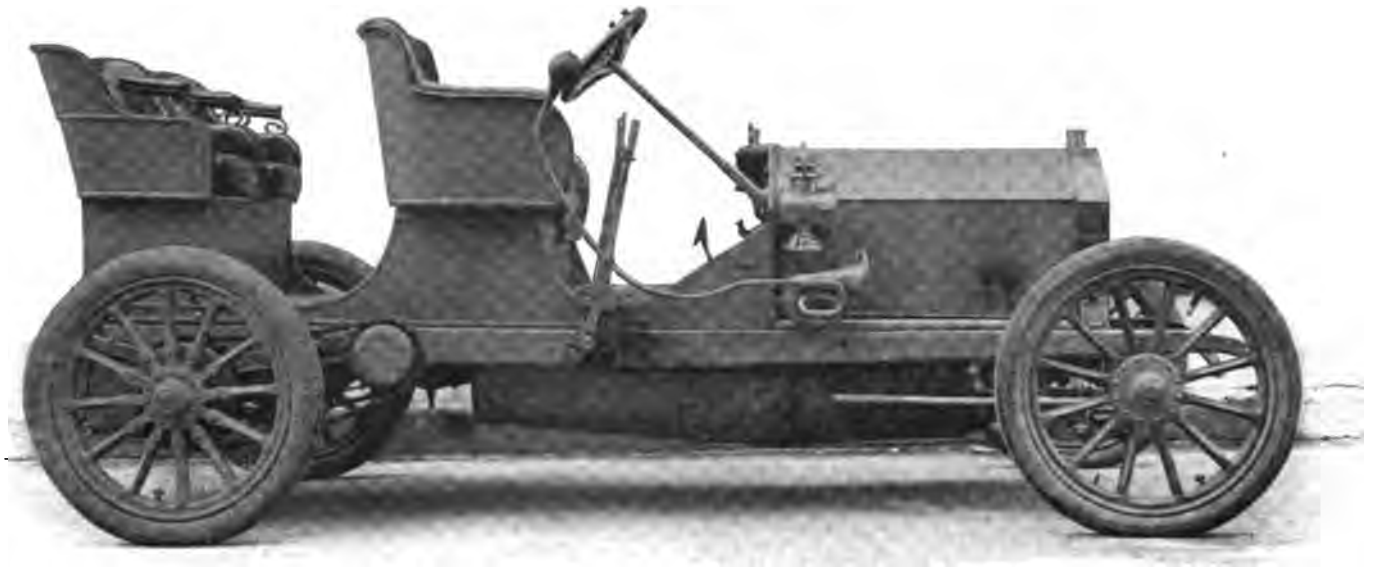
A drop forged crank shaft of 1¼ inch diameter, supported in five bronze bushed bearings, is employed. Integral with it is the flange to which the 16 inch, 50 pound flywheel is bolted. Drop forged steel



WALTHAM ORIENT ENGINE.



WALTHAM ORIENT CHANGE SPEED GEAR.



THE ZUST CAR.

connecting rods of I section are used. Mixture is furnished to all four cylinders through pipes of equal length and curvature, from a single automatic carburetor mounted at the right of the engine. An accessible priming device is provided for use in starting. Upon the forward end of the cam shaft is carried a well enclosed governor of the centrifugal type, which acts directly upon the throttle valve of the carburetor and holds the engine to a speed of about 300 revolutions per minute when idling or when the clutch is thrown out either by the pedal or by the brake lever. This prevents the engine from racing during gear changing. On the 16 horse power cars no governor is provided. The throttle lever upon the steering wheel controls the gas supply at other times. The cylinders exhaust into a manifold, the cross section of which increases from front to rear and thence into a capacious muffler, being under the centre of the car on the left.

Jump spark ignition is employed, the source of current being a three cell accumulator, with a dry battery of four cells held in reserve.

The Lacoste wipe contact timer is carried upon the cam shaft just in front of the governor and controls the primary circuits of a quadruple Pittsfield coil, placed upon the dash. The mica spark plugs are screwed into the inlet valve caps. All high tension wiring is of best rubber insulated cable, supported in vulcanized fibre brackets. Both dry and storage batteries are carried in a handsome mahogany box, mounted on the running board. Oil is supplied to the partitioned crank case by a Hill Precision automatic sight feed lubricator, located upon the front of the dash inside the hood. The reservoir contains three quarts of oil, and a hand pump is also provided as an auxiliary, by means of which the crank case may rapidly be supplied in an emergency. Distribution of oil to all parts of the engine is by the splash system. The gasoline tank, holding 10 gallons, is mounted directly upon the car frame under the front seat.

A leather lined clutch of the inverted cone type acting within the flywheel is employed. The sliding member is very light, in order to minimize momentum effects, and is thrown out of contact by means of a pedal. Three forward speeds and a reverse are provided, the sliding pinion mechanism being contained in an oil tight gear case. All gears are of special stock, carefully hardened. The gear shafts have their bearings entirely in the lower half of the case, so that the upper section may be removed, if necessary, without disturbing the mechanism. There is also a removable hand plate. The drive is direct on the high gear, through a jaw clutch of the usual form, and, by means of a pivoted fork acting to slide rearwardly the driven gear of the side shaft, this shaft is thrown entirely out of action, so that no gears are in mesh when the car is on the high speed. This fork is moved by a projection upon the shipper which moves the regular sliding pinions, so that when the jaw clutch is engaged the side shaft is thrown out. A coiled spring throws the side shaft back into gear as soon as the shipper is moved back from the high gear position.

The following reduction ratios between engine and rear wheels are employed: High gear, 4.5 to 1; intermediate, 7.5 to 1; low gear, 17.1 to 1. All speeds are engaged by means of a single side lever moving over a notched quadrant.

The standard finish of this line of cars is dark Quaker green, with carmine striping for the body and carmine running gear.

At the recent meeting of recognized automobile clubs at Paris a resolution was passed unanimously recommending that motor tourists boycott Switzerland.

1906 50 Horse Power Zust Car.

R. Bertilli & Co., of 124 East Nineteenth street, New York, are importing to the American public the Zust Italian car, made in Milan and Intra, Italy. It is a high powered, light weight, four cylinder machine.

MOTOR.

The cylinders are soft gray iron, cast in pairs with their water jackets integral. The jackets are very thin and extend only a short way down the cylinder walls. The valve chambers are all on one side, and the valves are all mechanically operated and interchangeable. These valves are made in one piece of special nickel steel and are very light. Their springs are of large diameter, held at the bottom of cup shaped washers supported by keys through the valve stems. The valve stems are guided by long bronze bushings, as are also the valve lifting rods. The cam shaft is a single piece of nickel steel with the cams made integral with it. On the opposite side of the engine is the ignition cam shaft, made in the same manner. Both of these shafts run on ball bearings and require but very little oiling, which is received from the crank case splash. The aluminum crank case is so constructed that the portion which serves and holds the cam shaft bearings in place can easily be removed and the shaft taken out. Brass screw caps with V shaped heads are fitted over the valves, permitting of their easy removal.

The pistons are rather long and have dome shaped heads. They carry their eccentric, diagonally split rings above the pin and below. These rings are rather narrow and are finished by grinding. The connecting rod is a hand forging of nickel steel of rectangular section, and although very light its weight is so dis-

tributed at the ends as to give it strength. The upper end is supplied with an upsplit steel bushing forced in. The lower end is fitted with a split bronze bushing, around the centre of which is cut a wide shallow oil groove, from which smaller oil grooves run outward in helical lines. This not only insures distribution of the oil, but gives a bearing on each end of the bushing and prevents rocking.

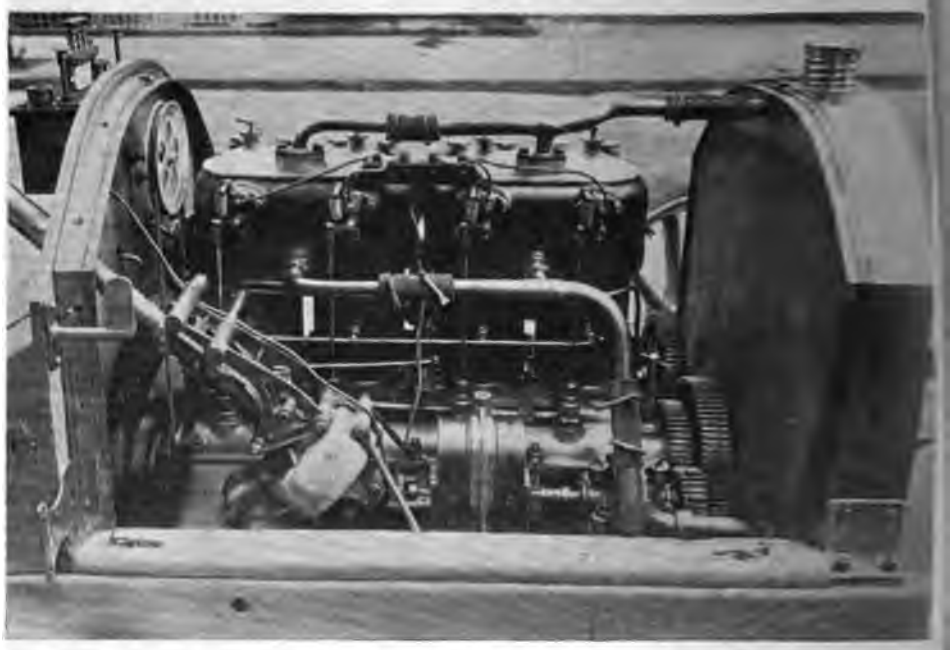
The crank shaft is a nickel steel hand forging with the flywheel flange made integral with it. It is supported by three long bronze bearings. The crank pins are made hollow. The flywheel is very large in diameter, with a thin, broad rim and large hollow hub, which contains the multiple disc clutch. This wheel is a steel casting and the spokes take the form of broad, thin curved fan blades. Its action is that of an exhaust fan, and as the hood is tight, is deemd sufficient., and no radiator fan is therefore supplied.

The crank case is a two piece aluminum casting divided horizontally. The upper part forms the arms, which support the engine by resting directly on top and against the inner side of the frame side members. A strip of wood covers the retaining lock nuts. At the front and right side is a brass standpipe vent so arranged that the oil will not be thrown out. The two to one gears are large, broad faced and made of fibre stiffened by brass. The exhaust pipe is a one piece, ribbed iron casting. A pipe runs from this to the baffle plate muffler situated transversely near the rear, and from here the outlet pipe runs to the rear. The inlet pipe is a brass Y casting and delivers the gases to a chamber in each pair of cylinders between the inlet valves. This arrangement is clearly shown in the photograph of the left side of the engine.

The lower portion of the inlet pipe forms a part of the large float feed carburetor. Air is taken from a shield encircling the exhaust pipe. The throttle valve is of the sliding piston type, an extension of which, with variable width openings, forms the auxiliary air inlet. This auxiliary air inlet works together with the main throttle, giving the largest opening when the main throttle is wide open. A thumbscrew and lock nut are provided for adjusting the size of the gasoline nozzle. Gasoline enters the flood chamber on the bottom and a shut-off valve is provided near the carburetor. The 30 gallon copper gasoline tank is placed crosswise under the rear of the car. Sufficient pressure for forcing the gasoline to the carburetor is obtained from the exhaust after passing through a spark arrester. A small hand pump on the front boards is arranged to provide the starting pressure in the tank and is connected to a small gauge in the dash which indicates the tank pressure at all times.

COOLING.

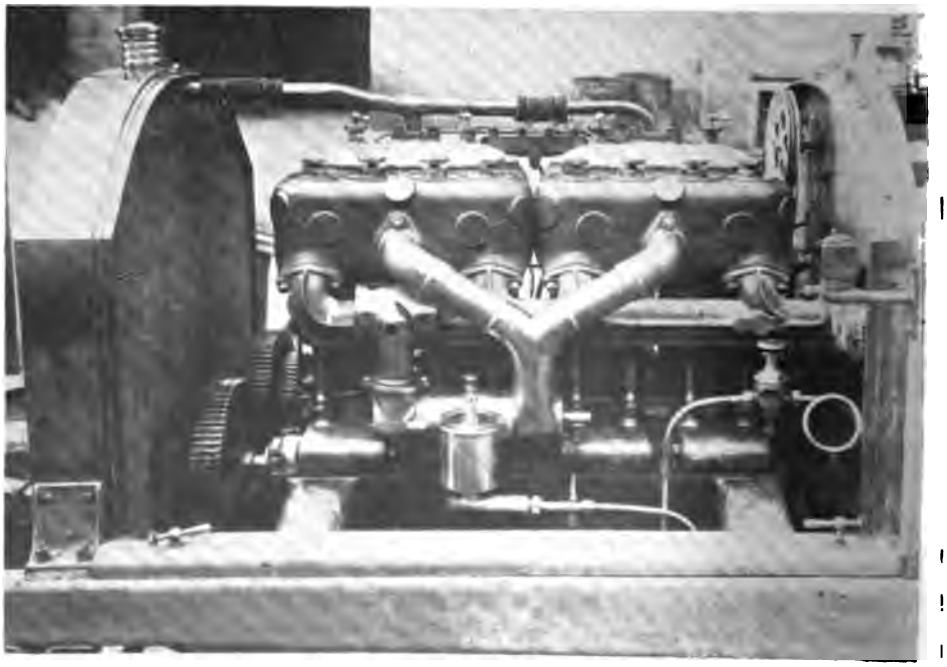
A cellular radiator acts as tank and cooler. This is fastened at the bottom only to prevent straining and consequent leaking. A screw cap of the inverted bottle type adorns the top, as shown in the photographs. It is claimed by the makers that this kind of cap, although set up tight, never sticks. The right side view of the engine shows the location of the bronze centrifugal water pump mounted on one of the engine supporting arms. This pump is gear driven from the ignition cam shaft and is provided with two grease cups. The pump forces the water through a brass pipe into the lower part of the water jackets. Running from the top of the engine to the radiator is another brass pipe. The connections between the pairs of cylinders and the engine and radiator are made flexible by the use of rubber hose. This hose is held by a patent fastener, consisting of a threaded wire around the pipe, passing through a brass piece cut to conform to the curvature of the hose in the inside side and provided with small wing thumb nuts abutting against its ends and threaded onto the wire. By this arrangement a tight joint can be made and yet the pipe may be quickly removed without the use of tools.



ZUST ENGINE, IGNITION SIDE.

OILING.

The engine oiling is taken care of by a force feed Dubrulle oiler placed on the dash and driven by a circular section leather belt from the rear end of the ignition cam shaft. A single pipe branches and leads to the base of each cylinder. Pipes lead to each of the main bearings and the surplus runs down into the case and supplies oil for the splash. The crank case pan is divided by partitions into four



ZUST ENGINE, VALVE SIDE.

ompartments, each one having a separate rain cock.

IGNITION.

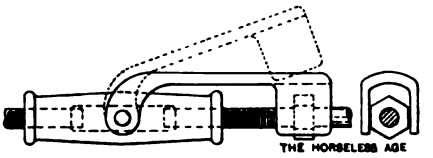
The current for the make and break spark is generated by a Simms-Bosch low tension magneto situated on the right side of the engine and driven directly from a continuation of the pump shaft, which is provided with a flexible coupling. The magneto is held in position by a yoke and cap screw to facilitate its quick removal. A wire runs to a switch on the dash and another runs from the magneto, which is grounded on the engine to a terminal on a short fibre piece running across the cylinders. From here a wire runs to each of the ignition points, which are inserted into the engine through insulating lava bushings. The fibre piece has four push buttons for cutting out the ignition for any cylinder. The igniter blocks are fitted into the cylinders on ground joints. The contact points are held in contact by coil springs on the outside. They are separated by the action of vertical rods raised by the cams, which separate the points by their sudden downward movement under the action of a stiff coil spring enclosed around its base. The timing of the spark is obtained by sliding the ignition cam shaft forward or backward in its bearings. Its cones are made helical, so that such motion advances or retards the time at which the vertical rods are moved, and, therefore, the time at which the break takes place.

STEERING GEAR.

On the right side of the engine can be seen the lower end of the steering lever and the casing enclosing the worm and worm wheel steering mechanism. This is packed in grease and also carries a grease cup on top. The steering column is tilted at an angle of 41° and passes through the dash at such a height as to allow of the placing of the steering gear well inside the hood and above the level of the frame. In this position it is not only protected but very accessible. The drag link connecting the steering gear arm to the right wheel steering knuckle is made of tubing with adjustable ball and socket joints. This rod is so bent and placed behind the front axle that it is protected from being hit by objects in the road. The cross link is placed behind the front axle. The steering knuckles are hand forged from nickel steel.

CLUTCH.

The multiple disc clutch is enclosed in the flywheel hub, the back of which hub is provided with a brass removable cap held by bolts, as shown in the plan view of the chassis. The discs are made of steel, with the friction or wearing surfaces made of thin rings of steel. These rings, when worn, may be replaced by a new set without removing the original plates. The friction surface is large, owing to the number of plates used, thus reducing the necessary pressure and consequent wear on each plate, and also making a clutch which will not grip suddenly. The shaft running from



ZUST TURNBUCKLE LOCK.

the clutch to the transmission has a removable piece in it, which, when taken out, allows the clutch to be removed without disturbing engine or transmission. No universal joints are placed in this shaft. The clutch is engaged by the action of a stiff coil spring, the tension of which is adjustable by means of a nut and disengaged by the action of the clutch lever by means of a forked arm and slotted collar. The slotted collar and fingers are provided with a special grease cup, which moves with them.

THE CHANGE SPEED GEAR

is of the sliding gear type and has four forward speeds and one reverse. Two driving bevel gears are used, one in line with the main shaft, which gives the direct drive, the other on the lay shaft, through which all the other speeds are obtained. The lay shaft rotates idly while the direct drive is being used. Two sliding gear members are moved by forked arms connected to longitudinal rods on the outside of the gear case. These rods are engaged by the selective system, by an arm on a sliding cross shaft, which is controlled by the gear shifting lever on the outside of the car. The shaft on which the gear slides has several grooves cut into it instead of being square. The rear sliding gear contains depressions, into which lugs on the driving bevel pinion sleeve fit, thus giving the direct drive. When this gear is moved forward it engages the rear gear on the lay shaft and gives the third speed. The other sliding gear member consists of two gears which engage the other two gears on the lay shaft and also an idler below, giving the second, low and reverse speeds respectively. The bevel gear differential is in the middle of the jack shafts inside the gear case. The gear shafts are all made of nickel-chrome steel and run in oil. Ball bearings of the annular type are used throughout the gear case, jack shaft, cam shafts and wheels. The transmission case is aluminum, and, as shown, the entire top may be removed by loosening eight thumbnuts on hinged screws. The case is supported at the front and rear by the frame cross members, the front of which is dropped and forced under the case. No sub-frame is used in the construction. The jack shaft bearing fixtures also support the front side of the rear springs. The side chains are of the roller type, 1½ inch pitch, and the sprocket teeth are wide. Adjustable radius rods connect the rear axle with the jack shaft bearing fixture; the length is variable by the use of a small turnbuckle with a right and left thread and a special locking device, as shown in the accompanying drawing. Two sets of brakes are supplied, one at the left of the transmission case on the jack shaft, and the other on drums on the rear wheels. The first is a double acting contracting brake, consisting of a steel drum about 12 inches diameter, 2½ face, upon which an upper and lower cast iron faced steel shoe contract. The shoe pivots are fastened to a frame cross member and the pull is from the right foot lever operating the longitudinal rod, connected to the brake, as shown in the plan view. This brake is independent of the clutch.



CENTRE PORTION OF ZUST CHASSIS.

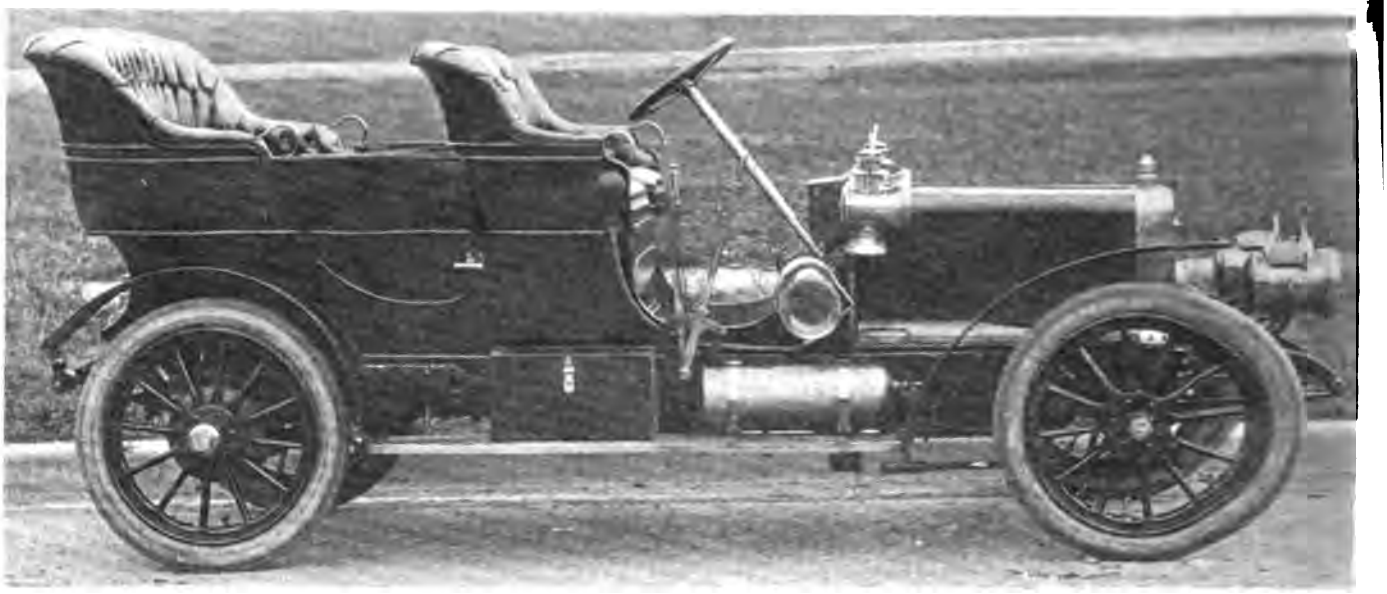
No governor is used, all throttling being done by hand on the notched sector, fastened to the spokes of the steering wheel. The spark is controlled by a similar lever working on another concentric arc.

The front and rear axles are both I section, nickel steel drop forgings. The springs are semi-elliptic, both front and rear, and are placed on top of the axles. Those in front are placed under the frame, while the rear ones are outside. The rear springs are 2 inches wide, 45 inches long and contain eight leaves.

FRAME.

The frame is pressed from one piece of steel, including three cross members, under the radiator. At the juncture of the cross members with the side members the metal is webbed out to give strength. At one or two places short, pressed plates are riveted to increase the stiffness.

The sports committee of the A. C. F., at its last meeting, decided that hereafter speed records, in order to be recognized, must be made in a regularly announced event; it will be no longer sufficient to drive to the Salon-Arles road at any time one may desire, taking along two timekeepers of the A. C. F., but public notice must be given a certain time in advance of the intention to attack the records.



THE "AMERICAN" TOURING CAR.

The "American" Touring Car.

The American Motor Car Company, of Indianapolis, Ind., are marketing a four cylinder, 35-40 horse power touring car, of the water cooled type. The engine cylinders are 4 9-16 inch bore by 5 inch stroke, and are cast in pairs. The engine is assembled entirely upon the upper half of the crank case, which is cast of nickel aluminum, with integral supporting arms. The lower half of the crank case can be removed without interfering with any adjustments. All connecting rod and crank shaft journals are split boxes of white bronze. The three shaft bearings are fitted with chain oilers, which carry the oil from walls beneath the bearing onto the journal. Both sets of valves are located on the left hand side of the engine and operated from a common cam shaft, which is lubricated by splash in the crank casing. The thrust of the cams on the valve rods is eliminated by means of rock arms inserted between them, which are pivoted on the opposite side of the crank case. The connecting rods are steel drop forgings, the cap at the crank end being held in place by four bolts. The pistons are extra long and provided with four eccentric rings, all parts being finished by grinding. The cylinders are offset from the crank shaft centre in order to reduce the side pressure on the cylinder walls. The cam shaft gears are enclosed, and cut with spiral teeth, which eliminate noise. The motor starting crank is supported on a bracket fastened to the frame, and when not in use is held in a horizontal position. The crank shaft is a nickel steel forging, with three main journals, 1¼ inches in diameter.

The combustible mixture is supplied by a float feed carburetor, with supplementary air valve and a balanced piston throttle. Ignition is by jump spark, the ignition outfit comprising a three cell 60 ampere hour storage battery (said to be good for 1,200 miles), a quadruple unit French coil, a commutator and spark plugs in the caps over the intake valves. The gasoline is carried in a 17 gallon oval section copper tank supported on the frame under the front seat. The body can be removed without disturbing the gasoline connections.

The radiator consists of one-quarter inch copper tubes with crimped spiral flanges, the tubes being placed vertically. A fan supported from the motor is located back of the radiator, and driven by a three-quarter inch flat belt, with provisions for adjusting the tension. The water is circulated by a gear pump, made of bronze, secured to the front of the crank case, and driven by a composition gear meshing with the cam gear pinion. The cylinder lubrication is effected by means of a six feed Lunkenheimer lubricator placed on the dash, and driven by bevel pinions from the vertical timer shaft. This lubricator also supplies oil to the two compartments in the lower half of the crank chamber.

The clutch is of the conical type, faced with leather and provided with flat springs under same to insure gradual engagement. A floating member is interposed between the clutch and the gear box to prevent binding of bearings, due to twisting of the frame. The change speed gear is of the sliding pinion type, giving three forward speeds, the high one a direct drive, and one reverse. All gears are case hardened. The aluminum case is provided with a large lid on top, which is held in place by a slotted swinging yoke and a set screw with hand wheel.

The drive to the rear axle is by a propeller shaft with two universal joints, and by a set of hardened steel bevel gears of four pitch. The rear axle is of the floating type, the outer ends of the driving shafts connecting with the wheel hubs by claw clutches. Large ball bearings are used throughout the rear construction. The front axle is of I section, drop forged of nickel steel, with integral spring seats. The frame is of pressed steel construction 3-16 inch stock, and there is a sub-frame which carries the engine and transmission. A metal apron extends underneath the engine transmission and all controlling members, to protect them from dust and splashing mud.

The lower half of the differential housing is of cast steel, the upper half and inspection lid are of cast aluminum. Into each side of this housing there is brazed a steel tube, which carries the hinged spring seats, and also forms the support for the driving wheel bearings. A truss rod fastened just inside the bearings and passing under the differential housing lends additional strength. The internal hub brake expanding member supports are also brazed to these tubes. The dead weight is carried by stationary tubes, and not by the live rear axles. To one side of the pinion shaft housing, and forming a part of the differential case, is a socket into which is fitted a torsion tube, which takes all of the driving and braking torque, relieving the springs of this load, which they would otherwise be required to withstand.

The wheels are of the artillery type, of second growth hickory, have twelve spokes both in front and rear, and a diameter of 34 inches. Ball bearings are used, with balls of sufficient size and strength to prevent crushing, the outside row being five-eighths inch and the inside three-quarter inch.

The steering gear is of the irreversible type and adjustable for wear. Spark and throttle levers operate on a stationary quadrant on top of the steering wheel. The foot brakes are of the internal expanding type and act on drums on the rear wheels, while the hand emergency brake acts on the bevel pinion shaft universal coupling.

The car is fitted with a body of the *King* of the Belgians type, made of wood, with double side entrance tonneau. The wheel base is 111 inches.

ıe Soules Light Delivery Wagon.

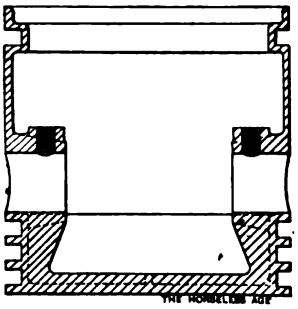
The Soules light delivery wagon, manu-tured by the Soules Motor Car Com-ıy, of Grand Rapids, Mich., is equipped th a motor rated at 22 horse power, d is designed to carry loads up to 1,500 unds. The manufacturers make the ım that, owing to the high horse power d the gear reduction of 6¼ : 1 on the gh gear, the low gear is very seldom re-rted to, even on heavy grades; also that th 34 inch wheels, extra long three-quar-r elliptic springs and a 90 inch wheel ıse, the car rides very smoothly, espe-ally with load on city pavements. The ›rings are of a special shape, so that all ght shocks are smoothly taken up, while ven the heaviest jolts do not make the ›rings bump on the axles.

The two cylinder, horizontal opposed mo-›r and sliding gear transmission are rig-ily bolted together in one unit, with an nclosed clutch between, and a flywheel in ront, all contained under the hood and ootboards. The whole power plant is piv-›tally supported at three points, insuring alignment to all bearings under all conditions. The cylinders, of 5½ inches bore, 5 inches stroke, are made from hard, gray iron, and are light and strong. The valves are operated by push rods working against two cams on the half time shaft, one cam for the inlet and one for the exhaust. The push rod has a fibre cap on the end, to make the valve action quiet. The connecting rod, of the full marine type, is made from steel. The bearing at the crank pin is 1⅝ inches in diameter by 2 7-16 inches long; at the wrist pin the bearing is 1⅛ inches in diameter by 3⅛ inches long. The crank shaft is drop forged, the forging being submitted to a special refining process after forging, which makes it tough and reduces the liability of fracture. The crank shaft has a total bearing length of 11⅞ inches. The bearings for the engine and transmission are of a white bronze bearing metal of high tensile strength and great anti-friction qualities. The flywheel is 20 inches in diameter and weighs 135 pounds.

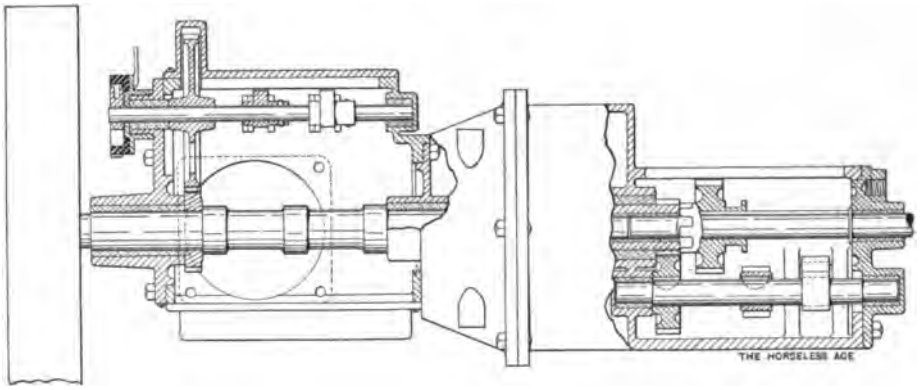
The pistons are of hard, gray iron, light and well braced. There are four rings of uniform cross section and of the flat lap type—three at the head end and one at the lower end to prevent oil from working out past the piston.

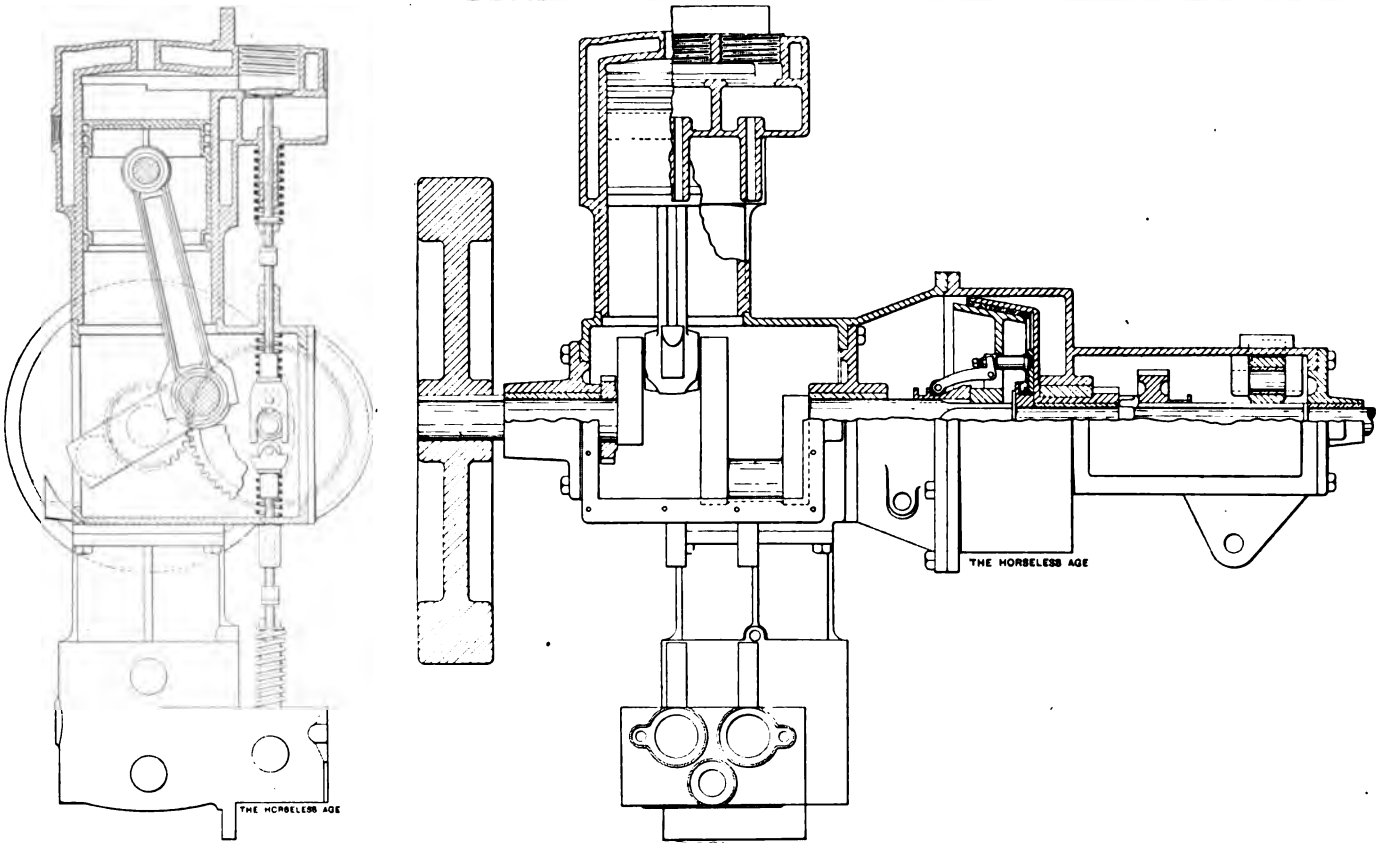
The base of the commutator fits the outside of the boss, which forms the front bearing for the half time shaft. To this base a fibre ring is fastened, this ring being bored out to form the runway for the roller contact, which is operated through an arm and a spring attached to a bracket on the end of the half time shaft. The contact is made on a projection of the contact segment, which passes through a slot on the fibre ring. The wiring is attached to the brushes supported on studs screwed into the end of the crank case. This gives stationary wiring, thus avoiding the breaking of wires through rocking the commutator to vary the point of ignition.

The Soules clutch is of the cone type. The male part is carried on the square

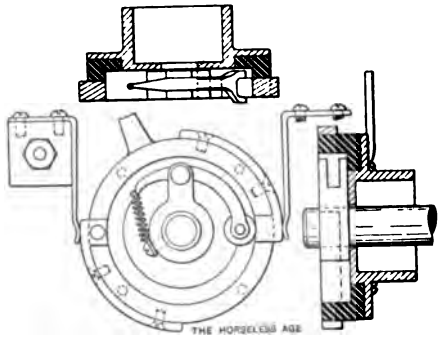


SOULES PISTON.





THREE VIEWS OF THE SOULES COMBINED MOTOR, CLUTCH AND CHANGE SPEED GEAR.

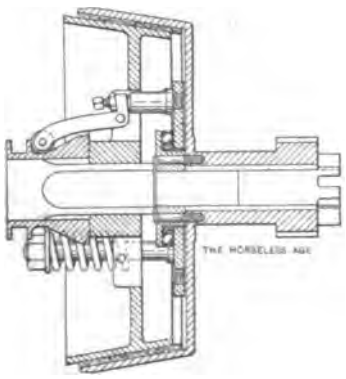


SOULES TIMER.

end of the crank shaft. The shell or female part is made of cast steel and has a bearing in the transmission case and on the ends of the crank shaft and the transmission shaft. The clutch is engaged by means of four coiled springs, one of which is shown, these surrounding four studs screwed into a hardened steel disc. A ball thrust bearing is provided to take up the end thrust when the cone is drawn out, until the rollers at the inner end of the clutch dogs rest in a groove at the big end of the sliding cone. The clutch is then disengaged and remains so until the movement is reversed. End thrust occurs only during the time of engaging or disengaging the clutch. The shell is bushed with bronze and receives the end of the crank shaft and of the transmission shaft.

The transmission is of the sliding gear type, with two speeds forward and one reverse. For high speed the ratio is 6¼ to 1, one of the sliding gears being thrown into mesh with the tooth clutch on the friction clutch shaft. For low speed the sliding gear meshes with a gear on the countershaft, and for the reverse it meshes with an intermediate gear, which is in mesh with a gear on the countershaft. The change gears all have 1¼ inch faces and are of 8 pitch. Connection is made to the propeller shaft by a single universal joint.

The brakes are all on drums on the rear wheels, there being an internal and an external brake on each drum. The internal brake is operated by a foot pedal, and the external brake (of 13 inches diameter and 2 inches face) is operated by a hand lever. Both are interconnected with the clutch. They are exceptionally powerful and are often needed when, with a full, heavy load, a quick stop is essential from a good speed. Both sets of brakes are equalized; that is, the pressure on each wheel drum is the same, no matter what the road conditions are. This does away with trouble in getting both hands on the same set of brakes set at the same tension.



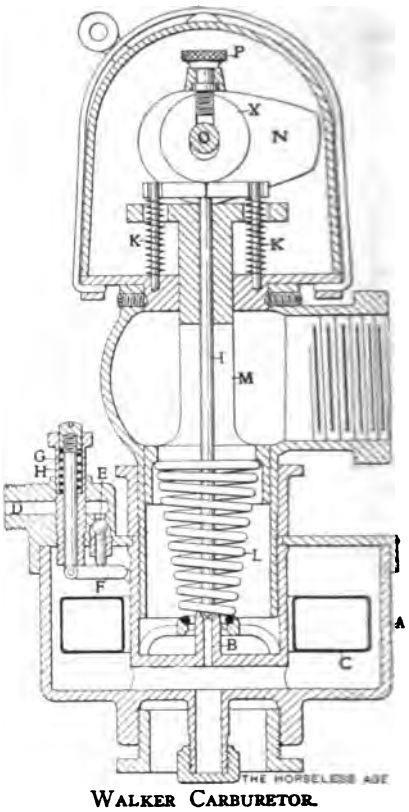
SOULES CLUTCH.

Steering is by a Brown-Lipe irreversible gear, with a 15 inch wheel. The spark and throttle control lever are on the steering column. The car is driven from the left side, which the manufacturers consider the only place on a commercial vehicle, especially with a closed body. Open and closed bodies will be furnished regularly. The floor space is 72 inches by 40 inches.

The engine is said to be very quiet, all exhaust noise being eliminated, and even cam and valve clicks being almost entirely absent. The engine is governed mainly by the throttle and is said to be very flexible, the car running on high gear with the clutch fully in as low as 3½ miles per hour. Consequently the gasoline consumption is said to be low, which is an important item in a commercial vehicle.

Walker's Carburetor.

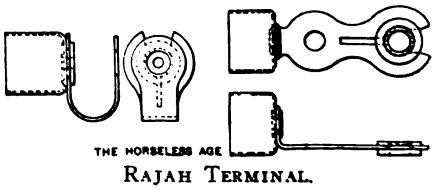
A new carburetor comprising a novel and original throttling arrangement has been placed upon the market by B. F. Walker, of Bridgeport, Conn., under the trade name of "Adjustable Throttling Ratio Carburetor." The float chamber A is concentric with the spraying nozzle B, and contains an annular spun metal float C, which controls the admission of gasoline to the float chamber. The gasoline arrives at D, and has to pass the ball valve E, which is acted upon by a rod resting upon the lever F, one end of which is pivoted to the rod G, and the other end of which rests on top of the float. The rod G carries at its upper end an internally threaded cap which rests on a coiled spring within the bushing or hollow bolt H. By depressing the rod G by hand the carburetor can be flooded for starting, and by screwing the hollow bolt H further into or out of the float chamber cover, the level of gasoline in the spray nozzle can be adjusted. The mouth of the spray nozzle B is made flaring to form the seat for a needle valve I, which is carried at its upper end on two coiled springs K K, through the intermediary of a cross piece J. Located within the mixing chamber is a conical coiled spring L through the spires of which the air is forced to pass, this spring serving the purpose of a throttle by compressing it more or less, and therefore decreasing and increasing the opening between its individual convolutions. The compression of the spring L is effected by means of a sliding block M, with which engages a cam N mounted on the shaft O. The cam N is double, and between the two parts of the cam is mounted an adjustable eccentric X, which acts on the cross piece J of the needle valve I. The throw of the eccentric can be varied by means of the adjusting screw P. By adjusting the eccentric the flow of gasoline for any given throttle position can be varied. In the drawing the eccentric is shown in its central position, in which which it has no effect on the gasoline valve.



WALKER CARBURETOR.

Rajah Ignition Terminals.

The Rajah electric wire terminals, illustrated herewith, are stamped out of hard brass of about 17 gauge. The ferrules are made to fit any size cable. With this type a short piece of the bare wire protrudes through the end and is soldered. The forked end slips snugly over a collar on the plug. These collars are sometimes made on the thumbscrew of the plug or a separate collar is provided to be held down by the thumbscrew. Various plugs are now made with a collar of the right size to receive this terminal. A terminal is also made to be attached to any cable by looping the wire about the body of the terminal and bending the prongs firmly around the cable. For this purpose the prongs have been annealed so they will not break. A U shaped terminal is made for the connection of the high tension cables underneath the coil box. After the cable is attached it will turn freely, and can be even roughly handled without breaking the wire. This simple connection is



RAJAH TERMINAL.

:ry convenient for this out of the way ace. These terminals are made by the ajah Auto Supply Company, New York.

The Fishback Non-Float Carburetor.

A new design of carburetor, in which he charge of gasoline per cycle is conrolled by the greater or lesser opening of . needle valve, is marketed under the above rade name by the Massnick Manufacturng Company of Detroit, Mich. In the lrawing, 1 is the elbow from which conıection is made to the motor inlet valve. The elbow carries the gasoline adjusting spring which is anchored at 4, and the spring adjusting screw 2. At the flanged base of the elbow there is a guide sleeve 6 for the stem 5 of the gasoline valve, to which the two throttle plates 10 and 11 are secured. The gasoline standpipe 22 is carried by the cone 11 and is provided with a tapered valve seat in which the needle rests.

To adjust the carburetor the check nut 23 and cap 25 are first removed. After the feed pipe has been connected at 24 the flushing pin should be depressed, engaging the diaphragm and lifting the needle slightly from its seat, until gasoline flows from the bottom of the carburetor. The motor is then started and run at low speed, while the lift of the needle valve is being regulated by means of the adjusting screw 2.



SECTION OF FISHBACK CARBURETOR.

This screw is turned to the right to cut down the feed of gasoline until the mixture is correct. If when the motor is stopped after running for some time at low speed a small quantity of gasoline drips from the bottom, it indicates that the flow is still too great on slow speed. When the mixture has been adjusted properly for slow speed, the throttle should be opened and the air adjustment made for high speed. This is done by means of the air adjusting thimble 20. Should the mixture be too poor, the adjusting thimble should be turned up, thus tightening the spring and allowing less lift to the auxiliary air valve 12, and causing greater suction on the gasoline. When this adjustment has been made the cap 25 is put into place, as the air rarely has to be readjusted. A low speed stop screw is provided by means of which the throttle opening for low speed can be regulated to any desired position.



LIPMANN'S SPEED INDICATOR.

The Lipmann Electric Speed Indicator.

Carl E. L. Lipmann, of Beloit, Wis., has brought out a combined electric speed indicator and season and trip odometer, which instrument can be attached to the dash or placed in the tonneau of a car. The speed indicator consists of an electric generator which produces an electric current, the strength of which is proportionate to the speed. A very sensitive voltmeter measures the current produced by the generator and indicates on a scale calibrated to read miles per hour instead of volts. The voltmeter used is so sensitive that less than one volt is required for a full deflection of the needle. The electric generator used is very small and compact and weighs but little more than a pound. It is claimed to require no attention except for oiling the bearings twice each season. The generator is mounted on the steering knuckle and driven through gearing by one of the front wheels. The entire generator is fitted into a dustproof case. The shaft is made of steel, hardened and ground, and runs in ball bearings. A heavy insulated flexible wire cable conveys the current from the generator to the indicator on the dashboard. The dashboard bracket is adjustable, permitting the instrument to be set at any angle desired. The instrument and generator case, including all fixtures, are made of brass, highly polished.

The combination season and trip odometer, which records the exact distance, whether the car is moving forward or backward, is operated by a flexible shaft which makes only ten revolutions to the mile. This great reduction in the speed of the flexible shaft is secured by the use of worm gearing mounted in the generator case. The right hand figure in both season and trip dials is printed in red and indicates tenths of miles. The season dial records up to 10,000 miles and repeats, while the trip dial records up to 100 miles. The method for setting the trip dial back to zero is said to be absolutely foolproof. It is only necessary to give the knurled button on the right a few turns—it cannot be turned in the wrong direction.

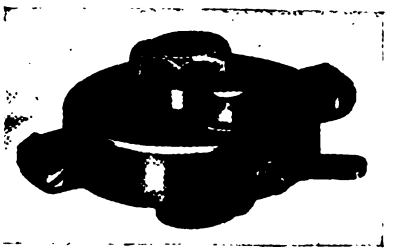
The Powell Double Contact Timer and Pressed Steel Muffler.

Two new specialties have been placed upon the market by the Powell Manufacturing Company, of Utica, N. Y., a timer and a muffler. The timer is made from a drum shaped hollow brass casting split through the centre diametrically, with the shaft that it turns upon. All moving parts and contacts are made from tempered steel, enclosed within the casing and running in grease. By unscrewing two lock nuts the outer casing may be removed without detaching the battery wires, showing the centre contact, which is pinned to the shaft.

Referring to the cut, it will be seen that the centre contact is a blade projecting from the collar keyed to the shaft. The outer contacts between which the centre one passes are tempered steel plungers sliding in steel sockets, with springs to press them out. The contact sockets are located opposite each other, one on each side of the timer casing, and screw into a central bridged nut, with fibre washers to insulate them from the wall of the outer casing.

The binding post is connected to the top of the bridged nut, forming an electrical connection as well as preventing the nut from turning. In operation the centre contact passes between the outer ones, forming at the proper time a double contact. In case one of the contact springs breaks it will not interfere with the proper operation of the other, it is claimed. A ground contact bearing on the collar of the centre contact is connected with a terminal on the exterior of the timer. The timer shaft (which may be the cam shaft) passes through the entire length of the timer, providing ample bearing surface, which is self greased. The outer bearing of the four cycle timer is protected with a cap that screws over the end, making it dust tight.

The muffler is made up of a succession of



POWELL DOUBLE CONTACT TIMER.

pressed steel cups or sections so designed that the top of one fits into the base of the next one. It is assembled with rods running through the head and sections, the entire arrangement being drawn up by nuts on the outer ends. Each section is so perforated that the hot gases are directed against the wall of the muffler, condensing the moisture and causing the gases to pass out of the muffler comparatively cool, noiselessly. These mufflers are perforated according to the bore and stroke of the engine. This muffler is made in three different diameters and of any length.

Lock Switch Company's Switch and Tire Gauge.

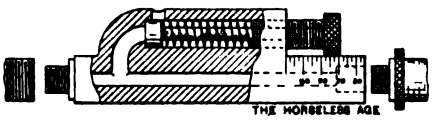
The Lock Switch Manufacturing Company, 20 Broad street, New York, are marketing two automobile specialties, one a lock switch for the ignition system of gasoline cars and the other a pressure gauge for tires. In designing their lock switch, they have provided for obtaining thousands of combinations by the arrangement of the circuit closing members with the switch, a specific form of plug or key being used to operate each combination. Each plug or key will control a plurality of circuit closing members, but no key or plug other than the one specifically designed for its particular switch will close the circuit within the switch. By operating the closing members within the switch by the key or plug, a closed circuit will be obtained by the circuit closing members being brought in contact with common terminals. These common terminals are so positioned that they will be engaged by the circuit closing members into whatever position with relation to each other the circuit closing members may be placed.

The switch is also constructed in such manner that tampering with it with tools, wires or other devices will not be effective. The common terminals within the switch are not exposed and cannot be reached for the purpose of closing the circuit except with the proper plug or key.

This switch is constructed with a base of insulation, into which is fitted a barrel



Auto Lock Switch.



Tire Gauge.

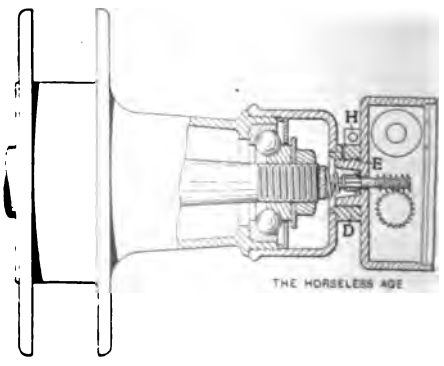
containing a plurality of discs, the majority of which are of insulating material, the others of metal. The metal discs are operated by the key or plug to engage the common terminals within the barrel. The common terminals project longitudinally into the barrel and through the discs. The discs within the barrel have a central opening adapted to receive the key or plug. In this central opening is a rod which is adapted to guide the key when it is inserted within the barrel. When the key is rotated within the barrel, the projecting parts on it will engage the metal discs and cause them to engage the common terminals and close the circuit through the switch. There are no exposed contacts in the switch.

The Lock Switch Manufacturing Company also make a tire pressure gauge, a part sectional view of which is shown herewith. The device consists simply of a nipple which is interposed between the tire valve stem and the pump tube, the nipple being provided with an escape valve the spring pressure of which can be adjusted by means of a regulating screw. A pressure scale is marked on the nipple, allowing of adjusting the valve to any pressure desired. It will be obvious that as soon as the pressure in the tire reaches the predetermined value, the escape valve opens and allows the additional air pumped to escape to the atmosphere.

Stevens "Auto-Kilometreur."

Two automobile specialties of French manufacture have been placed upon the American market by Stevens & Co., 99 Chambers street, New York city. One of these is an odometer, known abroad as the "Auto-Kilometreur." This device is of flat, cylindrical form, and is secured directly to the hub cap of the right front wheel, so that all exposed driving devices are dispensed with. As shown by the sectional sketch herewith, the instrument comprises a worm and worm wheel mechanism, and rotates with the wheel, so that the readings must be taken while the car is at a standstill. The method of attachment of the instrument to any vehicle is extremely simple. A hole of approximately 1¼ inches diameter is drilled centrally through the hub cap, and into this hole in the cap is brazed the split nut D. The instrument is provided with an externally threaded hub E, which is screwed into the nut D, and the latter is then clamped tight upon the hub E by means of a clamp screw H. The worm shaft has a squared end projecting out of the casing of the instrument, over which is passed a sleeve having fastened to it a coiled spring carrying at its end a mushroom shaped piece of steel with a striated surface, which, when the instrument is put in place, is pressed by the spring against the outer end of the axle stub. Unless the end of the axle stub is extremely smoothly polished, the friction of the steel mushroom against it is sufficient to hold the worm shaft stationary and as the instrument revolves with the wheel hub, the worm wheel of the instrument revolves around the worm and sets the indicating mechanism in motion. In case the end of the driving shaft should be extremely smooth, it can readily be sufficiently roughened by means of a cold chisel. Any tampering with the instrument may be prevented by passing a steel wire around one of the wheel spokes and through an eye formed on the case of the instrument and connecting the ends by a lead seal. It is then impossible to take the instrument from the wheel without breaking the seal, and the proprietor of the car can ascertain at any time by the indications of the instrument whether the machine has been taken out without his consent or not. Lubrication of the device is insured by means of the oil working through the front wheel bearing. The instrument projects about 2 inches beyond the hub cap and weighs complete about 1 pound 4 ounces. As made for the French market, it registers up to 99,999 hectometers, or 10,000 kilometers. Besides the regular season dial, the instrument possesses an arrangement for ascertaining the distance of individual trips. This consists of five dial plates at the front of the instrument, which can be turned around their axes by means of small handles. In starting out on a trip, these dial plates are turned by hand, so that the figures appearing behind the slots in the covers correspond to the indication of the season indicator. Then, at the conclusion of the trip, it is only necessary to subtract this figure from the new reading of the season indicator to get the distance covered. The instrument is made in nine different models for different sizes of wheels, the diameter of wheel with which it is to be used being stamped on the cover of each instrument.

The other instrument referred to is a



Stevens Odometer.

agneto electric speed indicator, known as ie "Auto-Controleur." It comprises two arts, viz., a transmitter and an indicator. he former is a small magneto generator upported by a bracket secured to the teering knuckle, which, by the simple ro-ation of a small piece of iron, generates n alternating current. The wire winding n which the current is generated is sta-ionary, and no frictional contacts or rushes are required to collect the current. The rotary piece is very light, and requires nly the least amount of energy to keep it n motion. The magneto is completely en-closed, and is driven by a rubber belt run-ning over a grooved aluminum pulley secured to one of the vehicle wheels. The great elasticity of the rubber belt prevents all slipping and consequent inaccuracy in the reading. The indicator is a galvano-meter of the so called hot wire type, and its indications are, therefore, not subject to change with age. It is a dead beat in-strument; in other words, its indicating needle comes to rest without a series of back and forth swings. The movable part of the instrument is extremely light, which avoids deterioration, and the instrument reads the same for reverse as for forward motion. The scale graduations start from zero and are practically uniform over the whole range. Two scales are furnished, one reading up to 60 and the other up to 90 kilometers per hour. The magneto and the indicator are connected by two wires of sufficient length to allow of placing the indicator at any point desired of the vehi-cle—either directly in view of the driver or in view of the rear seat occupants.

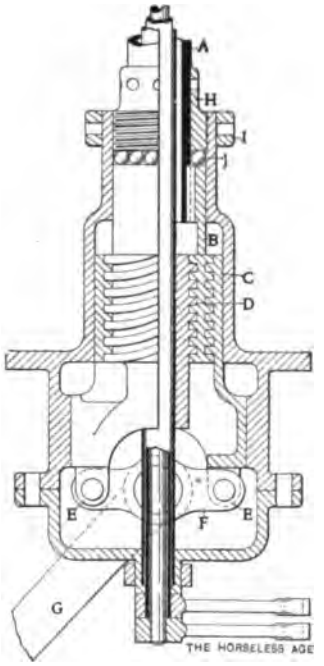
Boyle's Leather Hampers.

John Boyle & Co., of 112 Duane street, New York city, are manufacturing a line of leather hampers of luxurious appear-ance. They are designed to fit various popular cars. They are made of 8 ounce sole leather, which is treated to a patent leather finish. A stiff steel frame is used, and wood for the ends and bottom. Trunk handles are fitted to each end, and a heavy strap encircles the hamper. A substantial lock is provided covered with a flap of leather arranged to buckle down. A part of the top, which opens on a solid leather hinge, laps over the sides, making the case dust and water proof. Each case is provided with a heavy paraffined duck cover. The firm also carries patent leather license pads and tool kits.

The Gemmer Steering Gear.

An interesting design of steering mech-anism has been placed on the market by the Gemmer Engine Company, of Marion, Ind., one of the features of this mechanism being that all wear on bearings can be taken up by a single adjusting nut. To the lower end of the steering tube A is keyed a steel tube B, which is cut with right and left hand square threads on its outer and inner surface respectively. This double threaded sleeve engages with two other threaded tubes C and D, the lower ends of which are forced against the pivot blocks E E pivoted to the ends of the double armed lever F, which is keyed to a shaft mounted in bearings formed between the upper and lower halves of the gear casing. To this shaft outside the casing is secured the steering arm C.

It will be readily understood that when the steering tube A is turned, one of the threaded tubes C and D moves up and the other down, whereby a rocking motion is imparted to the lever F. The threaded tubes C and D are prevented from rotating by shoes formed on them which rest against flats formed in the case. It can be readily seen from the drawing that all wear on the steering mechanism and its bearings can be taken up by means of the



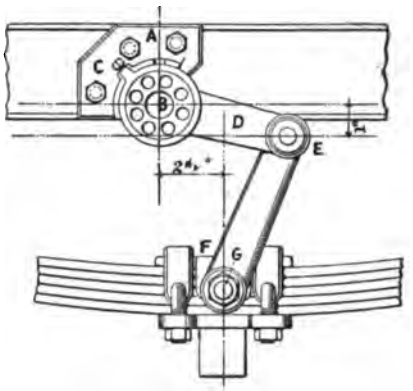
GEMMER STEERING GEAR.

adjusting nut H, which is secured by the lock nut I. The steering wheels are moved in both directions by a downward pressure of the threaded tube B, and the end thrust of this tube is taken up on a ball bearing J.

Within the steering post there are two small concentric tubes M and N for con-trolling the spark and the throttle.

New "Soot-Proof" Spark Plugs.

C. A. Mezger, of 203 West Eightieth street, New York city, has made some changes in the design of the Soot-Proof spark plug. The porcelain is of some-what different shape, and an asbestos washer is used in the centre and a spring copper washer at the end. The porce-lain body is of a new composition that is guaranteed to withstand the most vio-lent thermal changes without cracking.



DIEZEMANN SHOCK ABSORBER.

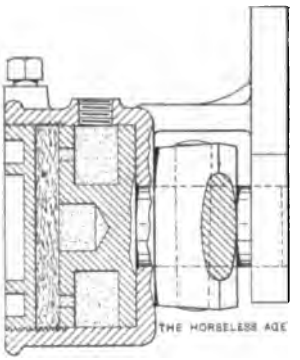
The Diezemann Shock Absorber.

The device manufactured by the Diezemann Shock Absorber Company, of Ho-boken, N. J., consists of a bronze casing A bolted to the side frame of the vehicle, in which are arranged a couple of friction discs, one of which is formed integral with a shaft which has a lever arm D secured to it by a taper pin just outside the casing. This arm D is connected by a link pivotally secured to a plate F mounted upon the vehicle axle or spring. The joint E between the arm and the link consists of a tapered stud working in a fibre bushing, which al-lows of making adjustments for wear.

As will be seen from the sectional view herewith the friction plate formed integral with the shaft has a deep groove cut into its circumference, which is filled with grease. In front of this plate there is a substantial hard fibre plate, and the casing is closed by another steel plate B, which is screwed into the cylindrical housing and secured by a set screw, the latter transmiting its pres-sure through a copper plug to prevent mar-ring the thread. The grease channel in the friction plate secured to the shaft commu-nicates with the friction surfaces through a number of fine holes, so that the working surfaces are always abundantly lubricated. This seems to be the distinctive feature of the device.

Electric Auto Lock.

The Auto Lock Plug Company, of 31 Nassau street, New York city, have de-signed a lock provided with a Yale key



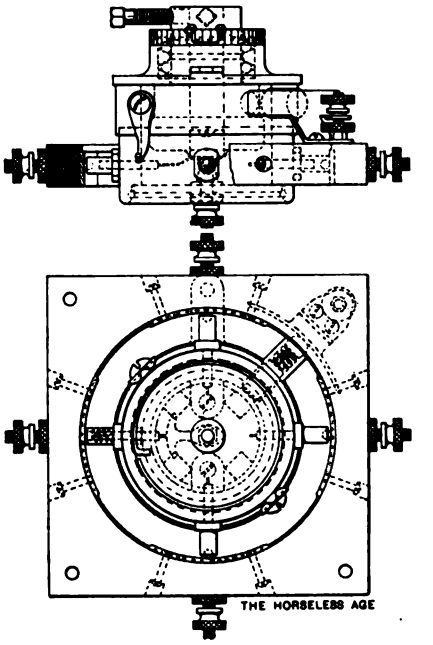
SECTION THROUGH DIEZEMANN SHOCK ABSORBER.

similar to their switch lock, which is used as a lock plug for electric vehicles. The back is concealed in the dash or body of the vehicle, only the keyhole showing. When the lock is turned and the key removed the ignition circuit is broken and the vehicle cannot be operated. The same concern also provides a device for securely locking the bonnet of a car at the same time the current is broken.

The New Breeze Carburetor.

We show herewith two sectional views of the 1906 model Breeze automatic carburetor made by the Breeze Motor Manufacturing Company, 33 Court street, Newark, N. J. The device is of the concentric float type, and is provided with a gasoline adjusting valve and a supplementary air inlet. It consists of a top A cast of brass and a spun brass float chamber B, which is screwed to the top casting A and can therefore be readily removed when it is desired to clean the carburetor, etc. Within the float chamber B is located a spun brass float C which acts through a lever J, hinged to the top casting, on the gasoline needle valve I. The gasoline arrives through the elbow H, which is connected to the gasoline valve housing by a union coupling.

The spray nozzle D is located at the centre of the float chamber and is surrounded by the main air inlet which is constricted at the top of the nozzle in order to increase the air velocity at this point. Directly over the opening of the nozzle is a peculiarly shaped needle valve which converts the jet of gasoline into a fine spray. At the bottom of the spray nozzle D there is a settling chamber which can be drained through a drain cock G. A priming pin K is provided, its guide being screwed into the cover of the float chamber directly over the free end of the lever J. By pressing down on this pin the gasoline needle valve I can be raised from its seat for flooding the carburetor. The supplementary air valve F is secured to the upper side of the top A. The valve proper is made of aluminum, and is provided with a hollow hub adapted to slide on a rod screwed into the valve spider, being secured by a nut and



MOSLER DASHBOARD TIMER.

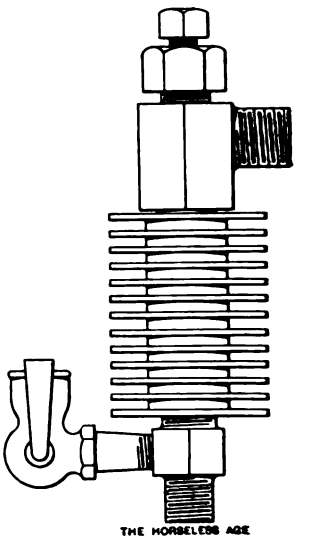
lock nut, by which means the spring pressure can be readily adjusted. A boss is cast on the top casting, to which the brace for the carburetor can be secured. With the carburetor is furnished a union with a short ¼-inch tube for soldering, or a ⅛-inch or ¼-inch fitting, as desired.

Mosler's Dashboard Timer and Commutator.

The latest addition to the line of ignition devices manufactured by Arthur R. Mosler, New York city, is a combined timer and high tension distributer suitable for mounting on the dashboard, and so arranged that no bending of wires occurs when the spark is advanced. The Mosler combined timer and high tension distributer has been described in these columns before, and the only change that has been made in this new device is that the porcelain insulated high tension terminals have been replaced by small brass terminals clamped into the hard rubber casing of the instrument and provided with spring pressed ball contacts at their outer ends. The instrument is placed inside a hard rubber frame mounted upon the dashboard by means of steel rods. The hard rubber frame is bored out to a diameter slightly larger than the distance apart of opposite contact balls of the instrument, and is provided with contact sectors with which the balls are adapted to make contact. The primary connection is made in a similar manner by means of a sheet brass sector secured to the rear side of the hard rubber frame.

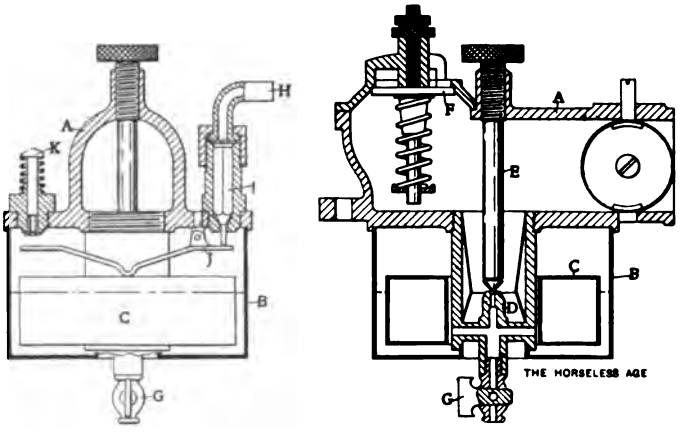
The Watres Power Brake.

The Watres power brake, manufactured by the Gas Engine Whistle Company, New York, works exactly like the air brake except that it uses spent gas from the engine. A slight touch on the lever at the steering wheel controls the largest car with no expenditure of physical energy. The physical work of continually putting the brake on and taking it off by hand or foot power is entirely eliminated. The power used for the brake is very small. So much spent gas as will pass through an opening the size of a needle is taken direct



WATRES POWER BRAKE CHECK VALVE

from the cylinder of the engine by way of the relief vent opening, and this only a few minutes at a time. As soon as the small reservoir is full no more gas is taken. There is no connection with the exhaust and therefore not the slightest back pressure on the engine. The system has been attached to one cylinder cars without effect on the engine. The control of the brake is through a valve attached to the steering post. This valve has two levers, one for the brake and one for blowing the chime signal used in connection with the same tank. The use of the power brake is claimed to also help prevent skidding through the equalization of the brake pressure on the two rear wheels. The cylinder 2¾ inches in diameter is placed on the brake rod on each side of the car. As the pressure from the valve is applied to these pistons, the two brakes are



SECTIONAL VIEWS OF BREEZE 1906 CARBURETOR.

at exactly the same pressure on each ke band. The cut herewith shows the ck valve fitting through which the gas :aken from the cylinder, it being formed h deep flanges to insure the cooling of gas. The brake pistons have a range motion of 3 inches, while three-quarters an inch is enough to apply the brakes. pressure of as high as 100 pounds has :n observed in the tank, which is made withstand several times this.

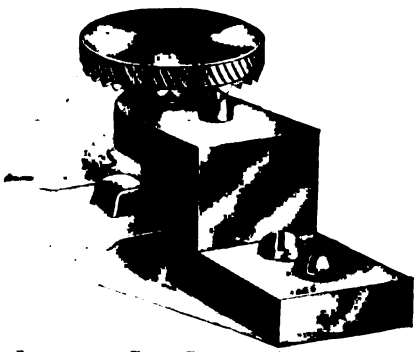
ew Shug Electric Ignition Devices.

A new battery switch with a detachable ver and sliding contact has been placed the market by the Shug Electric Manucturing Company, of Detroit. It is aimed that there is no strain on any part the device, thus insuring durability. ne base is 3 inches in diameter and com-sed of rubber. The contacts are brass, hile a fibre guide is used. One feature this device is claimed to be that it cannot ossibly be turned accidentally.

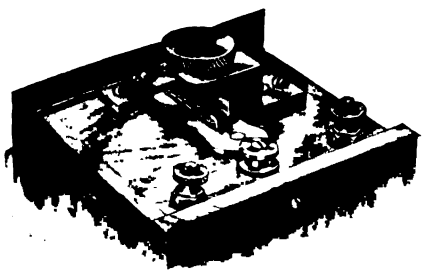
Among the other things which this con-rn places before the public is a unit oil so arranged that any one of the sep-rate units can be removed without dis-rbing the rest. These coils have hard ubber tops, nickel plated fittings and the est grade of silk covered wire. The wax sed in construction will not melt. The onnections are arranged on the inside f the coil box, while the outside case, hich is made of mahogany, is fastened o the dashboard by means of cast brass rackets. The contact points are of plati-um, and the coil is comparatively large nd claimed to give a strong hot spark. The rapid, non-sticking vibrator can be emoved for inspection without changing he adjustments.

Besides the individual unit coil just mentioned, this firm is preparing standard or plain box coils which have from one to four coils in a case. They possess the same vibrator attachments as the dash coils. A quarter sawed oak box is furnished for single coils, and also for two and four cylinder coils if they are together in one case.

A new timer enclosed in a fibre case with a glass top and an ignition dynamo enclosed in a dust and moisture proof case are two new products which they are now constructing, and intend to place before the public soon. The dynamo is sufficiently strong to charge the storage battery and furnish current for the coil at the same time. One of the principal features of this device is that it is very light in weight.



Induction Coil Company's Vibrator Adjustment.



Induction Coil Company's Vibrator.

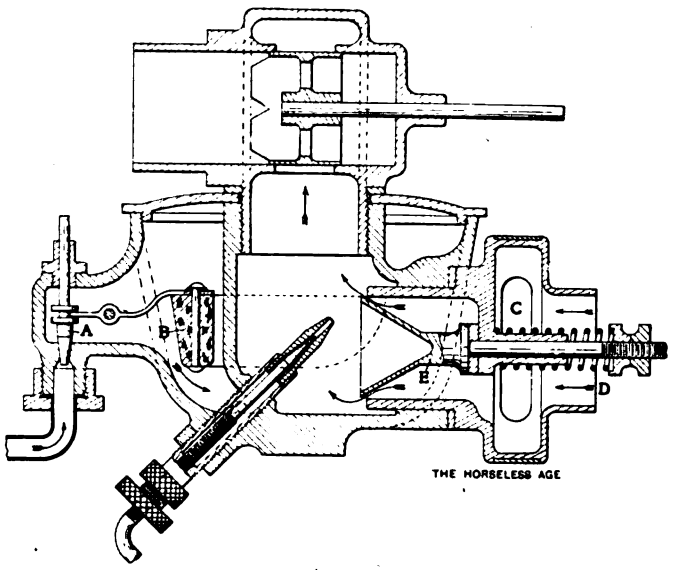
The Sherman Vibrator.

The Induction Coil Company, of Milwaukee, have designed a new coil vibrator adjusting mechanism which is claimed to excel in point of simplicity and durability. No screwdriver or other tool is necessary for making the adjustments. The head of the adjusting screw is provided with V grooves on its under side all around its circumference, into which engages a spring pressed ball whereby the adjustment is locked. This vibrator also has a double spring, one portion of the spring being arranged so that when in motion it engages the other spring, dealing it a so called "hammer" blow, which insures a quick break and prevents sticking of the contact points. The coils of this company are said to be suitable for both battery and dynamo operation.

Morgan's Improved Carburetor.

B. Morgan, of John street, Newport, R. I., has brought out a new automatic float feed carburetor, which is shown in the sectional drawing herewith. The admission of the gasoline to the float chamber is controlled by the vertical needle valve A, which is operated by the hinged horseshoe-shaped cork float B, which surrounds the mixing chamber. The jet is inclined at an angle of about 45 degrees and is provided with an adjusting needle valve, which extends outside of the carburetor housing. The air supply is drawn in through an annular slot C in an extension to the mixing chamber and through the inlet D around the stem of the automatic valve E. This valve is cone-shaped, and as it is drawn in by the suction prevents the inrushing air from passing directly over the gasoline jet and deflects it so that the amount of gasoline lifted depends upon the engine's suction only. A piston throttle valve is fitted in a second extension to the float chamber.

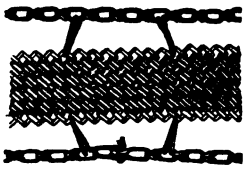
A number of modifications in the design of the carburetor in regard to the position of the throttle valve and air valve extensions relative to each other and to the float feed chamber are shown in order to adapt the device to various motors and cars.



Sectional View of Morgan's Carburetor.

Canne's Metallic Tire Shoe.

Henry L. Canne, of Dingman Township, Pike County, Pa., has secured a patent on a flexible metallic tire shoe, which is claimed to prevent skidding and puncturing of the tires. The device consists of a metal latticework, which is secured by numerous clips to two chain rings running around the wheel at the beads of the tire. The shoe is made in different thicknesses, from ⅛ to ½ inch.



Metallic Tire Shoe.

The complacency with which the French are wont to regard themselves in matters automobile is well illustrated by a passage in a recent editorial in *La France Automobile*, as follows: "If we are beginning to feel foreign competition, it is not at home, but in foreign markets. Until now only French products were known in England, America, Italy and elsewhere, but now one sees there, alongside of our own, cars of home production, manufactured under license or copied after our best makes."

COMMUNICATIONS

Accessories at the Shows.

Editor HORSELESS AGE:

The accessory and sundry exhibits at both shows were very complete and well handled. No startling novelties were shown. The increased number of exhibitors indicated rather that new competitive firms are entering on the manufacture of the various classes of accessories, than that many new accessories are being added to the motorist's catalogue. While last year there were but a few firms offering shock absorbers, speed indicators and some of the other sundries, the shows this year disclose a number of new concerns in each of these lines.

The exhibits of the parts makers were also prominent, though by no means so interesting to the average visitor as were the accessory exhibits. The stands of the parts exhibitors, while used to display their products, were employed more as temporary offices from which to reach the automobile manufacturers in the shows.

Knowledge of a technical sort having become much more general among automobilists, accessory exhibitors seem to have found it to their advantage to put men of special knowledge in charge of their exhibits. At all of the accessory exhibits it was possible to get intelligent, clear explanations of the principles involved in the devices offered, with reasons for everything. This was an agreeable change from previous experiences with demonstrators who could only say that this is a fine thing because "so-and-so," the famous driver, uses it on his car.

ROY S. DRAKE.

The Chauffeur Problem.

Editor HORSELESS AGE:

In conversing with motorists I have been continually impressed with the fact that one of their most difficult problems is how and where to obtain a driver that is both capable and suitable to look after a car and to keep it in perfect running order.

From personal experience I am fully convinced that quite 90 per cent. of the men who apply for positions as, and really consider themselves, "skilled drivers and mechanics," are totally unfitted to look after a car satisfactorily, that considerably more than half the breakdowns and mechanical troubles could be avoided by competent drivers, and that a car that is improperly driven and attended to costs at least 50 per cent. more to run. However perfect a car may be, its usefulness must depend to a very great extent on the comparative proficiency of its driver.

It appears to me, therefore, that it is almost as important for a firm supplying motor cars to be in a position to provide qualified drivers as to sell good cars, as the one is practically useless without the other, and in consequence, I have now a special department for providing men who are "drivers and mechanics" in the real sense of the term, and who are qualified to get the best results from a car.

I first select from the hundreds of applicants those who appear to be the most suitable on account of their references and experience; in accordance with the replies to the letter and list of questions I send to applicants (A) and references from previous employers (B). These men are examined personally by my instructing engineer for a fortnight, on the terms shown in my letter to applicants (C) and their form of contract (D), and those who are found to be intelligent and proficient mechanics are trained by him by a continual course of personal and practical tuition in the construction of the cars in every detail, and how a car should be looked after and driven, enclosure (E) being a list of some of the headings of the subjects on which they are fully instructed.

As a result of this instruction department I am able to provide drivers who have had instruction in the general construction and satisfactory maintenance of the cars, and who can give their employers the satisfaction of knowing that they are not grossly ignorant of the principles of driving and looking after their cars.

The most astonishing point in comparing motor cars with other similar valuable and complicated pieces of machinery, and one which often appears to strike engineers, is the very small amount of attention in the way of adjustments that the average motor receives and that under these circumstances they should give such satisfaction as they do. It is well known that locomotive engines are laid up in the running shed after every few journeys and thoroughly overhauled, whereas the average automobilist is surprised and disappointed if it is suggested to him that his car should be overhauled once every year, and that he requires a properly trained and qualified driver to keep his car in good running order.

As an assistance to the unemployed question motor driving is interesting, as it offers positions to thousands of men and the number of positions is increasing by thousands each year.

S. F. EDGE.

Value of Exponents for Gasoline Engine Compression and Expansion Curves.

Editor HORSELESS AGE:

In L. E. French's excellent article on "Compression," in your issue of January 10, it is stated that Messrs. Brooks and Stewart found the exponent in the formula, $P V^n$ = constant, to be 1.303 for the expansion curve and 1.335 for the compression curve of a gas engine indicator card. Nevertheless, Mr. French advises that "we may, in the absence of actual measurements, use 1.41" as the exponent. It may be teresting to know that by "actual measments" made on more than two hundred dicator cards the present writer found exponents 1.3 for the compression cu and 1.35 for the expansion curve to fi closely as to make it unnecessary to de mine the actual exponent to the third fourth decimal place for widely vary conditions. These exponents were sugge ed for general use in a series of article the writer, published in *Power* in 1900 subsequently in the form of a supple devoted to gas engines. The use of would lead to rather serious errors.

CECIL P. POOLE.
Editor *Pow*

Compression.

Editor HORSELESS AGE:

During the past few months I have re with interest the discussions which h appeared from time to time in your valu journal on the subject of compression. look upon this as a very encouraging sig an awakening, I might say, to the vi importance of compression in a gas engi It is not so very long since that compre sion was commonly looked upon as a s of chance phenomenon, nice to have, b not at all important to the working of engine. Why, only a year ago at the C cago show the writer chanced to be stan ing in front of a certain exhibit presid over by the company's engineer and desig er. This would-be automobile designe (probably originally a bicycle tinkerer was busily engaged in explaining to a gro of visitors that compression was not at a necessary in a gas engine, and, while didn't know within 50 pounds what com pression his engine had, yet he assured hi hearers it was very low and hence the e gine was par excellence. It is just th class of self-styled designers who (becaus they have tinkered up a machine that wi turn over) think they can go ahead and pu up a motor car, a machine which embodies in the most refined degree nearly all the known principles of mechanics and the sciences; it is this class, I say, that has caused the average person of to-day to become so distrustful and skeptical when it comes to "talking automobile."

So I repeat, I am glad to see this topic of compression brought up and threshed out. While it is discussed mainly by those who recognize its importance, yet I fear that they do not heed it enough, as too much stress cannot be laid upon it. That its importance is gradually becoming recognized is well attested by the great care and expense to which a few prominent American firms are resorting in order to obtain perfect fitting pistons and cylinders. The question of going to France for castings or the outlay of four or five thousand dollars for special machinery is nothing if only good compression can be obtained thereby. Cylinders are no longer designed with regard merely to looks, con-

nience and weight; the all important estion now is, how will the metal ex- nd and will this expansion be equal in directions? Some one or two firms now vocate the practice of first simply "rough- g out" their cylinder castings and allow- g them to *cure* in the shop for several onths before giving them the final finish- g cuts. All this leads us to reasonably ex- ct that in the near future the automobile s engine will be very nearly theoretically rfect as regards leakage, and when this age of the art is reached, then, and only en, can we expect to obtain reliable re- lts from the application of theoretical for- ulæ based upon an ideal machine.

In a recent issue of your journal Mr. ay clearly gives us some of the practical easons why it is utter fallacy to apply ome of these formulæ for the computa- on of compression in a modern engine. et us see, for instance, what one of these ormulæ requires in order that it may be pplicable to a practical case. Take the ormula $P_2 = P_1 \frac{V_1}{V_2}$, in which V_1 = volume it atmospheric pressure, P_1 = atmospheric pressure, V_2 = clearance and P_2 = compression. To be applicable this formula requires the following conditions: First, there must be no leakage of the working gases; secondly, the gases must obey Boyle's law, and thirdly, the charge must be a full charge, i. e., taken at atmospheric pressure, permitting of no wire drawing or resistance to the flow of gases into the cylinder. As has already been pointed out, the first condition can be approximately realized in modern practice. The same can hardly be said of the second requirement, as it is obvious that the density of the working gases, an exceedingly variable quantity, is considerably greater than that of air, the nearest approach to a perfect gas. The fulfillment of the last requirement is extremely uncertain and impossible to obtain, fully depending as it does upon the resistance offered to the flow of gases, which, in turn, varies radically with the design of the valve system, time of ignition, speed of the engine, etc. That the ideal cars, of no resistance, cannot be obtained is apparent to all.

Let us now see just how the formula should be modified to meet actual working conditions. It will be observed that the volume V_1 should be something, say X, less than the theoretical V_1, if P_1 is taken as the atmospheric pressure, or vice versa. P_1 must be taken as less than the atmospheric pressure if V_1 is to be the theoretical volume. In either case it is obvious that the product $P_1 V_1$ is bound to be much less than the theoretical $P_1 V_1$. Moreover, it will be observed that the decrease in this product, $P_1 V_1$, is much more in proportion to the decrease in the product of $P_2 V_2$, occasioned by leakage, loss of heat, etc. As the values of P_1 and P_2 will vary with the design and setting of the valves, the carburetor, the speed of the engine and the workmanship thereon, these, of course, should be taken into account in computing the compression in any individual case.

R. B. Otis.

Another One for Steam.

Editor Horseless Age:

I have just been refreshed by that one of the faithful and few who signs himself "Steam" in your issue of December 6. This article expresses my own views so accurately that were it not for the scholarly tone, and its material presence in print, I would surely think I was dreaming it myself; in fact, a certain lady who knows my weaknesses and hobbies better than anyone else in the world accused me of having written it "on the sly."

I want to congratulate this unknown writer upon his pluck in coming out so boldly with such an able defense of the downtrodden steam auto in these days of insane fadism, when it takes a hero indeed to open his mouth if he has anything different from the conventional in his heart.

Oh, how long must we hide our heads in shame, we of the kindly throttle and reverse bar! How long must we blush in nauseating humility when in an unguarded moment we chance to say the hallowed word "steamer" in the presence of the lean faced, muscle twitching, mud backed, crank turning fraternity, and hear that ominous snap of the molars as they close their valuable mouths to further conversation!

I have lately had some gratifying experience with a burned out steam runabout of a noted make. A friend of mine and myself, both quite green at the business, undertook to make a "flash boiler" to supplant the incinerated "pea blower museum." We used proper steel tubing, and after a little floundering produced an excellent generator, which, with a 10 inch burner and 2½ inch by 3½ inch cylinders, drove the stanhope auto everywhere, over country roads, up hill and down, through mud and sand at any speed we dared to take.

The power in that bundle of pipe was a revelation to us, though we were both steam makers of long standing, and now we are convinced that for a light, simple and thoroughly reliable car motor, the steam engine and flash boiler would be hard to beat. It is mighty soothing to know that your motor is reliable, that you can creep along over ticklish places, or instantly fly like a bird when the coast is clear. You have a restful confidence in your machine; you know it is going to do your bidding; your nervous system continues normal, and the dread, reckless spirit of don't care will not possess you, causing you to drive with that "now she is going, I'll get all I can" policy which has been the parent of so many mangled remains.

Yes, get a steam car, a steam conscience and a steam set of nerves, and many morgues will fail.

Pop Valve.

Mean Effective Pressure in Gasoline Motors.

Editor Horseless Age:

A discussion has arisen among the automobilists of this vicinity concerning the average pressure within the cylinder of a gasoline engine while running at normal speed. Can you throw any light upon this subject? Some maintain that the average pressure is over 100 pounds per square inch, while one party claims that it does not often rise above 60 pounds. We realize that the rapidity of the compression and the absolute pressure before the explosion takes place modify the resulting pressure after explosion. Also that the quality of mixture taken from the carburetor does likewise, but we would like to know what the average results in practice are.

The several different formulæ usually given for estimating the power of an engine give this average pressure as one of the elements, and without some means of estimating this pressure we are at fault. If there was no heat developed by the compression, or nothing added from the heat of the cylinder itself, we could easily work out the average pressure from the theoretical law for the compression of gases, provided there were no leaks in the cylinder itself. High speed will, however, cut this loss down to a minimum, and it may be practically ignored in an engine which is in good shape. If you will give this question a candid answer we will be much obliged.

E. H. Van Patten.

[Owing to the special devices required for taking indicator diagrams on high speed gasoline engines, and the considerable difficulties involved in taking such diagrams successfully, very few data on maximum and average pressures in automobile motors have been published. From an article by Dugald Clerk, which appeared in The Horseless Age of December 30, 1903, we note that a test made on a well-known English automobile engine revealed that with a compression pressure of 125 pounds per square inch a mean effective pressure of 92 pounds per square inch was obtained. At half load, with a compression pressure of 80 pounds per square inch, a mean effective pressure of 60 pounds per square inch was obtained. A brake test on another automobile engine gave a mean effective pressure of 90 pounds per square inch, 25 per cent. being allowed for friction losses. From this and some other data in our possession it appears to us that the highest mean effective pressure obtained with high compression engines is between 90 and 100 pounds per square inch. What the average mean pressure in engines is we have no means of telling. The compression employed by different makers varies from 60 to 100 pounds, and the mean effective pressure must vary almost as much.—Ed.]

MINOR MENTION

There were 456 automobiles registered in Indianapolis, Ind., during the year 1905.

An automobile show will be held at the Granite Rink, Toronto, Canada, from March 31 to April 7.

The Burtt Manufacturing Company, Kalamazoo, Mich., will build an addition to their factory in the spring.

The Desmond Automobile Company, Chicago, will erect a factory at Oklahoma City for the manufacture of automobiles.

The Y. M. C. A. of Portland, Ore., announce that they will open a school of automobiling for owners and chauffeurs.

The Columbia Electric Company, of Indianapolis, Ind., have decided to move their factory from McCordsville to Noblesville.

The Portland, Me., Automobile and Power Boat Show will be held at the Auditorium from February 26 to March 3.

An automobile show will be held at Columbus, Ohio, in the spring under the auspices of the Columbus Board of Trade.

The Auto Machine and Repair Company, North Washington street, Wilkesbarre, Pa., has been bought by Ambrose West and Laning Harvey.

It is again rumored that certain alleged basic patents covering steam propelled motor cars are to be made the basis of action against infringers.

The Palmer Automobile Manufacturing Company, Ashtabula, Ohio, recently incorporated, are soon to engage in the manufacture of automobiles.

The Payne Manufacturing Company, of 40 Fulton street, New York city, are introducing to the trade a novel device for cleaning the spark plug of soot.

T. Winton Henderson, of Cleveland, vice president of the Winton Automobile Company, will start the operation of motor car tours throughout Europe this spring.

The Waverley factory of the Pope Motor Car Company, Detroit, will build a third story to their factory, which will be used for the manufacturing of electric commercial vehicles.

Carl E. L. Lipman, Beloit, Wis., has just placed on the market a small gear pump which is designed especially for use in the lubrication systems of motor and transmission bearings.

B. L. Brown, Pittsburg, Pa., has taken over the electric business of the Standard Automobile Company, and will occupy the premises now used by the Highland Automobile Company.

John C. Higdon, of St. Louis, writes us that the Success Automobile Company, of that city, with whom he is connected, will manufacture a low priced runabout, with single cylinder, vertical, 2 horse power engine and two speed and reverse planetary gear. The running gear is the same as that of an ordinary buggy, with common wheels and tires.

F. J. De Janette, Omaha, Neb., is the inventor of a new type of spring wheel for motor vehicles.

The New York and Broadway Rubber Tire Company have merged with the Electric Rubber Manufacturing Company, of Rutherford, N. J. D. D. Martin is the general sales manager.

B. S. Clark & Co., of Providence, R. I., are publishing a little book, "Who Is It?" which gives a list of the automobiles, motor cycles, manufacturers and dealers registered in Rhode Island.

The Huntington Automobile Company, Huntington, L. I., will take over the business of the Automobile Machine Company of that place, and have their quarters in the Underhill Building on Wall street.

The George W. Worthington Automobile Company, which was recently organized in Fond du Lac, Wis., will open a general sales agency on or about March 4 for the sale of electric and gasoline automobiles.

The Brennan Motor and Manufacturing Company, Syracuse, N. Y., elected the following directors at their annual meeting: A. C. Brennan, P. H. Brennan, T. J. Brennan, Ernest R. Deming and Arthur Perkins.

Chester I. Campbell, manager of the Boston Automobile Show, to be held beginning March 10, announces that the committee will lease Symphony Hall as an annex to Mechanics' Hall because of the demand for space.

A class of students of the Shortridge High School, Indianapolis, Ind., are studying storage cells in connection with electric motors, using the shops of the Waverley branch of the Pope Motor Car Company for practical demonstrations.

The Metallic Rubber Tire Company, 52 Broadway, New York city, are sending out notices to users and the trade stating that they are owners of United States patents which they claim cover certain well known metal and leather non-skid tires.

The Motor and Components Manufacturing Company, of Middletown, Conn., will move its business to Des Moines, Ia. It is said that a new corporation, with a capital of $50,000, will take hold of the manufacture of this company's products.

Rumor has it that the Detroit Trust Company are negotiating with A. M. Bentley, of the Owosso Manufacturing Company, for the sale of a carriage factory in Owosso, Mich., and that the manufacture of motor cars will be begun there.

At the annual meeting last week of the Long Island Farmers' Club, a resolution was introduced that only one day for racing for the Vanderbilt Cup next year should be allowed, and thereby eliminate the practice trials. This, however, was amended to allow two days for racing.

At the meeting of the mechanical branch of the Association of Licensed Automobile Manufacturers on January 19, screw threads, their number and pitch, were discussed. A report was received from Jos. Tracy, the association's special representative, who was sent to the Paris Show examine the features of the foreign ca

The new Autolytes sold by A. H. Fu of 83 Chambers street, New York city, a fitted with a pull-up catch that cannot open. The back, which can be opened cleaning the reflectors, is fitted with same style of catch.

William Roche, of 52 Park place, N York city, has improved the two insula terminal spark plug by increasing the dia eter of the porcelain at the sparking e The porcelain is protected from cont with metal by washers and packing.

R. E. Dietz Company, of 34 Laight stre New York city, this season make a sm gas lamp for runabouts, called the Dai they also continue the Peerless, Ideal a Orient types. The bodies and backs of these lamps are now made of one pie with no soldering or riveting. The t and bottoms are seamed on, instead being soldered and riveted, as heretofor These corrugated back lamps and the b let and flat back also are fitted with r movable reflectors for cleaning.

Agency and Garage Notes.

The Wolverine Motor Company, Gra Rapids, Mich., anticipate erecting a facto on Johnson's Creek.

The New York Motor Car Compan have acquired the agency for the St. Lou car for this season.

The Royal Tourist car will be repre sented in Binghamton, N. Y., during 190 by Ensign & Moore.

The Sullivan Auto Company, of Indian apolis, Ind., have been made agents for th Queen and Mitchell cars.

The Wayne Automobile Company, o Detroit, Mich., have made J. A. Rutan their Port Jervis, N. Y., agent.

C. F. Taylor and William Copeland, Pontiac, Ill., have formed a partnership to embark in a garage business.

The Decauville Automobile Company, New York city, have arranged to handle the Babcock electric carriages.

Dr. Frank E. Russell, of Tarrytown, N. Y., has been appointed the Westchester agent for the Stoddard-Dayton car.

A garage is soon to be opened in Saginaw, Mich., by J. Philip Beck and George Fischer. The firm will act as local agents for the new Ford runabout.

A large garage is to be erected on Sycamore street, near Sixth, Cincinnati, Ohio, in which it is planned to rent space to manufacturers for exhibition purposes.

Carl N. Richardson and John D. Manley are erecting a garage on Federal street, Greenfield, Mass., which will be 40x120 feet. The company will be known as the Greenfield Automobile Company, and will act as agents for the Rambler and Ford cars.

The Matheson Motor Car Company, of New York, will act as local agents for the Matheson car, with temporary quarters at 1619 Broadway. They expect to erect a

ge garage on upper Broadway in the r future.

. Deserano, Detroit, has opened a garage repair shop on Scoten avenue.

The Ford Motor Car Company have ened a branch at 318 East Eleventh eet, Kansas City, Mo.

A wareroom and garage, 60x160 feet, is ut to be erected on Spring and Seventh eets, Los Angeles, Cal.

The Standard Automobile Company, Deit, Mich., will this year represent the ckard, Peerless and Autocar.

J. A. Clairmonte, of Los Angeles, has cured the southern California agency for e English and American Napier cars.

Jacob Schiemer & Son have bought out e business of the Central Auto Exchange Alexandria avenue, Detroit, and will nduct a garage and repair shop.

The Morrison-Tyler Motor Company, of oston, have acquired the Marion agency r Massachusetts, Maine, New Hampshire, ermont and Rhode Island.

The H. J. Willard Company, 28 Preble reet, Portland, Me., will handle the Packrd, Peerless, Franklin, Winton, Cadillac, uick and Elmore cars during 1906.

The Palace Automobile Station Company, 348 Trumbull street, Hartford, Conn., re erecting an addition, 40x65 feet, to heir present quarters, which will be fitted s a machine shop.

The Maxwell-Briscoe-McLeod Company, f Detroit, now occupy the premises formerly used by the Oldsmobile Company. It is aid that the Maxwell Company will soon arry a line of electric vehicles.

Legislative and Legal.

AKRON, Ohio.—The Swinehart Clincher Tire and Rubber Company recently made application in the United States Circuit Court to restrain the Motz Clincher and Tire Company from infringing one of the Swinehart Company's patents.

HARTFORD, Conn.—Judgment for $2,500 was recently ordered by Judge Reed to Walter G. Johnson against the Electric Vehicle Company, for injuries sustained by him while out in one of the Electric Vehicle Company's cars.

JERSEY CITY, N. J.—John B. O'Hara and Catharine O'Hara applied to Vice Chancellor Garrison in the Court of Chancery on January 17 for an injunction restraining R. J. Nelson and James Ray from operating a garage near their house, claiming that the noise which emanates from the place is a public nuisance.

NEW YORK CITY.—On the Goodyear Tire and Rubber Company's suit for $25,000 for alleged breach of contract brought in December 23, 1905, against the New York and Broadway Rubber Tire Company, Justice Fitzgerald, of the Supreme Court, on January 17 issued a decision vacating the attachment which took effect on January 20 when the order was signed. The decision stated that the plaintiffs must pay the sheriff's fees, counsel fees and damages sustained by the New York and Broadway Company during the time the sheriffs occupied their premises.

BRIDGEPORT, Conn.—On January 2 John J. Albright filed a quit claim deed for $1,500,000 with the town clerk, releasing the mortgage held by him on the property of the Locomobile Company of America.

PHILADELPHIA, Pa.—Judge Brodbeck, of the United States Circuit Court, of the Eastern District of Pennsylvania, last week refused to grant a stay in a case of suit for infringement of the Selden patent pending the decision of the court in the several chief cases now awaiting decision. The defendant in this case was Stephen de Feher. The counsel for De Feher applied for a stay pending decision in the cases against the Ford Company, John Wanamaker, O. J. Gude and C. O. Duerr, but the stay was refused, and a decree and an injunction against Mr. de Feher was granted.

New Incorporations.

The Plaza Automobile Company, Brooklyn, N. Y.—Directors, H. B. Sands, Abraham Adelberg and Mary H. Sands.

Columbia Garage Company, Spokane, Wash.—Capital, $5,000. Incorporators, Glenn O. Yergy and L. W. Hutton.

The Cronin Automobile Company, Syracuse, N. Y.—Directors, Wm. W. Cronin, Thos. J. Foyle and Anna R. Gleason.

Portland Garage Company, Portland, Me.—Capital, $10,000. Officers, president, A. G. Frost; treasurer, H. R. Stickney.

The Darracq Motor Car Company, New York.—Capital, $100,000. Directors, L. B. Case, C. W. McCandless and Judson Hyatt.

The Cronin Automobile Company, Syracuse, N. Y.—Incorporators, Wm. N. Cronin, Thos. J. Fayles and Anna R. Gleason.

Universal Motor Car Company, New York City.—Capital, $500,000. Directors, M. R. Hutchison, Frederic E. Gunnison and Walter Moffat.

The Rex Automobile Company, Denver, Col.—Capital, $10,000. Incorporators, Harrison B. Robinson, Lansford F. Butler and Milton J. Stair.

The Miller Garage Company, Bridgeport, Conn.—Capital, $35,000. Incorporators, Willard R. Miller, Elmer E. Miller and Chas. H. Peck.

Chalfant Motor Car Company, Chalfant, Pa.—Directors, Millard F. Chalfant, Harry Chalfant, W. Howard Chalfant, Horace S. Boyd and Wm. Michener.

Consolidated Automobile Company, Kittery, Me.—Capital, $1,000,000. Officers, president, Horace Mitchell; treasurer, S. J. Morrison; clerk, H. Mitchell.

American European Automobile Touring Company, Monticello, N. Y.—Capital, $150,000. Directors, Chas. E. Wemple, G. W. McTaggart and Henry A. Taylor.

Anderson Forge and Machine Company, Detroit, Mich.—Manufacture crank shafts and drop forgings. Capital, $150,000. Incorporators, Russell Alger, Jr., president; W. R. Anderson, secretary, and F. A. Hunchman, treasurer.

The Hamilton Automobile Company, Augusta, Me.—Capital, $50,000.

Breese, Lawrance & Moulton Motor Car and Equipment Company, New York.—Capital, $100,000. Directors, S. S. Breese, A. J. Moulton and H. C. Dickinson.

The American Motor Truck Company, Albany, N. Y.—Incorporators, Chas. B. Bishop, Harry J. Babcock, Robert Hall, Bert W. Hall and Henry C. Eddy.

The White Automobile Company, Columbus, Ohio.—Capital, $10,000. Incorporators, C. M. Taylor, H. F. Kruger, W. P. English, C. E. Yoder and J. B. McCaughy.

The Palmer Automobile Manufacturing Company, Ashtabula, Ohio.—Capital, $50,000. Incorporators, Richard Conrad, A. R. Fisk, C. W. Savage, H. Beider and J. J. Farrell.

Westchester Motor Car Company, Port Chester, N. Y.—Capital, $25,000. Incorporators, David W. Glasser, J. Albert Mahlstedt, F. W. Bender, Chas. A. Singer and Frank G. Riker.

Cleveland Automobile Safety Switch Company, Cleveland, Ohio.—Capital, $100,000. Incorporators, Thos. Fleming, John MacKenzie, Frank M. Carroll, Frank C. Carroll and E. J. Mullen.

Van Dusen Motor Car Company, Montgomery, Ala.—Capital, $25,000. Incorporators, A. Q. Kahin, E. W. Van Dusen, Jr., C. S. Creelman, R. D. Johnston, Jr., and D. B. C. Van Dusen.

Trade Literature Received.

Reo Motor Car Company, Lansing, Mich. —1906 catalogue of Reo cars.

Heinze Electric Company, Lowell, Mass. —Circular about the Heinze coil.

Apperson Brothers, Kokomo, Ind.—Illustrated catalogue describing their 1906 models.

Briscoe Manufacturing Company, Detroit, Mich.—Catalogue E of automobile parts.

Dorris Motor Car Company, 1211 North Vandeventer Avenue, St. Louis, Mo.—Catalogue of Dorris cars.

Dodge Lubricator Company, 36 Columbus Avenue, Boston.—Pamphlet describing the Dodge positive force feed oiler.

Michigan Top Company, 15 Duffield Street, Detroit, Mich.—Booklet telling about the Coombs automobile tops.

The Light Manufacturing and Foundry Company, Pottstown, Pa.—Illustrated booklet showing various castings made by this firm.

American Electromobile Company, Detroit, Mich.—Bulletins telling about the 3 ton Electromobile truck and two passenger car.

Hicks Speed Indicator Company, 1384 Bedford Avenue, Brooklyn, N. Y.—Folder showing 1906 model of Hicks speed indicator and odometer.

Club Notes.

Report on Economy Test.

The contest committee of the New York Motor Club have issued a report of the club's first national economy test, held during the week of November 30-December 4, 1905. The complete records of all the cars which ran in the contest are given in tabular form, one table for each daily stage, and there are also a table summarizing the results, a table giving deduced data in connection with the run and a table giving specifications furnished by entrants before the test, to be used in deciding the award of the McMurtry ignition medal. In the outcome it was not necessary to use these facts in making the decision.

One of the tables gives the fuel consumption of each car for the entire trial, reduced to fractions of a gallon per ton mile. These results are as follows:

Name of Car.	Weight of Car.	Weight of Passengers.	Gasoline Per Ton Mile in Gallons.
Marmon	2,330	600	.0657
Reo wagonette....	2,050	1,500	.0544
Reo runabout.....	1,250	600	.0526
Compound	1,890	750	.0505
Compound	1,730	600	.0538
Olds runabout.....	1,425	600	.0728
Wayne	1,870	750	.0708

In closing their report, the contest committee of 1905 submit the following suggestions relative to the running of this test in 1906:

The test should be held during the months of May, June or July. The board of directors should take immediate steps to authorize the contest committee of 1906 to begin arranging at once for the said test, and then make an effort to find out what are the opinions of prominent manufacturers and other leaders in the trade as to the best time and methods of conducting the same. The cars entered should be arranged by classes in future, trophies or medals being offered for class prizes only. It is desirable that cars in a test of this kind should compete only against cars in the same class. The classifications next year should be made upon piston displacement or cylinder capacity. There should be special classes for light trucks, delivery wagons and other commercial vehicles, such as park carriages, buses, etc. The system of recording results used in 1905 should be retained, except that an effort should be made to more fully complete the records day by day, so that a complete report may be prepared and distributed without the delay which has necessarily attended the preparation of this one. In preparing rules for 1906 provision should be made for the computation of depreciation in both machines and tires.

A. C. OF AMERICA.

Xenophon P. Huddy delivered a lecture on "Legal Aspect of Motoring" before the club on the evening of January 23.

AUSTIN (TEX.) A. C.

At the recent annual meeting of the club the following officers were elected: President, J. H. Frances; first vice president, C. E. Ingalls; second vice president, J. E. Plew; secretary, C. P. Westwood; treasurer, John S. Wayman; attorney, J. E. Redmond; surgeon, Dr. M. R. McBirney.

ERIE (PA.) A. C.

The club was recently formed with the following officers: Chairman, F. H. Payne; secretary, N. H. Fleming. The executive committee consists of Davenport Galbraith, F. H. Payne, Fred Densmore, Dr. E. F. Gifford and N. H. N. Fleming. The object of the club is to protect its members and to prevent reckless driving.

CINCINNATI A. C.

The club is preparing to hold a number of hill climbing and straight run contests during the summer. Fifteen trophies have already been offered as prizes. President Duttenhoffer, who attended the meeting of the State Good Roads Association at Columbus last year, stated that the Legislature would be asked to appropriate $500,000 this year and $1,000,000 next year.

ST. GEORGE (N. Y.) A. C.

The annual meeting of the club was held on January 17, when the following officers were elected: President, Chas. A. Schultz; vice president, Emil H. Poehn; treasurer, W. O. Sprigg; secretary, J. J. Worrell, and trustee for three years, Alfred H. Fletcher. It was decided to hold the annual stag dinner on March 3 at Hugot's. The next meeting of the club will be held on February 5, when a proposed amendment to the bylaws will be taken up.

Commercial Vehicle Notes.

The National Cash Register Company, Dayton, Ohio, are using an automobile for carrying cash between the bank and their office on pay day.

It is reported that a company will be organized to operate a line of automobiles between Punta Arenas, Chile, and Puerto Gallegos, Argentine Republic.

The Auto Sightseeing Company, Salt Lake City, Utah, will soon place in operation three Oldsmobile passenger buses, which will be used for sightseeing purposes.

Patents of January 9.

809,337. Power Transmitting Mechanism for Motor Vehicles.—Robert Symmonds, Jr., Kenosha, Wis. Filed April 7, 1905.

809,338. Power Transmitting Mechanism for Motor Vehicles.—Robert Symmonds, Jr., Kenosha, Wis. Filed April 7, 1905.

809,341. Vehicle Brake.—Bartholomew Viola, Brooklyn, N. Y. Filed March 20, 1905.

809,400. Valve Mechanism for Internal Combustion Engines.—William H. Schoonmaker, Montclair, N. J. Filed Feb 11, 1904.

809,406. Variable Speed Gear.—M C. Talcott, Hartford, Conn. Filed Oct 14, 1905.

809,453. High Tension Current D tributer for Internal Combustion Eng —Leon J. Le Pontois, New Rochelle, Y. Filed December 13, 1904.

809,475. Motor Vehicle.—Thomas Sturtevant, Quincy, and Thomas J. St vant, Wellesley, Mass. Filed June 6,

809,509. Motor Car.—Frederick W. L chester, Edgbaston, Birmingham, Eng Filed June 3, 1905.

809,510. Water Level Regulator.—W liam J. Lane and George Lane, Poughk sie, N. Y. Filed February 15, 1905.

809,530. Pneumatic Tire Cover.—Wi liam A. Sankey, Sutton, England. Fi January 24, 1905.

809,533. Wheel Rim.—Charles S. Sa Cadiz, Ohio. Filed May 3, 1905.

809,560. Combined Sparker and G ernor for Gas Engines.—David F. Gra and Frank A. Fox, Stamford, Conn. March 11, 1903.

809,578. Sparking Plug.—William C way, Aurora, Ill. Filed February 15,

809,614. Internal Combustion Engi Henry C. Holloway, Gilroy, Cal. Fi February 6, 1905.

809,620. Steering Mechanism for M Vehicles.—Theodore P. Meinhard, St Louis, Mo. Filed August 7, 1905.

809,641. Vehicle Tire.—James A. Sa hart, Akron, Ohio. Filed April 2, 1904.

809,654. Exhaust Muffler.—Louis Weiss, Brooklyn, N. Y. Filed August 1905.

809,655. Automobile Body.—Allie Welch and Fred S. Welch, Pontiac, M Filed May 29, 1905.

809,656. Automobile Frame.—Allie Welch and Fred S. Welch, Pontiac, Mi Filed May 29, 1905.

809,711. Automatic Speed Regulator Internal Combustion Engines.—John Callan, Lynn, Mass. Filed October 1903.

Renault Shaft Drive Patent Recognized.

According to latest advices from abro a majority of the French manufacture have acknowledged the validity of t Renault shaft drive patent and agreed pay a small royalty. After the patent has been sustained in the last court the Fren Manufacturers' Association appointed committee to look into the matter and ma a report, and the outcome has been as ed above. The owners of the patent h agreed not to demand any royalties cars delivered previous to this year, a even for the current year considerable lowances are made, in view of the fact most manufacturers had already fixed prices and concluded agency contracts, could therefore not pay the royalty wi out considerable loss to themselves.

...THE...

Horseless Age

VOLUME 17 JANUARY 31, 1906 NUMBER 5

WINTON MODEL-K

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Nor did any car actually demonstrate greater Ease of Operation and Control.

The WINTON MODEL K went through congested traffic on the high gear (without juggling of levers or pedals) where other cars required changes of gear.

Its 30 horse power motor carried the WINTON MODEL K up the grades at greater speed than any car having less than 40 horse power.

The WINTON MODEL K engine ran noiselessly and without fault.

The car's gracefully beautiful body lines and its wonderfully comfortable upholstery and Winton Twin Springs won heartiest approval.

And the buying public marveled that such superb value could be purchased at $2,500.

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Volume 1 of "The Motor Car Dissected" (limited edition, but free for the asking) gives more "inside information" on automobiles than any other book we have ever read.

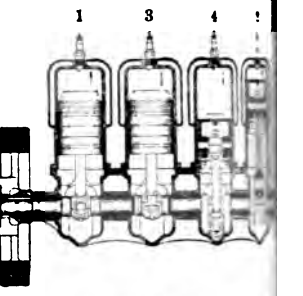
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The TWO-CYCLE ELMOR

Four Cylinders constantly helping one another bear the burden of eight

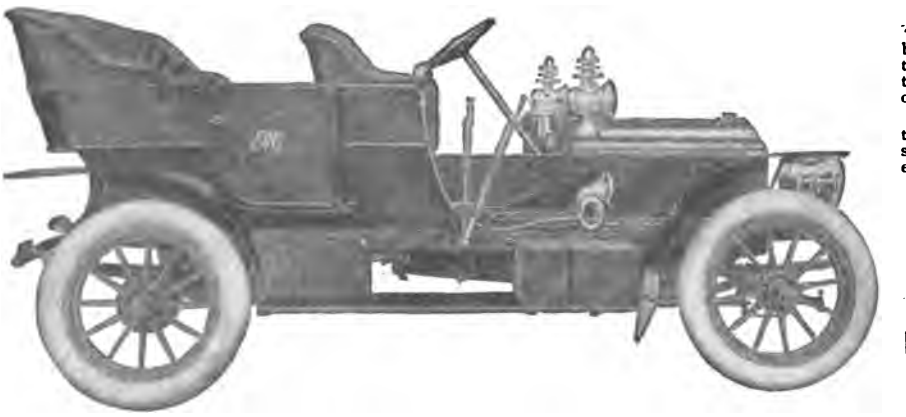
With four impulses every revolution, the Two-Cycle Elmore engine produces a power that can only be equalled in the four-cycle type by the use of eight cylinders. The application of power is always uniform; the force of one explosion impelling the piston half way through the cylinder when another begins.

NOTE.—Cylinder No. 1 shows the piston half way down. The piston of cylinder No. 2 is at this point starting down from another explosion Before the force of the explosion on this piston is exhausted the third cylinder will come into action, then the fourth and then No. 1 again, as long as gas is fed into the cylinder and there is a spark to fire it.



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Actually fifty per cent. of the moving parts done away with. Up-keep reduced fully fifty per cent. Most successful self-starting engine made. When you understand that the Two-Cycle Elmore engine does away with 18 to 20 parts on each of the four cylinders, and absolutely eliminates all inlet and exhaust valves with their attendant mechanism, you'll agree with us that this is the simplest engine in the world.



You can cut out one, two or three cylinders both spark and gasoline. With one cylinder the difference is imperceptible, except in speed two cut out—barely noticeable. Do you see the economy of this?

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Automobile Frames.

By E. S. Foljambe.

The history of the different parts of the automobile has been one of gradual development. Aside from the motive power, the frame presented entirely new problems for the solution of which little data was available. No such data could be gleaned from experience with vehicles previously in use, yet many of the earliest automobile experimenters thought it appropriate to use the body frame as a support for the mechanism. As their cars seldom exceeded a speed of ten miles per hour, this practice in many instances proved fairly successful, but as the power and speed of vehicles increased and greater structural strength without increase in weight was required, other forms of construction had to be looked for. It was then that the makers with bicycle antecedents introduced the steel tubular frames, while others adopted specially designed wood frames. In fastening the engine and bolting on the many necessary parts, these wood frames were much weakened, so that many makers reinforced these weak places with sheet steel. As the cars became longer these metal parts were also lengthened and gradually developed into what is known as an "armored wood" frame.

ARMORED WOOD FRAMES.

This type of frame (Fig. 1), a few of which are built today, consists of a frame of oak, ash or hickory, formed by the long side members or side rails with a cross member at the front and rear, and as many intermediate ones as the case demands. These members are all of rectangular section, varying from 1¼x3 to 3x6 inches, placed on edge or with their greatest dimension in a vertical plane. The armor is made of steel plates of from ⅛ to 3-16 inch thickness, and of a depth at the ends usually equal to that of the wood members, while at the middle the depth is often greater, as shown in the cut. In most cases the armor is placed on the inside and held by bolts or through rivets. Some frames are reinforced by angle iron instead of by plates. The armor plate at the corners is usually bent to a right angle to act as a brace. Such frames very often have beneath each rail a tension rod forming a truss. At the recent Sixty-ninth Regiment Armory Automobile Show about five makers, including two large foreign concerns, exhibited machines with armored wood frames. In one instance the frame was made of nickel steel pressed into a box shape or rectangular section and this entirely enclosed a wood member. Three makers showed cars with frames of wood not armored. The most notable example of this construction is the frame of the six cylinder Franklin car, which has a 119 inch wheel base. The H. H. Franklin Manufacturing Company are strong believers in the wood frame, and their whole line of cars are so equipped. The side seats or sills are made of three pieces of second

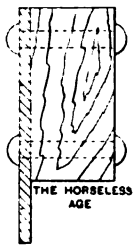


Fig. 1.

growth ash, which has been doubly seasoned. These are put together with white lead and leaded screws, and are so arranged that the grain of the strips is not exactly parallel. On the upper edge is placed another strip or veneer which precludes the possibility of moisture getting in between the strips. Diagonal wood braces at 45 degrees are used at the corners. With this construction great care must be exercised in the method of fastening braces and supports in such a way as not to weaken the frame. These frames are very light, resilient, and yet strong.

ANGLE IRON FRAMES.

Angle iron of light weight was very early used for the construction of frames for small cars, and still continues to be a very popular material for such vehicles. Where more strength was required, I section or channel iron was used. These forms lend themselves readily for such construction, as they present flat surfaces upon which it is very easy to fasten the body or fixtures. However, for large cars this type of frame becomes rather heavy and cumbersome.

A very natural step in the development was to copy the very light and yet rigid construction of the bicycle. This brought forth the tubular type of frame which followed bicycle construction in regard to the fitting, pinning and brazing of sleeves over tubes which were butt jointed or placed end to end. The corners and bracing were made in the same manner by the use of special fittings very similar to those used in ordinary pipe work. Such frames were used extensively for small steam carriages and on several well known small French gasoline cars. These tubular steel frames served the purpose sufficiently well until large powers and long wheel bases came into fashion, when they were inadequate and were entirely superseded by the angle iron or the modern pressed steel frame which, for a given weight, was much more suited to stand the kind of stresses to which automobile frames are subjected, such as repeated stresses due to the repeated and sudden application of a long continued vibration of one end of a piece while the other end is rigidly fastened.

MODERN PRESSED STEEL FRAMES.

With very few exceptions the cars of to-day have pressed steel frames. A pressed steel frame, as the name suggests, is made of thin sheets of steel pressed into form. The metal generally used is open hearth steel, as free as possible from sulphur and phosphorous, and of about "22 point" carbon. This material has a tensile strength of about 70,000 pounds per square inch, and an elastic limit of about 50,000 pounds. The metal as first poured forms a billet. The billets are thoroughly cleaned and sealed, and then rolled to form slabs, which are again passed through rolls to come out as thin sheets. There are two methods of forming the metal into sheets, one by rolling it hot, and the other by cold rolling. The hot rolling is much quicker, as the metal flows into shape very rapidly and the number of times it is passed through the rolls is proportionately less. Heating the metal too often tends to make it weaker, so many prefer the sheets prepared by cold rolling, which, of course, is a much slower process, and when the proper time is taken gives a very tough metal as a result. The price of the cold rolled sheets is about double that of the hot rolled. As far as practicable, the rolling is all done in one direction, which gives the metal a grain or fibre running lengthwise.

The manufacturers who press out the frames usually order the sheets of specified length and width suited to the shape of the finished piece, so there will be as little loss in trimming as possible. They also specify that the metal shall conform to their own individual formula which by experiment has been proved most satisfactory for the purpose. The rolled sheets can be had in almost any length, but the width seldom exceeds 16 inches. Two years back very few frames were more than ⅛ inch in thickness, while to-day nearly all are 3-16 inch. The plates come in thicknesses of ⅛ inch, 5-32 inch and 3-16 inch to ½ inch if ordered. Pressed steel frames just as used are made up of side rails and cross members. The members are usually of channel section form, although one or two use a tube of rectangular section. Fig. 2 shows the usual form of straight side rail. The frame members are pressed either hot or cold, but at present cold pressing prevails. The difficulty of pressing carbon steel hot is the fact that after it cools off it is too soft and must be hardened and drawn to the proper temper for toughness. To do this uniformly is rather difficult. The pieces are given a uniform heat in suitable furnaces, or by being submerged in a lead bath of the proper temperature.

Cold pressing is done either by cam machines or by a hydraulic press. The cam press can be run faster than the hydraulic, but this is not advisable, for if the pressing is done too rapidly the metal will be

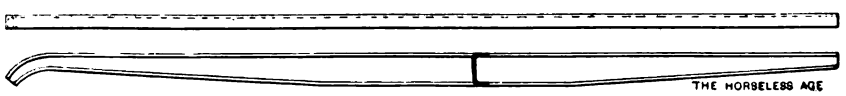


Fig. 2.

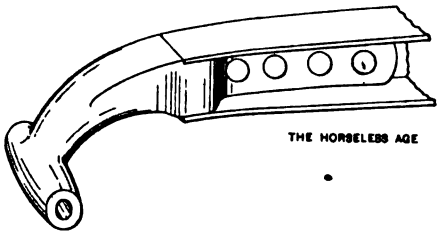


FIG. 3.

strained and not have time to flow into shape. A pressure of from 400 to 500 tons is used, according to the kind of metal and the shape of the piece. To a certain extent this steel acts like a stick of sealing wax, which can be pressed into almost any shape while cold if the pressure is gradual enough, but is injured or fractured if the pressure is suddenly applied. There are in the United States only about three manufacturers of pressed steel frames. Each of these had to design and have built their own machines, as there are none on the market.

Simple forms are pressed in one operation, while seven stages are necessary for complicated ones, or those in which the metal must gradually be drawn out. The side rails are made tapering at the ends and the downward bends are put in after-

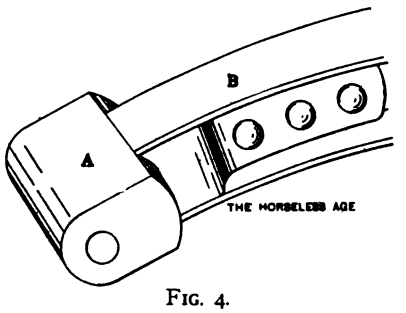


FIG. 4.

ward. An unlimited variety of cross members are used, varying with the requirements of the mechanism to be supported. They are usually of channel section, but in some cases are of steel tubes, manganese bronze castings (when very complicated in form) or angle steel forged into the proper shape. All members are usually hot riveted together. The corners and the juncture of the cross members with the side rail are stiffened by using gusset plates. The ends which support the springs are usually steel drop forgings, either riveted in place or brazed and riveted. Fig. 3 shows an end with rather a sharp downward curve, and its method of fastening with round headed rivets. Fig. 4 shows the same kind of construction, but the steel forging A does not project far beyond the side rail B and has very little downward curve. Fig. 5 shows a common construction at the rear of light cars, where the side rail A extends back beyond the rear cross member C, which is of channel section. A small gusset plate B, riveted as shown to both members, stiffens the corner. In some cases the piece C has less depth and a gusset plate is placed on top and at the bottom of it and riveted to the under and upper surfaces of the flanges A. Another construction is to place diagonally across a piece of channel steel with its vertical web flattened out and riveted against A and C. The rear construction of one of the heavier cars is shown in Fig. 6. Here the steel drop forging has a long overhang, which is formed into a brace which fits against the back of the rear cross member. It is brazed and riveted. One large gusset plate is used. At the end of the forging is shown a steel bar which extends from one side member to the other and projects outside of the side rails to form the support for the spring end. In

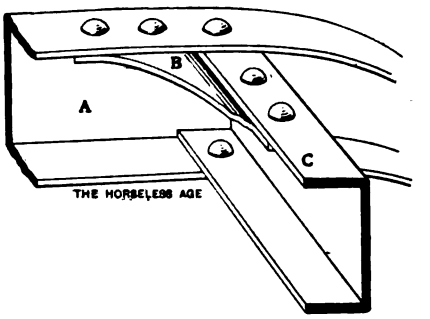


FIG. 5.

Fig. 7 is shown another rear construction used on large cars. In this case the side rail B flares out at the end to form gussets and does not extend beyond the rear cross member C. The drop forged piece A, riveted and bolted on the under side, forms the extension and spring support. Fig. 8 shows the separate parts of a construction known as boxing a spring end. A is the side member, B is a single piece of sheet steel pressed and drawn in the box form

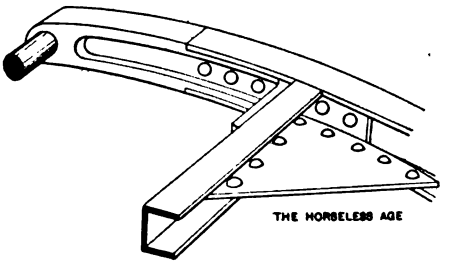


FIG. 6.

shown, and of such a depth that it will just fit into A. It also forms the gusset plates. C is a stub forged from steel and slips up into the rectangular box formed by A and B. The parts are then clamped together,

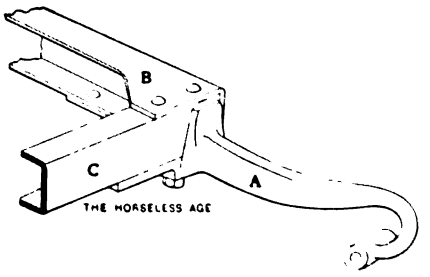


FIG. 7.

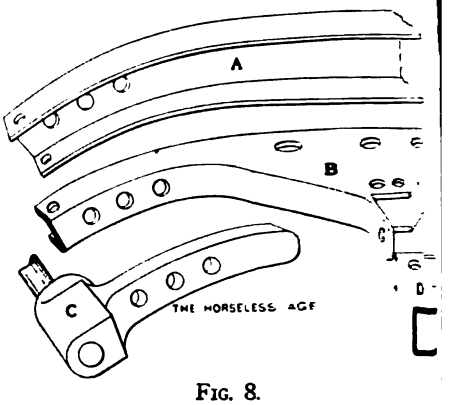


FIG. 8.

drilled and through rivets are put a Piece D is the rear cross member and f between the lip of B and its vertical w is bent, as shown, to form a brace aga the vertical web of A. This is a very lig strong but expensive construction. very similar construction is also used the forward end of the frame. The pr vailing style in steel frames is to narro them at the front for the purpose of gett more clearance for cramping the fro wheels. This practice certainly weake the frame at this point. In consequen many are reinforcing this place by a st

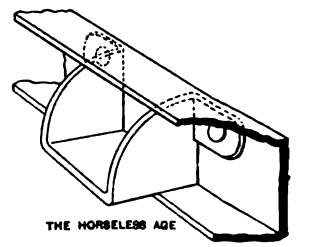


FIG. 9.—FRAME BRACKET.

plate, and others have gone back to the straight frame.

NICKEL STEEL FRAMES.

At the New York Shows about six cars were exhibited which had nickel steel frames. The use of this metal for frames has been brought about by the fact that an ordinary cold pressed steel frame, after being subjected to the continual pounding of the road will sag permanently; in other words, it lacks spring. The new alloys of steel are much more elastic, tougher and stronger, weight for weight, but are very difficult to handle. As far as the writer has been able to learn, there are no manufacturers of pressed alloyed steel frames in this country. However, I am informed by Mannsel White, of the Bethlehem Steel Company (whose name is linked with the latest advances in rapid cutting tool steels) that this company will take up immediately the work of manufacturing nickel steel frames. They have already developed an alloy steel for automobile parts which shows a tensile strength of 270,000 pounds to the square inch. They are still experimenting, and expect by special treatment to get it as high as 300,000 pounds per square inch. Mr. White believes it perfectly possible to make a frame of similar material

:h will be fully two to three times as ng as the ordinary steel frame of the e weight. Special treatment cannot be well applied to frames, but he believes ossible to make a metal which in an ealed condition will show an elastic t higher than the tensile strength of the on steels. With this end in view, the ipany, whose plant is probably the best pted to this work of any in this coun- are going to design and build a com- e equipment for the purpose.

Nickel steel must be worked hot, but, un- carbon steel, if it is properly heated it comes very hard and elastic when cold. e heating furnaces will be heated either oil, gas or directly fired by coal. Oil gas are easy to operate, but give off drogen which is absorbed by the hot el and is very detrimental. By experi- nts it has been found that steel at red at will absorb twenty times its volume of drogen, and is thereby made very brittle. is occluded gas is not in chemical union, t is simply mechanically enclosed be- een the molecules of the steel and can be iven off. This was first discovered in e manufacture of steel wire, which, after ckling, was found to be filled with hydro- n and so brittle it could not be drawn til it was first heated to a cherry red d box annealed. The correct composi- on and handling of these new alloy steels r frames and thin sheet work is prac- cally yet unknown, and can be determined nly by exhaustive tests which will prob- bly prove very expensive. The future evelopments in the manufacture of auto- obile frames, due to the use of alloy teel, I shall not attempt to predict, but the rospect is certainly very promising.

The Stolen Trophy.

During the Olympia (London) Show in November last the "Coupe des Pyrénées," a massive silver trophy valued at $5,000, was stolen from the stand of one of the exhibitors. The mystery of its disappearance has now been partially cleared up by the arrest of Robert Henry Burn, nineteen years old, a jeweler, charged with being concerned with another man in stealing and receiving it. The other man mentioned in the charge is Frederick Hall, who was arrested, and is now on remand, charged with loitering about Olympia for an illegal purpose. It is alleged that on November 25 Burn engaged a carman named Martin to remove a parcel from Oympia. They both drove there in Martin's van, and Hall, who joined them on the way, entered the building and came out with something wrapped up in a cloth. This parcel was taken to Martin's stable, where Burn and Hall, it was said, "did a lot of hammering."

Baudry de Saunier, formerly editor of *La Vie Automobile*, has resigned and started a new weekly journal, *Omnia*, devoted to locomotion. The office of the new publication is 20 rue Duret, Paris.

Fuel Consumption as a Criterion of a Car's Condition.

By Albert L. Clough.

The expense entailed for fuel is so small a factor in the total cost of operation of a gasoline car that, as a rule, owners do not keep very close "tabs" on the rate at which it is consumed in regular use. Nevertheless, the proportion of the amount of fuel used to the mileage traversed furnishes a valuable indication of the condition of a car.

The number of miles which a car will cover, carrying a certain load over a certain road, per gallon of gasoline burnt, will at once inform its owner, who has given consideration to his special case of the fuel question, whether or not it is performing as well as usual. Sudden changes of condition in the car, evident losses of power, manifested in decreased speed and hill climbing power, are readily noticed as they occur and may usually be traced to their sources by characteristic symptoms. On the other hand, the gradual deterioration in the condition of a car which comes about through extensive use may be hardly noticeable from day to day, but may amount to a very material difference in the quality of its running during a period of several months.

JUDGMENT UNTRUSTWORTHY.

One can hardly be sure, on any given day, that one is opening the throttle just the same amount in order to secure a certain speed or hill climbing power on certain roads as was required to give the same results several weeks or months ago. The loss of power may have been so gradual during the period that the increase of gas required has been imperceptible from day to day, but, in point of fact, the added amount of fuel gradually called for may be very considerable. An operator can hardly be expected to remember for several weeks or months just how much the lower gears were required in order to traverse a certain road with a certain load, and he is thus usually unable to compare the performance of his car on that trip with its actions when covering the same ground at a later date. The judgment of the operator is quite unreliable in determining the question of condition during long periods of time. Very often an owner beginning to drive a new car is quite impressed with its speed and power, but after a little while he becomes used to it, its capabilities seem more ordinary to him, and he often thinks it is not doing as good work as it originally did. If he drives or rides much on other cars of higher power, when he resumes the control of his own car he often does so with other and higher standards of performance in mind, and is likely to regard the work of his own lower powered vehicle in an unflattering light.

If, however, an automobilist knows exactly what was his mileage during a certain trip, at a certain speed at the beginning of the season, he has a measure of the car's performance with which he can at any time compare its later condition, if he drives the vehicle over the same route, under nearly the same conditions of load, road surface, speed and quality of fuel. If the later test shows a greater consumption of gasoline he may be sure that the car is in some way or ways less well conditioned than it was at the time of the first run.

GASOLINE AND MILEAGE RECORDS.

If a car is equipped with a trip odometer it may be set at zero each morning that the car is to be used, and if a record of the daily mileage obtained from it is kept upon a calendar pad, and with it is made a record of the quantity of gasoline required to just refill the tank at the end of each day's run, data will be collected for determining the daily miles per gallon that the car is making.

An occasional glance at the figures obtainable from these records will show whether the fuel economy of the car remains satisfactory or is decreasing. The mileage obtainable from a gallon of gasoline on ordinary country roads varies roughly from slightly less than 10 in the case of very heavy vehicles with inefficient engines and wasteful transmission systems, to 20 or upward in the case of light cars with engines of good efficiency and direct and economical transmissions. Experience has shown that about 15 miles on a gallon is a fair average figure for the ordinary four passenger car under normal conditions, and this estimate is certainly as high as is warranted by observed facts.

LOSS OF FUEL ECONOMY.

If a user begins to feel that his car is not doing quite so good work as formerly and finds by consulting his fuel figures that while previously the vehicle has been covering 15 miles per gallon it is now traveling only 12 miles per gallon, he may be reasonably sure that his suspicions concerning the car are well founded, and that it is, in fact, "out of tune." In an automobile which is out of condition the excess of gasoline consumed is accounted for by the necessarily wider throttle opening required to give the desired speed and by the increased proportion of the distance which is traveled on the lower gears, which ordinarily waste much more power than does the direct drive.

When increased gasoline consumption, as well as the driver's observation, indicates that the car is "out of fix," it is usually found that there are quite a number of things simultaneously a little in need of attention, and the problem of setting matters right is sometimes quite elusive and complicated. A single defect, which is complete or very bad indeed, usually demands immediate remedy, but a "complication of diseases" resulting in "general debility" is often difficult of treatment.

LEAKAGE OF FUEL.

Before drawing any conclusion from the rate of gasoline consumption, it is well to determine that no leakage of fuel is taking

place. Occasionally the float needle valve becomes slightly leaky through the roughening of the conical valve surfaces due to constant vibration or on account of small foreign particles lodging therein. The leakage may not be sufficient to cause any loss of gasoline or flooding of the vaporizing chamber while the engine is running, but may be sufficient in amount to lead to a constant slow dripping while the engine is stopped. As it is the practice of many users not to shut off the gasoline supply from the tank when the car is left standing, there may be an escape of fuel in this manner, amounting in time to a very considerable amount. The gasoline will usually evaporate from the floor or be absorbed by the road without forming any noticeable puddle, and unless the carburetor be very closely watched the leak may continue undetected for a long time. The unions on the gasoline pipe which connect its respective ends to the tank and the carburetor float chamber may have become loosened and leaky, and there is always the possibility of a slight split having developed in the gasoline pipe. Considering the danger that is inherent in gasoline leaks, it is surprising that the fuel system does not receive more careful attention than is generally bestowed upon it.

LOSS OF COMPRESSION.

If no gasoline leak be found the figures showing a reduced mileage per gallon are to be trusted as evidence that the car will bear overhauling. In the regular use of a car there usually occurs a very gradual loss of compression, the progress of which is not at all evident to the sense of feeling, because the change is so slow. The piston rings wear so that their ends do not come together, they lose their resiliency or are stuck in their grooves by an accumulation of carbonized oil. Then there is a tendency for valves to gradually become leaky through long use. The exhaust valve particularly is likely to become warped by the intense heat of the escaping charge or to scale or pit, and thus in time to seat very imperfectly. All these actions result in a lack of tightness on the part of the cylinder and, while the volume of gas drawn into it during each suction stroke is as large as ever, there is an escape of fuel during both the compression and explosion strokes, a reduction of the pressure at compression, a corresponding reduction of the explosion pressure and a diminution of power generated during the cycle. In other words, a portion of the fuel taken from the carburetor is thrown away into the muffler and crank case and the rest is used uneconomically.

DERANGEMENT OF VALVE MECHANISM.

Another cause of a progressive decrease in fuel efficiency and of power is the gradual decrease in the exhaust valve lift due to the wearing down of the surface of the exhaust cam, wear of the pin in the roller follower and lost motion in the valve operating rocker arm, if one be used. The wear of the valve stem end and the push rod end and of other parts, if they are not carefully hardened, contribute to this backlash. The result of this reduced exhaust valve lift is to throttle the outgoing gases and to produce a back pressure which is subtracted from the pressure of explosion, and, while the same amount of fuel is burned at a given throttle opening, the production of power is naturally reduced. The same reduction of lift, due to wear of the operating parts, may affect the inlet valve as well, with the result that a lessened charge is admitted to the cylinder and less power produced per stroke, but this defect produces the same effect as throttling and has not much influence upon fuel economy.

MUFFLER BACK PRESSURE.

In the same connection as the reduction of exhaust valve lift may be mentioned the progressive choking of the muffler which sometimes occurs if its passages are contracted and if an excess of oil or a bad fuel mixture is habitually used. The carbon deposits in the muffler passages give rise to an excessive back pressure and an inevitable loss of power and of fuel efficiency, and, as the accumulation is quite gradual, this source of trouble is likely to be overlooked.

No single defect is more surprisingly productive of poor fuel economy than a weak spark due to insufficient battery power or to vibrators which have lost their proper adjustment through long use.

A considerable period may elapse after the spark ceases to be perfectly efficient before it actually begins to fail to produce an explosion, and, during this time, the charges are very imperfectly ignited, the initial pressure is very low or very late in being realized and the mean effective pressure in the cylinder, and consequently the power developed, is very unsatisfactory. A considerable portion of the charge, when ignited by a weak spark, seems to escape unburned or only partially oxidized. The deterioration in the quality of the spark, being quite gradual, may not be realized by the operator, or identified as a cause of trouble, unless close account is kept of the fuel consumption.

CARBURETOR OUT OF ADJUSTMENT.

There is always a chance that the carburetor gasoline adjustment may have changed on account of the loosening of the set screw, or that the air admitting poppet valve or swinging damper in the carburetor air inlet may be prevented from acting, because of having been fouled with mud. A bad mixture and consequent low fuel economy will be the result. A great change in temperature or the use of the car in a much higher or lower altitude may render the original gasoline adjustment imperfect and prove to be the cause of wasted fuel.

WASTE IN TRANSMISSION.

The above mentioned defects, which may be the causes of observed wastefulness of fuel, affect the production of power; in other words, the engine. But sometimes wastefulness in applying the power may account for the increased consumption of gasoline. A driving chain is likely gradually to stretch and become very much out of pitch with the sprockets, thus wasting in friction a considerable amount of power.

There may be a lack of lubrication somewhere which may not be serious enough to give immediate notice by heating or sticking of the parts, but still produce serious "drag." Brake bands or shoes may fail to entirely part contact with the drums when released, and reverse and high speed bands may be dragging. These defects, while individually insufficient in themselves to attract the atention of the operator, still cause the car to run hard and to the waste of fuel and contribute to the general unsatisfactoriness of the car's performance.

The Automobile Testing Plant of Purdue University.

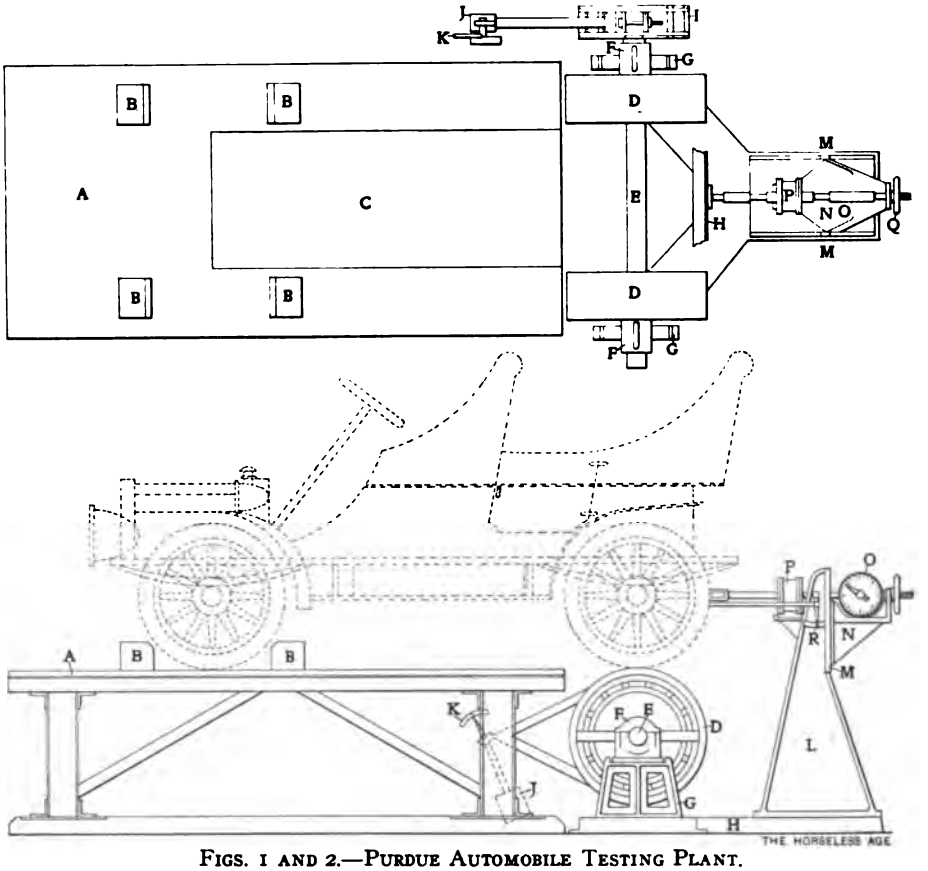
Purdue University at Lafayette, Ind., has installed an automobile testing plant. The design of the plant has been worked out under the general direction of W. H. Goss, dean of the Schools of Engineering, assisted by Professors J. R. Mc... and W. O. Teague. It follows lines which are similar to those of Purdue's locomotive testing plant, and constitutes a mechanism upon which an automobile of any type, whether steam, electric or gasoline driven, may be mounted and operated. While thus operated the power delivered and the efficiency which marks the action of the machine may be determined. A plan and elevation of the plant are set forth in Figs. 1 and 2. By these it will be seen that an automobile mounted for test has its driving wheels carried by the supporting wheels of the plant. These wheels are upon an axle which revolves in fixed bearings. Thus mounted, the automobile is held in its desired position by a connection with a traction dynamometer which, in Fig. 2, appears at the rear of the machine. A friction brake on the axle of the supporting wheels absorbs the energy delivered by the machine. A motor driven pressure blower delivers air through adjustable piping for cooling the radiators of steam and gasoline machines, and a motor driven exhauster takes air from a point near the exhaust of the machine, thereby freeing the laboratory of obnoxious gases.

Concerning the theory of action, a glance at Fig. 2 will make clear the fact that if the supporting wheels were blocked so that they could not turn, the automobile would, if started, tend to move forward with its full tractive power, even to the extent of slipping its wheels upon the supporting wheels. Its tendency to move forward in this case will be registered as a pull upon the dynamometer. If, on the other hand, the supporting wheels are frictionless, then the turning of the wheels of the automobile through the action of its machinery will not result in any pull upon the dynamometer, for if frictionless, the supporting

:el can offer no reaction for such a pull. : supporting wheels are, in fact, neither :ked nor frictionless, but the design is have them turn against a resistance the ue of which may be varied at will. The angement is such that whatever this re- :ance may be it appears as a stress on draw bar. The resistance is regulated means of a friction brake, to which erence has already been made. By its justment the automobile may be made to ll little or much upon the dynamometer; at is, it may run under a light or a heavy ad, as may be desired. In all cases the ıergy delivered by the automobile is the oduct of the pull exerted at the draw ır into the distance passed over by the ead of the driving wheel. Thus, the orse power delivered is equal to the pull pon the dynamometer in pounds, multi- lied by the space passed over in one ıinute by the automobile driving wheel, ivided by 33,000. The space passed over ; most conveniently found by determining he number of revolutions of the support- ng wheel, since the latter is of fixed diam- ter; that is, the determination is based ıpon the length of the path traveled, rather han by the revolution of the driver.

Fig. 3 is a photograph of the plant with ıutomobile removed, looking toward the lynamometer. Fig. 4 is a partial view of :he opposite end showing the traction dyna- nometer, and Fig. 5 shows the supporting wheels and friction brake.

The platform is built up of I beams and angle iron, and is heavily planked. The car is backed up onto it, and the rear wheels are run out over removable blocks to the supporting wheels. The rear axle



FIGS. 1 AND 2.—PURDUE AUTOMOBILE TESTING PLANT.

is then connected by means of straps and an equalizing bar to the pull rod of the traction dynamometer. This dynamometer is mounted on an adjustable cast frame which is bolted to the floor. It is provided with a large dial so that readings may be easily made.

In Fig. 5 will be noticed the friction band composed of annular metal strips and wooden blocks and the hand screw by which the amount of friction is varied. It will be seen that the inner side of the friction wheel rim is provided with flanges which tend to hold the water which, for

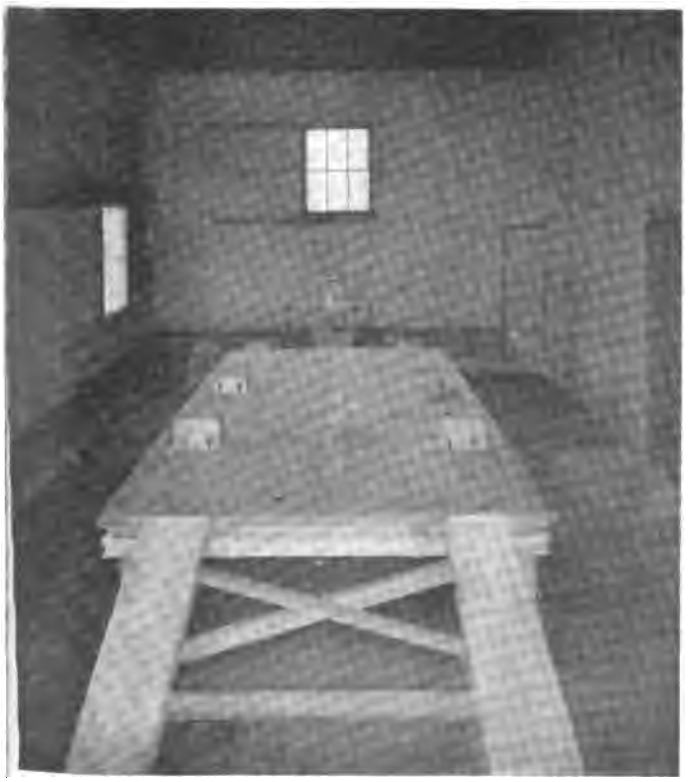


FIG. 3. PURDUE AUTOMOBILE TESTING PLANT.



FIG. 4.

purposes of cooling, is fed to the rim through a pipe, the end of which can be seen in the photograph. The friction band is connected by means of a strap to a pivoted weight attached to a fitting bolted to the floor and provided with a pointer which indicates upon a graduated sector the amount of retarding influence exerted by the band upon the friction wheel during the test.

While the plant will lend itself to studies of a highly refined character, it is proposed during the present winter to determine the output of power under various conditions of running of a considerable number of typical machines.

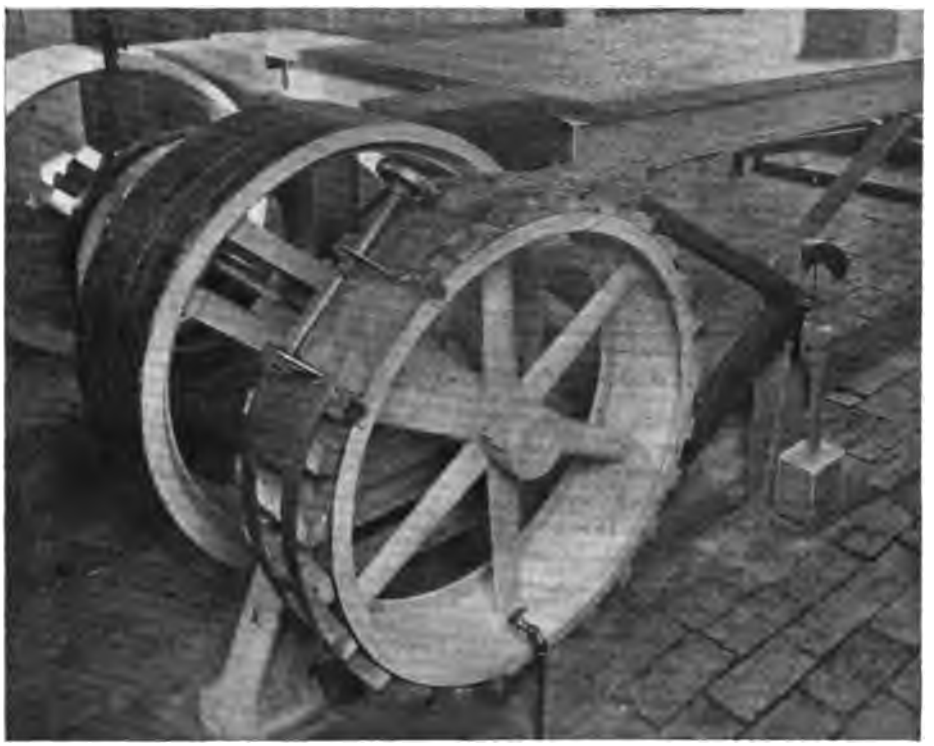


FIG. 5.—FRICTION WHEEL OF PURDUE TESTING PLANT.

"Laying Up" Storage Batteries.

Referring to the recent inquiry in these columns as to how to treat storage batteries which are to be put out of commission for a certain period of time, the C. W. Hunt Company, of West New Brighton, N. Y., send us their pamphlet containing "Instructions for the Care and Operation of the Hunt Storage Battery Locomotive," which contains the following:

"The battery can be taken out of commission in the following manner: Give the battery a complete charge and syphon off the electrolyte. As each cell is emptied, refill the cell immediately with pure, distilled water. When all of the cells have been filled discharge the battery by running the locomotive without a load on a level track, until the voltage drops to .45 volts. When this point is reached, syphon off the water, and the battery may then stand without water in the cells until needed."

Rating of Automobile Gasoline Motors.

BY ALBERT L. CLOUGH.

A study of the rating of the engines of this year's cars is a matter not devoid of interest. Data were obtained as to the bores, strokes and published horse powers of over eighty cars of the four cylinder type, the cubic inches of piston displacement possessed by each was computed, and this volume was in each case divided by the rated horse power, thus giving the cubic inches of piston displacement per horse power. When a hyphenated horse power rating was given (as was the case with over a third of the engines studied) the mean of the two ratings was taken as the horse power. These figures representing "cubic inches of piston displacement per rated horse power" were then averaged, and the mean was found to be 10.19 cubic inches. In other words, the average manufacturer credits his four cylinder motor with one horse power of output for each 10.19 cubic inches of volume swept by the pistons per revolution.

That this practice in reasonably uniform among all the principal manufacturers is shown by the fact that the average deviation from their mean of these "cubic inches per horse power" figures is but .9 cubic inch or about 8.8 per cent. There is probably a greater uniformity in the rating of engines of this type than ever before. Still there are some quite wide departures from the average practice of rating. One engine, which is manufactured by a concern which has been somewhat noted for the high rating of its product and which has been accused (whether justly or not) of publishing "instantaneous" brake tests, credits a motor with a horse power for each 7.85 cubic inches of piston displacement. The most conservative rating is that of the motor of one of the oldest and most reputable of the manufacturers, who rates his motor as delivering 1 horse power for each 14.57 cubic inches of cylinder volume. That this motor is underrated in comparison with the others in the list is quite possible. In order to find out one may "ask the man that owns one." The latter of these two engines, though larger both in bore and stroke than the former, is rated at 8½ horse power less. These two manufacturers accord each cubic inch of piston displacement capacities for power production one of which is about double the other.

For roughly computing the rated horse power of 1906 four cylinder engines the following formula will be found to fit the average case:

$$\text{Horse power} = \frac{.7854\,D^2\,L \times 4}{10.19}$$

where D = the bore in inches and
L = the stroke in inches.

If it be remembered that the formula refers solely to four cylinder motors it may be written H. P. = .3083 D^2L.

It should, of course, be borne in mind that this formula merely enables one to compute the horse power of an engine in accordance with the average practice (or perhaps one should say fashion) in vogue at the present time. In the summer of 1903 the present writer obtained figures upon the "cubic inches per rated horse power" of the automobile engines concerning which data was then available. The dimensions of a goodly number of them were obtained, many of them of the two cylinder type, however. The average value of the "cubic inches per rated horse power" then obtained was 191 inches, or not far from double the average found for this year's motors. In other words, the average manufacturer is according to every cubic inch of his motor's piston displacement an efficacy nearly twice what he credited it with in 1903. How wonderfully the gasoline vehicle engine seems to have improved in the interim! It is interesting to conjecture how many (or how few) cubic inches will be required in 1908 to produce a "horse power."

Calendar of Automobile Dates and Events.

February 3-10.—Chicago Show, Coliseum Building.
February 5-10.—Washington Automobile Show.
February 12-17.—Detroit Automobile and Sporting Goods Show.
February 17-25.—Cleveland Show.
February 26-March 3.—Portland, Me., Show.
March 3-10.—Philadelphia Show.

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The Frelinghuysen Bill.

The first automobile bill of the season has been introduced in the New Jersey Legislature, and though it has been drafted by an automobilist who claims to have toured extensively here and abroad it contains many provisions which are extremely objectionable. "The bill embraces many of the provisions of the French and Austrian regulations," says Senator Frelinghuysen, and he seems to think that this is all the argument necessary to prove that it would make an ideal automobile law for the Mosquito State. It has not been the custom in the past for American legislators to go abroad for examples of fair legislation; on the contrary, every patriotic American has been imbued with the idea that the laws of his native land were more liberal and more equitable than those of European states. What has been the success of the French and Austrian regulations that they should serve as models for automobile laws in this country? The present French regulations have entirely failed to prevent reckless driving and to provide the desired protection for the public, as, since they have been in force, a number of governmental committees have been successively appointed to investigate the subject of automobile traffic and make recommendations for more effective legislation. The present Austrian regulations have been in effect less than a year, and are of a more or less tentative nature. But even if these regulations had been found suitable for the countries in which they were originally adopted, it would be no proof that they would be equally suitable here, chiefly because of the difference in topographical conditions. American villages and towns are built on an entirely different plan from those of France and Austria, with their narrow winding streets, which require far greater caution on the part of the automobile driver.

The avowed object of practically all this automobile legislation is to prevent furious or reckless driving, and to protect the life and limb of the public who use the highway. The proper way to accomplish this is to prescribe maximum allowable speeds, at least in built up districts, and to make the driver responsible for damage done, owing to his incompetency, recklessness or negligence. An elaborate system of examining, licensing and taxing will not reduce the amount of fast driving on the highways in the least, because, as has been emphasized again and again, the majority of the drivers arrested for speeding are professional hired drivers, most of whom could pass with honors any examination that could reasonably be demanded. If the records of speed cases and of automobile accidents be analyzed it would be found that in the great majority of cases negligence and recklessness were the underlying cause, and not incompetency. Where incompetence is mentioned as the cause of an accident, inability to control the car at extreme speeds or in an emergency is usually referred to, and the examination could hardly bear on these points. The system of examination proposed in the Frelinghuysen bill would provide a number of politicians with desirable jobs, and that is probably all that would come of it.

Power With Different Systems of Ignition.

It is not generally credited among automobile engineers that the same motor is capable of greater power with low tension or make and break ignition than with high tension or jump spark ignition, but this is, nevertheless, a fact, and may eventually decide in favor of low tension ignition as the preferred system. The difference is entirely due to the greater heat normally contained in the contact

spark or arc. Owing to this very same cause the low tension spark does not require as much advance at high speeds as the jump spark. A number of foreign manufacturers using the make and break provide no spark advancing device whatever, simply depending upon the increasing heat of the magneto generated spark to give more rapid ignition at high engine speeds. Anybody familiar with the jump spark system will admit that it would be impracticable to employ it without varying the time of the spark, as the engine would either run unsteadily at low speed or develop comparatively little power at high speed. The two systems may be easily compared where they are fitted to the same car, and the change from the one to the other can be made by simply throwing over a switch. Of course an individual case does not admit of drawing general conclusions, but in most instances the contention that a motor will develop more power on the contact than on the jump spark will be borne out by experience.

Two Cycle Motors on Commercial Wagons.

The interest which the manufacturers of pleasure cars have begun to take in the two cycle engine seems to be more than equaled by that evinced in this type of motor by builders of gasoline commercial vehicles. There are already several makes of delivery wagons on the market which are equipped with motors of the two cycle type, and one of the important Eastern manufacturers of heavy commercial trucks has recently announced that his 1906 product will be engined with motors employing the two stroke cycle.

It has been realized almost from the earliest beginnings of the art that business vehicles must of necessity be of simple design, so as to be successfully operated by drivers who are but very slightly versed mechanically, and hence simplicity of mechanism has always been regarded as an important desideratum in their construction.

The inherent simplicity of the two cycle motor is evidently making a strong appeal to commercial vehicle manufacturers who have given consideration to the limited technical ability likely to be possessed by the prospective operators of such cars. It is evident that the elimination of all valves and of the secondary shaft and gears which the two cycle engine secures will prove a step toward the elimination of the possible roadside derangements with which the average motor truck driver might find difficulty in dealing successfully. In a case like this, simplicity, even though atttained at the cost of some disadvantages in other directions, such, for instance, as greater fuel consumption, might on the whole be desirable.

Thus far, the two cylinder motor has generally been found adequate for the propulsion of American commercial cars, and the adoption of the two cycle engine of two cylinders would insure a torque closely resembling that of the four cylinder Otto cycle motor, while still retaining the desired degree of simplicity.

Commercial cars propelled by air cooled motors have met with success, and it is not likely that a very long time will elapse before air cooled two cycle engines are commercially exploited for the propulsion of business vehicles. The commercial vehicle field is less hampered by technical tradition and example than is the pleasure car field, and radical departures from accepted methods are not so unlikely to take place in it. One thing is reasonably certain: for a long time to come the successful commercial car must be the simple car of rugged, substantial design and construction.

Facilitating Gear Shifting.

Automobile change speed devices of ordinary construction, especially those of the sliding pinion variety, call for a certain degree of dexterity upon the part of the operator in order that the speed changes may be effected with smoothness and without subjecting the mechanism to undue stresses. The likelihood of the occurrence of a sudden jerk or shock when changing from a high to a low gear is especially great, as it is only when the motor is speeded up by just the proper amount, before the clutch is re-engaged, that it will take up the driving of the car on the reduced gear ratio without a jar. The skillful chauffeur is able, through long practice, to increase the speed of his engine by just the right amount before letting in the clutch, and thus avoid the sudden checking of the car speed, which occurs when the car mechanism is coupled to the engine when the latter is running at a rate less than that corresponding to the car speed. The unskillful operator is often unable to regulate his engine speed and clutch engagement with the necessary nicety, and both the passengers and the car mechanism suffer in consequence.

One of the high powered 1906 cars is equipped with an arrangement incorp in its sliding pinion change speed which is designed as a safety device t vent the above mentioned difficulty, a secure other advantages.

The driven gear of the side shaft, is in constant mesh with a mate on th gine shaft, is not fast upon its shaft drives the side shaft through a ratche pawl device, which releases and allow gear to turn idly when the side shaft to be driven by the momentum of the at a greater speed than that at which engine shaft is turning. The car can under no circumstances drive the en through the side shaft, but the ratchet pawl device is effective, at all times, t low of the driving of the shaft and the by the motor. When a change is made the direct drive to the intermediate or f the intermediate to the low gear, e though the engine be not speeded up to p vide for the difference in speed ratio tween it and the car which will be ca by the change of gear, there will be no p itive engagement between the motive po and the change speed gear mechanism un the speed of the latter has fallen to a point correspondence, when the motor will be to drive the car at the greater reductio ratio, and the change will have been effecte without shock. Whnever the engine spe is suddenly reduced the car coasts free the motor and a change to a lower gear ca then be made without danger to the gears even though the clutch be not disengaged This arrangement is similar in its effect t that of the dead pedal coaster as applie to bicycles, and naturally involves the con dition that the motive power, under certai conditions, cannot be used as a brake. De pendence must then be placed upon me chanical brakes and not upon the retarding effect of the motor, which, when closely throttled with retarded or entirely interrupted ignition, may otherwise be used to moderate the speed of a vehicle in a very effective manner.

When the above described arrangement is employed, the motor may be employed as a brake, so long as the direct drive is in use, as the ratchet device is then inoperative, but on the intermediate and low gears the car is free to overrun the engine, and the regular brakes must be relied upon.

The German Automobile Club has been granted permission by the Emperor William II. to style itself "Kaiserlicher Automobil Club" (Imperial Automobile Club).



DELIVERING MAIL BY MOTOR CARS.

Motor Cars in Mail Service.

During the Christmas rush the postmaster Detroit, Mich., placed four motor delivery ons, made by the Rapid Motor Vehicle npany, of Pontiac, in service. They e in use from December 19 to 26, and e operated between stations and in mak- collections and deliveries of mails. It said to be largely owing to their use the Christmas Day mail, which on pre- is occasions had, to quote an official, n "piled to the office roof until late in day," was entirely cleared way by 10.30. uperintendent of Mails Fuller said, when d about the experiment and the use of mobiles by the post office in general: the Government adopts motor car de- y of mail it will probably be done by ract. The contractor will have to have a cars, which he could rush to the scene breakdown without delay. There is no t but the time will come when auto- iles will be adopted; the mails can be lled so much more quickly than by pres- methods."

livering Coal With an Electric Truck.

order to test the practicability of the r truck in their particular line of busi- , the F. G. Hartwell Company, coal ers, of 277 Dearborn street, Chicago, have recently purchased and put into mission a 5 ton electric truck. The of this vehicle is 12 feet in length 5 feet 4 inches wide. Besides the oard, which is fastened by chains n ordinary coal trucks, an innovation is duced in the way of additional facili- for unloading. Gates 2 feet wide are d in the sides of the car, 5 feet back he front end, which swings upward and eld in place by staples. They make it possible to unload the coal without backing the truck against the curbing and thereby obstructing the thoroughfare.

The truck is equipped with Firestone solid tires, 6 inches wide on the front wheels and 7 inches on the rear. It has a twenty-one plate forty cell battery, having a capacity of 350 ampere hours.

To obtain an idea as to the work this truck is doing, a representative of THE HORSELESS AGE spent a day upon it. At 7:45 a. m. the first load of 10,400 pounds of hard coal left the yards at Fourteenth and Clark streets, and after pumping over innumerable railroad tracks, proceeded over pavements of all sorts from cobbles to asphalt, to the Great Northern Hotel, a distance of about 1 mile, delivered this turned to the yards, rea When reloaded, the sc pounds on the truck. the same place, the run was made, and the bigg amounting to 10,700 po on.

Some little time havi count of blocked traffic sage of railroad trains, when the truck started make this delivery at A West Madison street, a miles. There had beer day previous, and the st things up a bit and cau



A CHICAGO DEALER'S ELECTRIC COAL WAGON.

come exceedingly slippery. The truck was proceeding westerly at the rate of about 7 miles an hour, when suddenly it skidded toward the curbstone, and to the surprise of all was headed east when stopped. The resourcefulness of the driver then became apparent. He ordered his helper to descend and to sprinkle several shovelfuls of coal dust over the pavement in front of the wheels. This gave the tires a chance to secure traction, and the truck started again. This load was delivered at 12:35.

At 2:20 p. m. the truck was again loaded, this time with 10,100 pounds, for the Great Northern. Another load of 10,300 pounds was delivered at the gas works at Twenty-fourth and Canal streets, a distance of about 1½ miles, after which, it being then 4:30 p. m., the truck was driven back to the barn and put up for the day.

The summary of the work accomplished by the car on this day shows that though no great amount of territory was covered, 51 miles all told, the coal delivered amounted to 51,800 pounds. The driver stated that when he was driving a horse drawn vehicle the average day's delivery amounted to but about 20,000 pounds, and the mileage covered was much less than that covered by the electric truck.

Hopedale's Motor Hose Wagon.

The town of Hopedale, Mass., has lately adopted an electric combination chemical and hose wagon, made by the Waverley branch of the Pope Motor Car Company, it having passed its final test for acceptance. This test included a trial of speed, hill climbing ability with some 300 or 400 pounds above that called for in the contract, as well as a practical demonstration of the time saved in getting under way over the old method with a horse drawn engine. The wagon is said to have developed a speed of over 16 miles per hour and climbed a hill of about 13 per cent. grade under poor road conditions with ease. Ten seconds was sufficient time for the truck to start and be on the street after the alarm was given.

The power equipment consists of forty-eight cells of Exide battery, furnishing current for two motors. The chemical equipment was made by the Howe Engine Company, of Indianapolis, and the fire extinguishing apparatus includes besides the chemical engine, ladders, some 1,000 pounds of auxiliary hose, besides the hose for the chemical engine, buckets and extinguishers and the usual equipment of axles, bars and tools.



HOPEDALE'S ELECTRIC CHEMICAL HOSE WAGON.



LA RUE'S GASOLINE FIRE ENGINE.

A Gasoline Fire Engine.

The Howe Engine Company, of Indianapolis, have recently completed for use in La Rue, Ohio, what is said to be the first gasoline automobile fire engine and hose wagon manufactured in this country. It weighs about 3,000 pounds ready for service, and has a maximum speed of 30 miles per hour. The power equipment consists of a four cylinder 32-34 horse power Rutenber engine mounted over the front axle and under the bonnet. The power is applied to the rear wheels through a countershaft and side chains. A double clutch is used, so that the engine may be employed when the vehicle is stopped to operate a triplex pump which is said to be capable of throwing 300 gallons of water per minute in a stream 150 feet high. Hand levers are fitted, so that if the engine fails for any reason the pump may be operated by hand. The vehicle is designed to serve as a hose wagon as well as an engine, and for this reason space for carrying hose is provided at the rear. Wooden tires are fitted, composed of four blocks to each wheel, cut with the grain of the wood running toward the centre of the wheel.

Audible Speed Indicator.

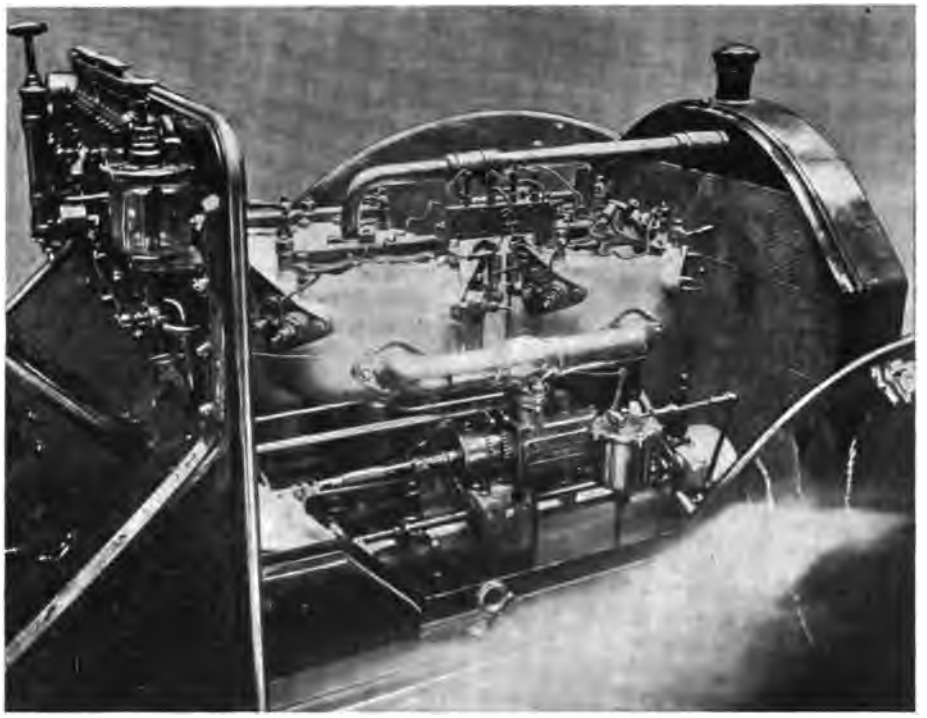
The latest foreign novelty in motor car speed indicators does not indicate the speed visibly, as is usual in all other instruments, but gives an audible warning by means of a small bell contained within it after the fashion of an alarm clock. The instrument may be set to sound the alarm at any desired speed between 10 and 30 miles per hour, so that it is of use by day as well as night, and is also an absolute check on every mechanician. Another use of the indicator is that it makes all the passengers legal witnesses of the speed, while the advantage which it possesses of never calling the driver's attention off the road minimizes the risk of accidents. The total number of miles run during the season up to 10,000 miles is recorded, and the exact number of miles run daily is also shown. It also records the amount of gasoline used, the record being maintained on the face of a dial registering up to 100 gallons, and situated on the near or left hand side of the casing containing the mechanism. The instrument is adaptable to all cars, and particulars of it are obtainable from the Lumsden Auto-Meters, 33 and 35 Summer street, Aberdeen, England.

ew Vehicles and Parts.

Mercedes 1906 Model.

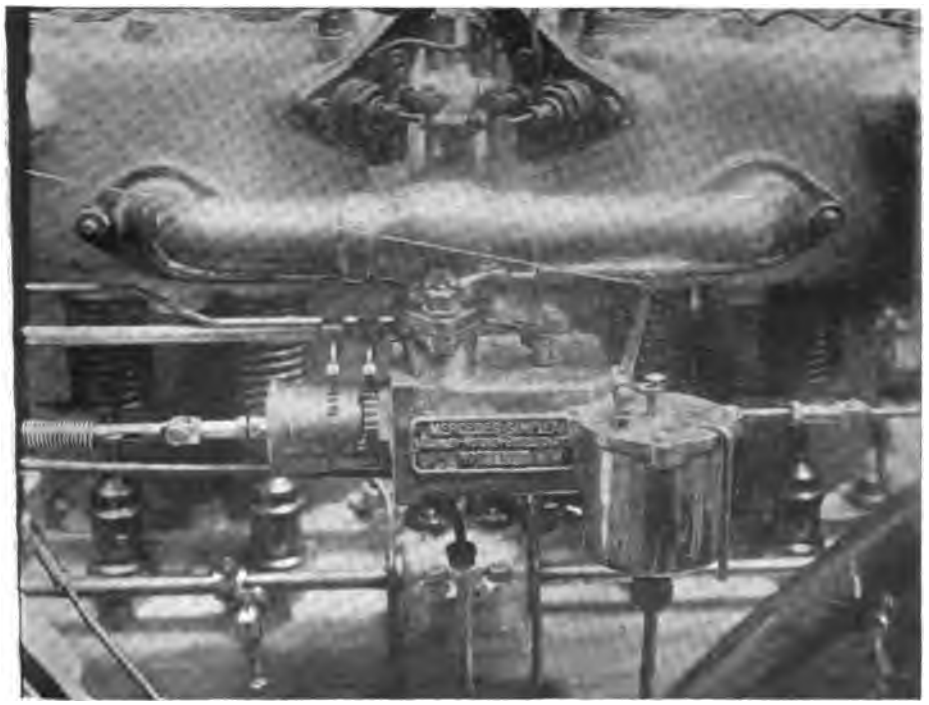
The latest models of the Daimler Motor-Gesellschaft of Unterturkheim, near ıttgart, Germany, have arrived in this ıntry only recently, and one 35 horse-wer car was exhibited at the 69th Regi-ent Armory during the last days of the ow. Mr. Allen, of the American Mer-des branch, was kind enough to permit e writer to go into all the details of the test productions of the famous German rm.

In general the 1905 model has been closely ollowed, all the following features being etained: Pressed steel frame, cellular adiator, I section front and rear axles, xhaust pressure fuel feed, exhaust pres-ure oil feed with sight feeds on the dash, vater cooled foot brakes, selective gear hange system, internal expanding and en-losed emergency brakes on rear wheels, scroll type metal clutch, semi-elliptic springs with "pump handle" extensions on rear springs, cylinders cast in pairs, valves oper-ated mechanically and located on opposite sides of the motor, low tension (Simms-Bosch) magneto ignition, pump circulation, flywheel fan, compression relief by stepped exhaust cam, irreversible steering gear, aluminum pan extending underneath all of the machinery, ball bearings on gear shaft and on the axles. The model has been changed in a number of details, however, and a description of these improvements ought to be of particular interest, for the reason that while the Mercedes engineers have practically settled on a standard de-sign, these are points in which they recog-nize that progress is still possible.



MERCEDES ENGINE SHOWING CARBURETOR AND IGNITION BLOCKS.

The motor is of 110 mm. bore and 140 mm. stroke, and is claimed to develop 35 horse power on the brake at 800 r. p. m. The water jackets extend down about one-half the cylinder length, and the water space around the valve chambers has been increased in depth. The crank shaft is mounted on three D. W. F. ball bearings, each being supplied with lubricant by means of an oil tube from the distributer on the dash. All the three bearing feed pipes are interconnected, so that if one feed should accidentally fail, the bearing will be sup-plied with lubricant anyhow. The bearings also receive lubricant through the splash in the crank chamber. The I section forged steel connecting rods have their crank pin bearings babbitted, a practice which has been followed by the Daimler Company for many years, and proven extremely satis-factory.



THE MERCEDES CARBURETOR.

The crank case receives all the surplus oil working through the ball bearings on the crank shaft, and it is also supplied with lubricant by means of the hand oil pump and reservoir on the dash. Oil may also be poured directly into the crank pit through a standpipe with two branches at its lower end, one to each compartment of the crank chamber, the latter being divided by a par-tition to prevent excessive lubrication of some of the cylinders when the motor is tilted, as in ascending and descending grades.

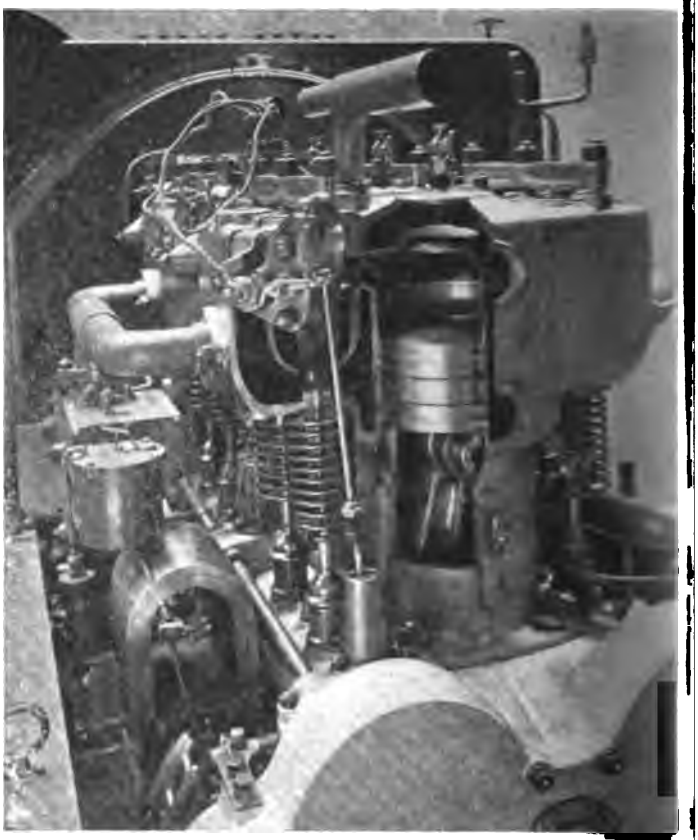
The reservoir of the oil pump is replen-ished through a pipe from the main oil supply tank seen on the right of the dash. The cylinders are lubricated, each by a separate feed from the distributer, the same as heretofore, and in addition they are lubricated by splash. The cam shaft and cam gears are inclosed, the latter being located at the forward end of the motor. The guides for the valve rods and igniter rods are provided with stuffing box ar-rangements, which prevents any oil oozing out through these bearings and soiling the external parts of the engine. The cams for operating the igniters are cut on the in-let valve cam shaft, and the igniter plugs or flanges are bolted to the corners of the valve boxes, to facilitate their removal for cleaning. Relief cocks are placed directly over the igniters, the object being to allow of cleaning the points by blowing the gas through these relief cocks, or by injecting kerosene through them.

The magneto, which is coupled to the pump shaft, as seen in the photo, is now

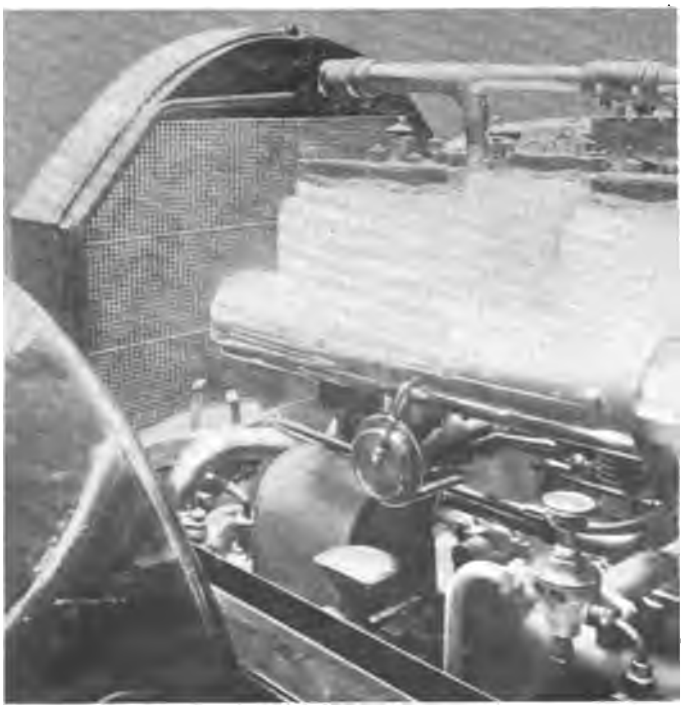
placed on the left side of the motor, on a platform provided for it by extending the crank case arm. There is a similar platform on the right hand side of the motor, and the writer is informed that a coupling on the governor shaft on this side provides for the installation of a high tension magneto for supplying a set of spark plugs, if the owner of the car should desire. The governor acts on the gas throttle and runs through the mixing chamber, which is a new practice for this firm.

The 1905 model carburetor has been retained, the multiple jet carburetor which was fitted to a new Mercedes model shipped to England a couple of months ago having evidently not proven quite satisfactory. Several improvements have been made in the old type of carburetor, however. Means are provided in the pipe supplying warm air to the carburetor for adjusting both the quantity and the temperature of the air, by by-passing more or less of it. The means of making these adjustments is evident from the photograph of the exhaust side of the motor. The auxiliary air ports, the shape of which has been carefully determined by extended experiments, are still retained, but experience has shown that even better results are sometimes obtainable by slightly varying the openings of these ports, so the makers have now introduced a rack and pinion device operating on an annular registering valve, as seen in the detailed photo, this valve being adjustable by fine gradations by means of the small levers working on finely divided sectors on the dash. The stop jet over the spraying nozzle is still retained, and is adjustable from the seat. This constitutes a comparatively simple carburetor in which all of the variables are under the control of the driver. The float may be "tickled" (the carburetor primed) from the dash, which obviates the necessity of lifting the bonnet.

The steering gear is essentially the same as in the 1905 models, except when the oil is fed at the top of the worm, and the steering gear housing may be filled with heavy lubricant through an opening closed by a screw plug. A total of four brakes is provided. Two work internally on the rear wheel hubs, being operated by a hand lever through a toggle joint mechanism. There are two foot brakes, one acting on the lay shaft of the change speed gear, thus acting through a pair of bevel gears and the differential, while the other acts on the jack shaft, thus acting only through the differential and chains. Both of these brakes are water cooled, the same as formerly. The brake drum on the lay shaft of the transmission has a flange bolted to it, the periphery of which is cut with saw toothed notches, and a pawl is provided which, when released by means of a small handle on the dash and a coarse pitched screw locks the wheels and prevents the car from moving backward. A simple and effective contrivance is provided for quickly adjusting these brakes, consisting of a knurled thumbscrew having a V notch cut into it and fitting over a projection on the upper half of the brake which is similarly shaped. The lower of the brake band has a link hinged which passes through the above mentioned thumbscrew, so that it is merely necessary to give the thumbscrew one-half turn to the right or left to adjust the brake



SHOWING CYLINDER AND PISTON IN PART SECTION.



EXHAUST SIDE MERCEDES ENGINE.



THE MERCEDES CLUTCH.

. wing nut similarly made is used on the y shaft brake.

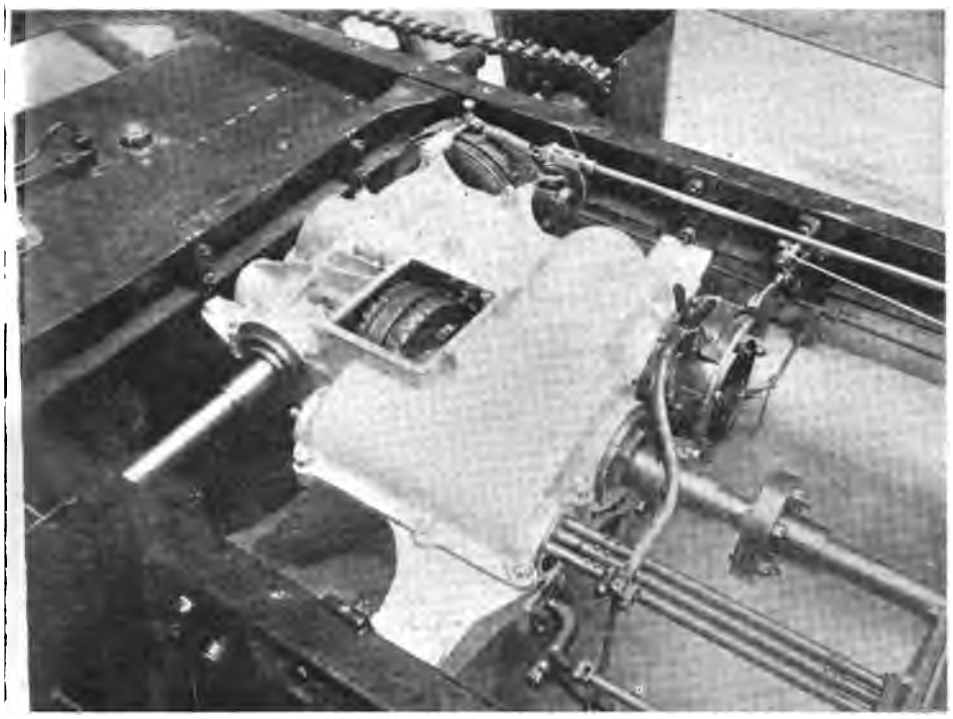
The pump has been altered, being smaller nd provided with two bearings, one at ach end, and both are fed with grease from cup placed on the dash. The pump deliv- rs the cold water directly under the ex- aust valve chamber, and it leaves the motor n top, as in the 60 horse power model of 905. The return pipe to the radiator, vhich formerly was in one piece, is now parted in the middle and coupled by a piece of hose and two clamps.

The clutch is of the scroll type, as used for some years, but is now encased in a bronze drum or shield, to retain the grease and oil, allowing smoother action in starting, especially for city travel, where considerable clutching and unclutching must be done. In addition thereto a grease cup is fitted on the flywheel boss which feeds grease to the clutch as often as may be desired. The hand pump on the dash has a twoway distributing cock, with one oil pipe feeding to a groove in the crank case to the clutch spring. Two forks are now fitted to withdraw the clutch cone instead of one, as was formerly used. The flywheel spokes are cast fan shaped, and act to draw cold air through the radiator, a feature which the Mercedes people claim to have patented.

The springs are extra long, half elliptic throughout, and clamped by wedges into a neat block, which has a single machine steel bolt passing through the axle instead of two box clips and four bolt heads as used heretofore.

The starting handle is fixed in an upright position by a neat forked latch. The engine speed is controlled from the wheel, and in addition there are a foot accelerator and a foot pedal for cutting out muffler. The motor is governed, but the foot pedal cuts the governor out.

The transmission has been radically altered by using a gear case which fits the contours of the gears and is heavily ribbed, which assists in eliminating the sounding board actions of a large plate. There are provided four forward speeds, with direct drive on the high speed, which necessitates the use of two driving bevel gears and two driven bevel gears. The gear case is extended more to the rear, to provide for a side entrance body, and gives more weight on the driving wheels, as well as shorter chains. The clutch shaft is of necessity lengthened, and therefore supported in the middle, on a ball bearing hung from one of the cross members of the frame. The rear wheels are 920x120 mm., and the front 910x90 mm.—a combination very often seen on foreign cars. The radius rods are I section steel forgings. The wheel base is 125 inches. The fuel tank is carried in the extreme rear; it has a funnel shaped opening containing a gauze filter to strain the gasoline, and there is also a strainer on the gasoline line to the carburetor. The gear box cover is readily removable for inspection by merely turning a half wing nut, which is kept in position by being passed over and through a stud on the gear case cover, and having a helical spring within to keep same under pressure in the gear box.

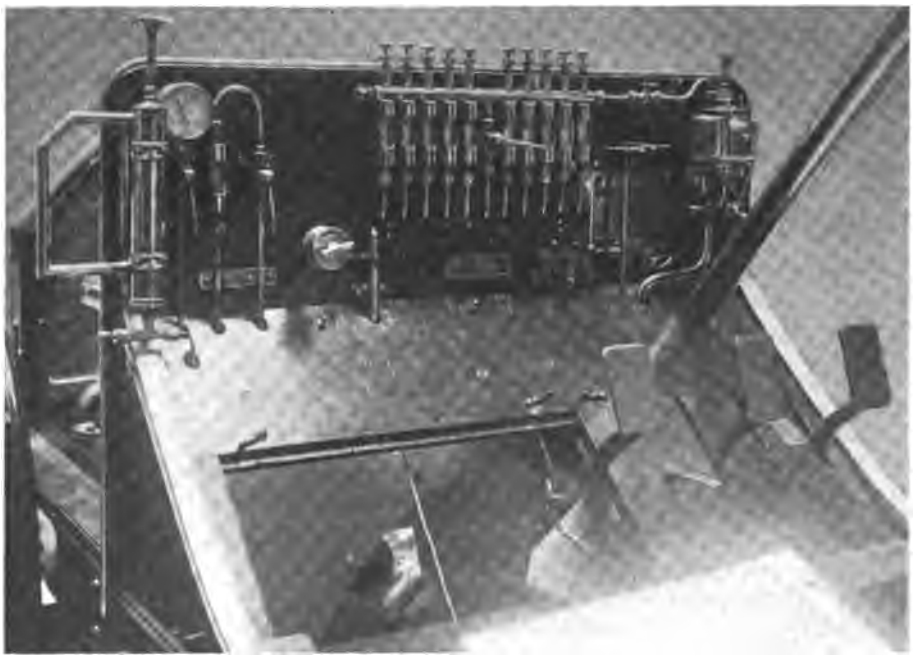


MERCEDES GEAR BOX AND TRANSMISSION BRAKE.

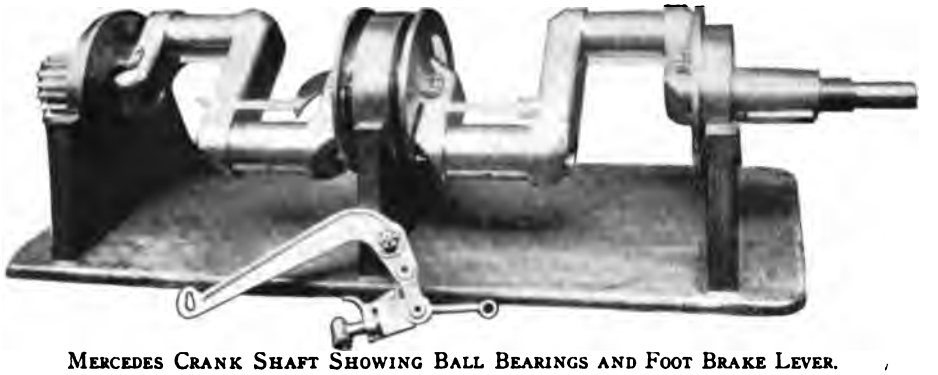
The American Mercedes.

With the object of permitting Mercedes cars to be sold to American purchasers without paying the high duty of 45 per cent. ad valorem, the Daimler Motoren Gesellschaft, of Unterturkheim, Germany, a little over a year ago made arrangements with the Daimler Manufacturing Company, of Astoria, L. I., by which the latter company was empowered to manufacture exact duplicates of the German Mercedes cars in this country. The contract between the two firms is one insuring continued co-operation, and the models which the Daimler Manufacturing Company will make this year show the same improvements as the latest German Mercedes models. So close is claimed to be the similarity between the German and American built Mercedes cars that the Daimler Manufacturing Company guarantee all their parts to be interchangeable with the corresponding parts in the same German model.

The Daimler Manufacturing Company will turn out two models the coming year—



VIEW OF MERCEDES DASH.



MERCEDES CRANK SHAFT SHOWING BALL BEARINGS AND FOOT BRAKE LEVER.

a 45 horse power and a 70 horse power. The 45 horse power was exhibited at the recent Sixty-ninth Regiment Armory Automobile Show, and the parts for sixty of these cars are now coming through. The 70 horse power model is less advanced, as not all the patterns for this car have yet been completed.

A representative of THE HORSELESS AGE recently was permitted to go through the works of the Daimler Manufacturing Company and noted some points in their manufacture which may be of interest. All work is done from drawings made in the designing department at Unterturkheim, which are here changed to show titles and remarks in English. In some departments where many German workmen are employed, like the pattern making department, for instance, the original blue prints are worked to occasionally. The metric system of measures is used exclusively.

The frame of the car is pressed by an American firm from imported stock. There are 112 drop forgings in the car, all of which are furnished by the Krupp Steel Works. These include the gear blanks, which are forged of chrome-nickel steel. There are four steel castings in the mechanical make-up of the car, including the flywheel (nickel steel), the clutch operating cone and the two halves of the differential gear case. The crank shafts are turned out of the solid slabs, and these, as well as the cylinder castings, are also imported. Not all the material used in the construction of the car is of foreign origin, however, for all such parts for which the company felt equally good materials could be obtained here are made from American stock. This applies to all bronze castings, for instance.

One peculiar feature in the construction of the Mercedes car is the amount of metal that is removed in finishing most of the parts. The front axle, for instance, which is of I section, is originally forged with a solid square section, except near the ends, and the I section is obtained by machining. The web of the axle is reduced to only 9 mm. (about three-eighth inch). Similarly the wheel hubs are originally massive forgings of 40 pounds weight, which in the process of machining are reduced to 5 pounds. The reason for removing so much stock is that the same strength could not be obtained if the parts were forged to size. The front axle is forged in a single piece and is not welded in the centre, as are most I section forged axles.

It has often been remarked by casual observers that the steering pivots on the Mercedes have a very short bearing, and may be expected to wear rapidly. This opinion is based on the mistaken notion that the middle portion of the pin is the bearing part. The steering knuckles on the Mercedes car are of what is known as the inverted Elliott type, the fork being forged on to the pivoted stub. Now, contrary to usual practice, the pivot is driven tight into the hole through the boss or hub forged on the end of the axle, and the knuckle swivels upon the ends of the pin, and as all these parts are of high grade materials the construction is very substantial. The rear spring horns are this year made straight, and are an improvement over those used last year, on esthetic grounds.

The steering gear is of the screw and nut type, both the screw and the nut being cut from steel with quintuple thread. The nut has considerably more bearing surface than last year.

The valves of the Mercedes motor are shaped from one piece nickel steel forgings, and have flat seats. Inlet and exhaust valves are interchangeable with each other. The cams are forged with the cam shafts, a practice that was first introduced by the manufacturers of the Mercedes. The writer noticed that the closing curve of the exhaust cam is concaved to insure very gradual closing, while the opening portion is straight. The exhaust cams are of d... width, and small auxiliary cams are fo... nearly opposite the main cams, but ... half as wide. These hold the exhaust v... open during a portion of the compre... strokes, thus relieving the compression. ... bring these compression relief cams ... action it is necessary to shift the exh... cam shaft axially, and that this may ... done the auxiliary cams have a slop... approach on one side.

The writer was informed that every bo... ing on the car that can be ground is gro... and that all plane finishing is done w... surface millers, no shaper work being do... on any part. The body is of the Daim... Manufacturing Company's own construc... and is notable for its light weight. ... made of sheet aluminum, with a w... framework, seats seven people and weig... complete with trimming and upholste... less than 300 pounds. There is a fol... seat in the tonneau, which comfortably ... commodates two full size persons, who ... forward in riding. Considerable ingen... has been displayed in the design of the b... framework to secure a maximum strength with little weight. Screws are u... very sparingly. The beading is solid w... the frame and not nailed or glued on.

Kirkham Motors.

The 1906 product of the Kirkham Mo... Manufacturing Company, of Bath, N. ... will consist of a line of automobile motor... ranging from 12 to 24 horse power in thre... four and six cylinder types; also a line ... air cooled engines for motor cycle use co... sisting of a 2½ horse power single cylinde... and a 5 horse power double cylinder type. The automobile types of motors are mad... in 12-14 horse power three cylinder ... cooled, and 12-24 horse power three cyli... der, 15-18 horse power four cylinder, a... 24-30 horse power six cylinder water cool... types, all being of practically the same de... sign, so that a description of the 18-22 hors... power machine will cover the entire *line* except as to size.

The 18-22 horse power motor is of th... four cylinder water cooled type. The cyl...



THE AMERICAN MERCEDES.

r bore and stroke are both 3¾ inches, the weight complete is 265 pounds. se motors are all tested, we are in-ned, to give 26 brake horse power maxi-n before shipment. The speed ranges n 150 revolutions per minute to 1,600 olutions per minute with load.

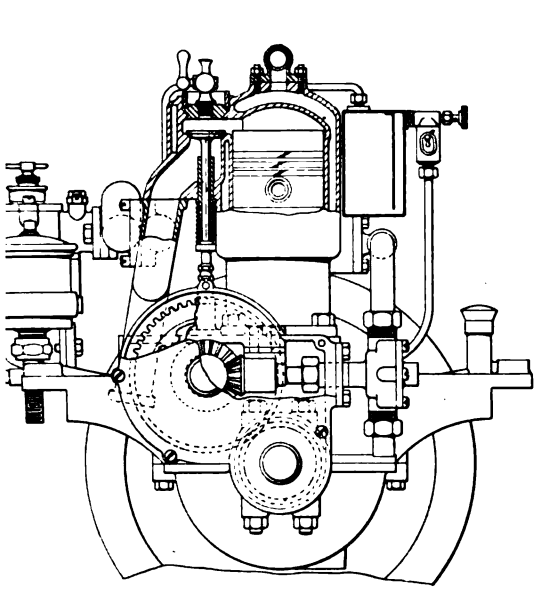
he crank case is an aluminum alloy ing parted on the horizontal centre line, has all shaft bearings fastened to the er half, leaving the bottom half free to removed for inspection of the bearings hout disturbing any other part. The sup-ting arms are cast integral with the up-half of the case and are of the hollow

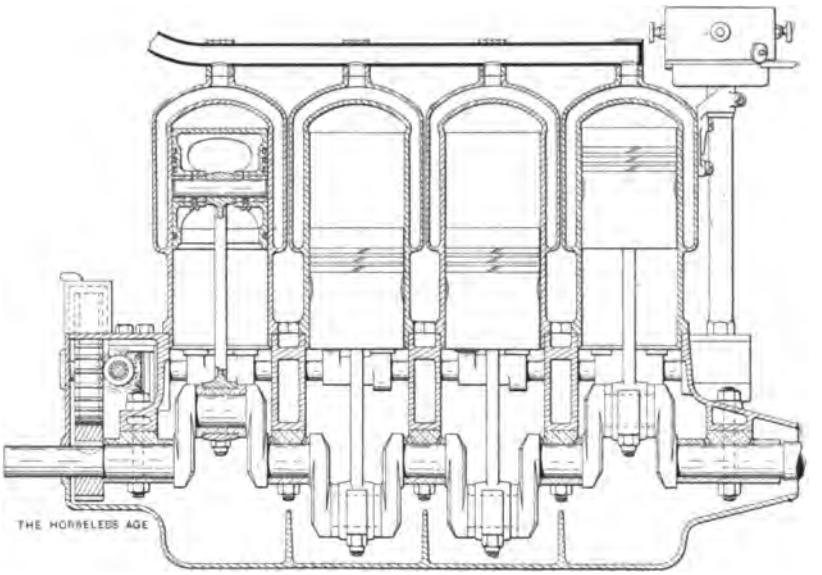
size. This shaft is supported by five large phosphor bronze bearings lined with Parsons' white brass bushings, sweated in. These bearings are all fastened to the upper half of the case by long steel bolts extending through to the top of the crank case, thereby relieving the crank case of all strain from explosion. All bearings in these motors are hand scraped. The flywheel is fitted to the crank shaft with a taper and key, and is made to allow of the use of a cone clutch when desired.

. The cam shaft is made from high carbon stock three-quarters of an inch in diameter and supported by three bronze bearings; it

cial timer and distributer being employed. This timer, which is shown in the line cut, is oil tight and possesses no movable wire connections, all connections being stationary. The primary contact in this timer is made with one pair of platinum points. The timer is located at the rear of the cylinders on a vertical shaft and is operated from the cam shaft by spiral gears which are enclosed in an oil tight housing.

The engines are furnished complete with an automatic carburetor inlet and exhaust piping, spark plugs, timer and distributer; pressure feed oil system (tank fastened at the rear of the cylinder) and water pump





Two Views of the Kirkham Four Cylinder Vertical Gasoline Motor.

nclosed type, having case vents in the outer nds.

The cylinders are cast from a special lose grain iron of a semi-steel nature. They are cast with integral heads and water ackets, the valves being located in a pocket t the side of the cylinders, all on the same ide. The valve pocket is very small, bring-ng the centres very close to the cylinder, which gives an approximate cylindrical com-bustion chamber without the use of over-head rocker arms, which are detrimental to quiet operation. The cylinder bores are finished by grinding, as are also the pistons and rings.

The pistons are made of the same grade of iron as the cylinders, and are very light, as may be seen from the line cuts herewith. The piston pin is of tool steel, hardened and ground, and is journaled in the piston bosses, instead of in the connecting rods, as usual, this arrangement giving 50 per cent. more bearing surface. The piston pin is a tight press fit in the connecting rods and is retained by taper pointed set screws. The piston is fitted with four eccentric flat lap rings which are ground on three faces. The connecting rods are special drop forgings fitted with Parsons' white bronze bushings at the lower end, and clamped to the wrist pin at the upper end.

The crank shaft is drop forged from high carbon steel and has all bearings ground to

is driven by a steel cut gear of 1 inch face on the crank shaft, which drives a phosphor bronze and fibre gear on the cam shaft. This is claimed to make an absolutely quiet combination. The cams are made from machine steel, milled to the exact size, case hardened, and fitted to the cam shaft by Woodruff keys and taper pins. Special care is used in the timing to secure uniform distribution.

All the gears at the front end of the motor, including the pump gears, are enclosed in oil tight housings which form a part of the upper case. The valve push rods are made from machine steel, case hardened, and have a very wide bearing on the cams. A small spring is provided inside of the guide which keeps the push rods always in contact with the cams. The top of the push rods is adjustable for wear, as shown.

The valves are all mechanically operated from the one cam shaft, located on the right side of the motor. They are made from steel drop forgings and are all interchangeable. The valve covers are made in two parts, the lower one of which is cast iron with a ground joint in the cylinders, and the upper piece is screwed into the cylinder and acts as a locking ring for the lower part, this being claimed to give an absolutely tight joint without packing.

The high tension synchronized system of ignition is used with these engines, a special timer and distributer being employed. This timer, which is shown in the line cut, is oil tight and possesses no movable wire connections, all connections being stationary. The primary contact in this timer is made with one pair of platinum points. The timer is located at the rear of the cylinders on a vertical shaft and is operated from the cam shaft by spiral gears which are enclosed in an oil tight housing.

The engines are furnished complete with an automatic carburetor inlet and exhaust piping, spark plugs, timer and distributer; pressure feed oil system (tank fastened at the rear of the cylinder) and water pump and piping. The water pump is located at the front end of the motor on a cross shaft which is driven by a pair of bevel gears from the cam shaft. The weight of this engine complete as shown is 264 pounds.

The Twentieth Century Tool Box.

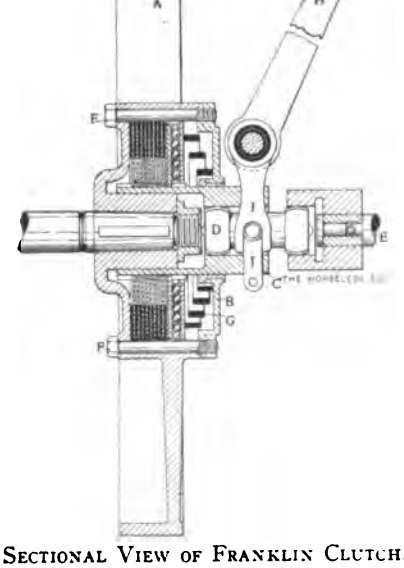
Patterson, Gottfried & Hunter, 146-150 Centre street, New York, have brought out the "Twentieth Century Tool Box," which is of cylindrical form, with drum of cold rolled steel, cast steel ends and wooden drawers. The case is oxidized and lacquered, the cast steel ends are brass plated, and the drawers are carefully finished and lined with black cloth. A solid brass hasp is securely attached to the sliding front cover and a substantial staple to the stationary case. A neat padlock is furnished with each box. A handle is provided for convenience in carrying. The drawers have solid brass flush pull handles. The case is 9 inches high and 16 inches long, and has four drawers opening sideways. This tool box is handy in the shop on the bench.

The Austrian War Office has resolved to establish a volunteer automobile corps, which is to take part in this year's manœuvres. The cars employed are the private property of the members of the corps.

The New Franklin Clutch and Carburetor.

Two of the most novel features of the new Franklin models are the multiple disc clutch and the compensating carburetor. The clutch is built into the flywheel A, which has its spokes cast fan shaped, so as to increase the cooling effect due to convection. The central portion of the flywheel forms a chamber in which are located the steel and bronze discs of the clutch. This chamber is closed by an end plate B, the hub of which is bushed, so that the entire clutch mechanism may be run in oil. The clutch used on the light touring car consists of nine bronze and nine steel discs, 1-16 inch in thickness and about 6 inches in external diameter. The steel discs have key slots on their inner circumferences, and are passed over a fluted sleeve C, which surrounds the hub of the flywheel and connects by a form of double universal and sliding coupling D to the first transmission shaft E. The bronze plates are provided with notches in their outer circumference and are passed over bolts F F by which the end plate B is held to the web of the flywheel. The two sets of discs are normally pressed together by a truncated spring G, between which and the discs a ball thrust bearing is interposed. The side plates of this thrust bearing are 3-16 inch in thickness.

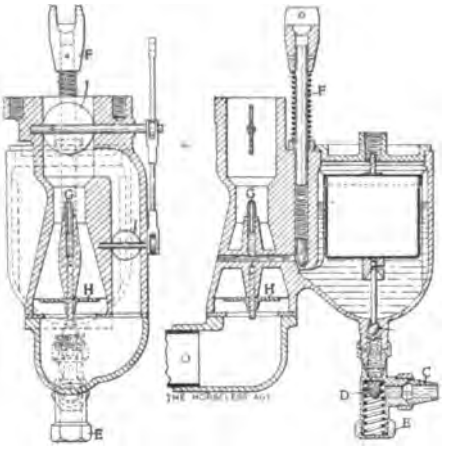
The clutch is disengaged by pressing with the foot on the pedal H, which connects by a downwardly extending forked shipper lever I and collar J to the sleeve C, thus drawing sleeve C out of the clutch, compressing the clutch spring and removing the pressure from the plates. The clutch is very compact, and as its diameter is small it has only a small moment of inertia and does not destroy the gear teeth in shifting gears.



SECTIONAL VIEW OF FRANKLIN CLUTCH.

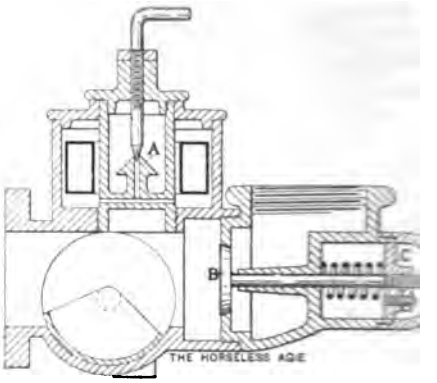
The new carburetor is used only on models G, D and H, the old style carburetor having been retained on the runabout. The new carburetor has a different arrangement of float valve, the float A acting on a ball valve B at the bottom of the float chamber. The connection of the gasoline pipe to the carburetor is made by a union coupling C, the gasoline being forced to flow through a strainer D before it can reach the float chamber. At the bottom of the connection to the float chamber is a settling chamber, closed by a cap E, which is prevented from jarring off by a coiled spring under compression within the settling chamber.

Between the float chamber and the spray nozzle there is, as before, a needle valve F, which can be controlled from the seat by means of an inclined rod coming through the dash, and which connects to the stem of the valve by a universal joint. The



THE FRANKLIN CARBURETOR.

spray nozzle G is located within a contracted passage, the entrance to which when the carburetor is not in action is closed by the disc H. The air is taken in through a pipe at the side of the cylinders, and is therefore slightly heated. The effect of the disc H, which does not leave its seat until a certain vacuum has been formed in the carburetor, is to increase the suction around the nozzle at slow engine speeds, thus doing away with the necessity of priming and allowing the engine to run at unusually low speed. While this valve H, owing to its influence on the suction, has a tendency to keep the mixture constant, irrespective of engine speed, as an additional means to insure this end a supplementary air valve I is this year provided, which is connected to the throttle valve J by two lever arms and a link. Both valves are of the butterfly type and both open and close together. These valves are under the control of the engine governor, and also that of the throttle lever on the steering wheel. The carburetor is connected to the engine by means of a brass tube secured to the carburetor by a bolted-on flange. Both devices, the clutch and the carburetor, show that simplicity of design which is characteristic of all Franklin machines.



PALMBLA CARBURETOR.

The Palmbla Carburetor.

The North Chicago Machine Co... of North Chicago, Ill., offer to the tra... carburetor which operates on a somew... different principle to the ordinary ty... When the piston in the engine comme... to draw in a charge, rarefaction im... diately takes place in the body of the ... buretor, because the intake air passag... closed by a flat seated valve which is ... in place by a helical spring of determ... strength against which the suction ... act. The instant a sufficient vacuum ... created, the atmospheric pressure o... of the carburetor forces the intake v... open and air rushes into the mixing ch... ber. The fuel nozzle with needle va... placed above the air passage and mix... chamber. It has a cone shaped cap ... which the fuel flows and the fuel rea... the base of the cone in a very fine spray, ... from there it is drawn into the mix... chamber. The vacuum in the body of ... carburetor is claimed to govern au... matically the supply of both the fuel a... the air, the valve action at the entrance ... the air passage literally following the mo... ments of the piston in the motor. Con... quently, the greater the speed of the mo... the wider the valve is forced open to ... mit the increased demand for air. T... vacuum around the nozzle remains, ther... fore, fairly constant, which tends to ins... constancy of mixture.

The Tiley-Pratt Tire Pump an... Hub Attachment.

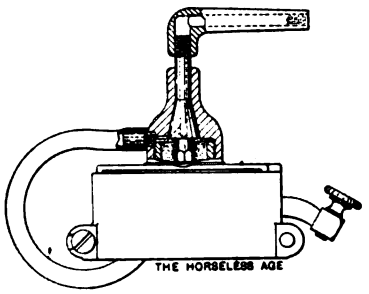
A novel tire pump has been placed upo... the market by the Tiley-Pratt Company, ... Essex, Conn., which enables the automo... bilist not only to inflate his tires by en... gine power while the car is stationary, bu... also to keep a punctured tire inflated whil... the car is in motion. This latter objec... is accomplished by connecting the tire pump... to the tire by means of a special hub at... tachment.

The tire pump, herewith illustrated, is of... the double cylinder type. The cylinders... are single acting and are pivotally mounted... Their lower ends are closed, the cyl... inder cap forming a guide for the... connecting rod. The two cranks are set... opposite or at 180 degrees, so that the...

linders act alternately. When the piston either cylinder is in its lowest position mospheric air flows into that cylinder rough a small hole through the cylinder all, which is closed by the piston during e early part of its compression stroke. s soon as the air in the cylinder attains certain pressure it opens a spring-pressed alve and flows out to the tire or pressure servoir.

The pump is driven from the engine rough a chain, a free sprocket wheel being ounted upon the pump shaft, which can e fixed to the shaft by means of a positive law clutch actuated by means of a knob cated on the dashboard or any other onvenient place. A coiled spring normally holds the claw clutch out of engagement.

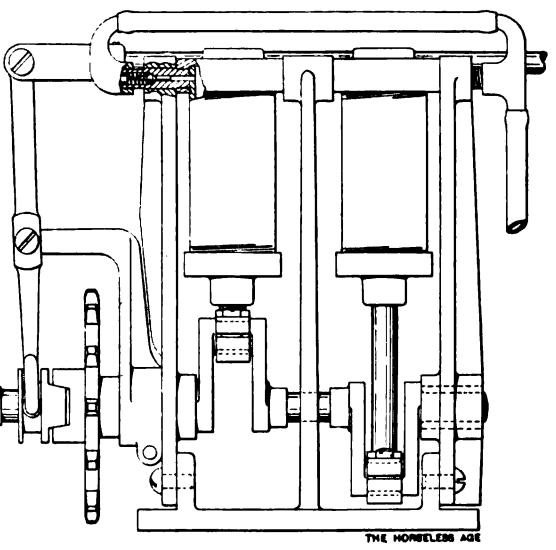
In case of a puncture the hub attachment, herewith shown, is put in place on he hub and the pump is placed in driving onnection with the engine. The pressure gauge on the dash will then indicate what ressure is maintained in the tire. This device therefore avoids the necessity of repairing punctures en route or interchanging tubes on the road. The hub attachment consists of a cap which is screwed over the



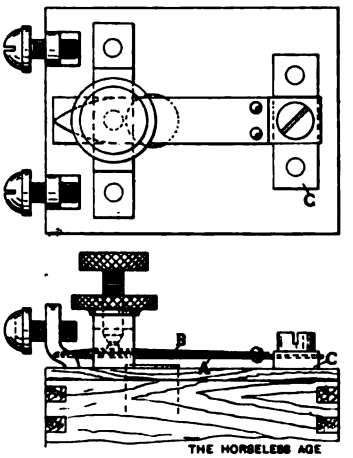
TILEY-PRATT HUB ATTACHMENT.

hub in place of the usual hub cap, and locked by a clamping bolt. On the top of this cap is formed a circular flange which is threaded on the outside to receive a fitting forming part of a conical revolving joint. The revolving part of this joint is connected by a rubber hose to the tire valve, while the stationary part connects to the tire pump.

The pump is installed near the engine, under the hood, in case of a front engine, or under the seat in case of an engine located at the middle of the frame. The installation is said to be an easy matter that can be attended to by any machinist.



TILEY-PRATT TIRE INFLATOR.

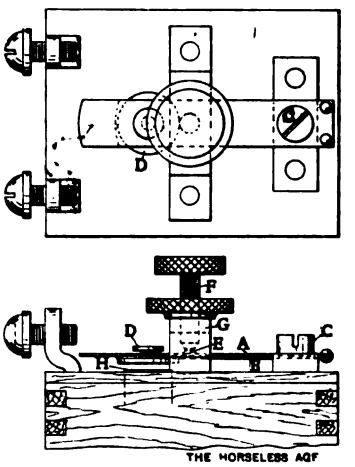


AUTOCOIL COMPANY'S DOUBLE SPRING VIBRATOR.

Autocoil Company's Spark Coil Vibrators.

The Autocoil Company, of Jersey City, N. J., now fit their ignition coils with either the compound (hammer blow) vibrator or with the new Lacoste type bow spring vibrator. Both of these vibrators are illustrated herewith. In the design of coil vibrators a point to be considered is that the break must occur as quickly as possible, as this determines the volume of the spark; the vibrator must also begin to act with a small current in the primary winding of the coil, in order that the current consumption of the coil may be low. Both of these considerations have evidently been applied in the design of the hammer blow coil, which is the older of the two types. By referring to the illustration, it will be seen that this vibrator consists of two flat steel springs riveted together at one end, and both clamped down by the screw C to a metal block which is secured to the coil box. The low spring B has secured to its outer free end a mushroom shaped armature D of soft iron, the stem of which extends through a slightly larger hole in the spring A, this spring being considerably longer than spring B. The spring A carries the platinum or iridium contact point E, which normally makes contact with the point of the contact screw F, which is carried in a yoke G secured to the coil box. Normally the two spring blades A and B rest in contact, and the point E is pressed against the point of the contact screw F. When a current is sent through the primary winding of the coil the soft iron wire core H becomes magnetized and attracts the soft iron armature D. The stem of this armature D being somewhat longer than the thickness of the blade A, the armature has acquired a certain momentum by the time that its smaller head strikes the blade A, and therefore deals the latter a hammer blow which insures a quick break between the contacts points E and F. Also, since the armature B has considerable mass, a comparatively small current is sufficient to operate the vibrator.

In addition to giving sudden breaks with small current consumption, a vibrator is sometimes required to vibrate very rapidly, especialy with high speed motors. The advantages of a rapid period of vibration are that a greater number of sparks are produced in a given period of time, with a consequent increase in the certainty of ignition. On the other hand, for a certain number of sparks per cycle, the time of contact in the primary circuit may be reduced and current economized. The bow type vibrator shown herewith was designed specially with a view to secure a very high rate of vibration. This vibrator consists of the spring blade A of non-magnetic material, which is clamped to the metal block C secured to the coil box. To the spring blade A is riveted another spring blade B of magnetic material, slightly curved in the



AUTOCOIL COMPANY'S HAMMER BREAK VIBRATOR.

direction of its length, and with the outer, V pointed end resting against the end of blade A. The reason for the high rate of vibration secured with this vibrator is twofold. In the first place, the mass of the vibrating member is considerably smaller than usual, and, besides, the vibrating member, while of approximately the same length as in other vibrators, is supported at both ends instead of only at one end, which greatly reduces its period of vibration. The spring B is very much lighter than the spring A, and being the only member of magnetic material the vibration is practically confined to it. The two vibrators illustrated are identical in every way except as to the construction of the vibrator springs.

The Connecticut Coil Current Indicators and Coil Switches.

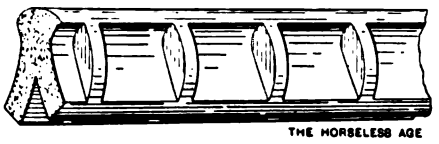
The Connecticut Telephone and Electric Company, Incorporated, of Meriden, Conn., have placed upon the market a special form of indicating meter, attached to which is a double conducting cord and metallic circuit plug, with which it is possible at any time to see just how much current is being drawn from the ignition battery. A plug switch is also required for the test. In order to ascertain the current being drawn from the battery, the running plug is removed and a metallic plug secured to the meter is pushed into the jack from which the running plug has just been removed. This throws the instrument into circuit and indicates the amount of current passing through the coil, which is an aid in adjusting the vibrator.

The New 1906 Fawkes Clincher Tire.

The new Fawkes tire, made by the Milwaukee Rubber Works Company, of Cudahy, Wis., fits the standard G & J clincher rim. This tire, which was formerly made in Denver, consists of a circular tube, with V-shaped trusses. In the development of this tire numerous experiments were tried with solid tires by cutting out triangular, square, round and other shaped cores, and also by different shaped tires, but tests always showed serious defects, hence the idea was abandoned. The experiments showed that the tire to be successful must be round like a pneumatic, but must not have any compressed air in it. The inventor reasoned that there is more than enough rubber in a solid tire to bear the weight required of it, hence if he could put a round, solid tire inside a pneumatic covering and cut from the solid inside all the rubber which could be dispensed with, he would have an ideal tire. It appeared to him that the greatest strength with the least amount of rubber could be secured by using a V-shaped core, with the base of the V on the tread and the upper parts or prongs of the V extending toward the rims, putting ribs every inch or so apart to connect the V with the outside covering, and give it the necessary support. In this way about one-half the core could



THE GODSHALK SHOCK ABSORBER.



INTERIOR CORE OF FAWKES TIRE.

be cut away. The flexibility is provided by the prongs of the V, and it is claimed that the tire does not spread at the base or



THE NEW FAWKES TIRE.

tread, so that the traction resistance is comparatively low.

The core of the tire is first molded with the V and the ribs are all in one piece, then a tube of almost pure rubber is wrapped around the core; then the fabric; then the outer covering of Para rubber; then the whole tire is put into a mold and cured. In the curing process the tube of almost pure rubber cements the core to the fabric and outside covering, as if they had all been molded together, it is claimed, and the tire becomes one homogeneous mass.

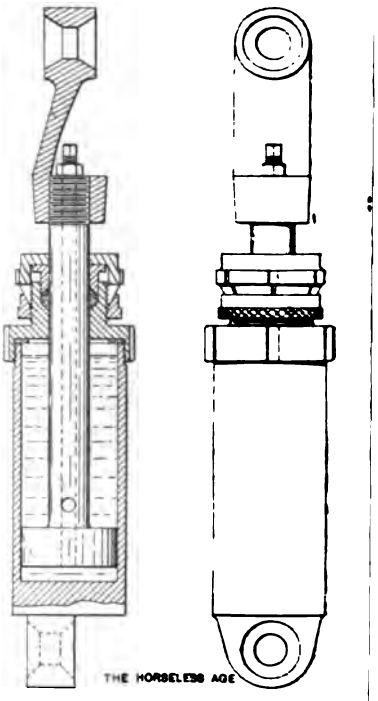
This tire differs from other cellular tires in that the truss is put in the centre of the tube, and the superfluous rubber is cut out next the covering. The space between the prongs of the V is open all around the tire, leaving about one-half the inside of the tire open space to insure sufficient resiliency.

The Godshalk Universal Shock Absorber.

The shock absorber manufactured by E. H. Godshalk & Co., of Twenty-third and Hamilton streets, Philadelphia, is of the type in which the spring motion is dampened by the friction of metal segments against a drum bolted to the vehicle frame, the segments being provided with arms, the outer ends of which are joined together and connected by a link to the spring plate or axle. The special feature of this construction is that the pivot joints of the link are arranged to give a universal joint effect, so that no part of the absorber will be strained by the side sway of the body in turning, etc. The friction segments are self adjusting for wear.

The "American" Shock Absorber.

A. G. Spalding & Brothers, of 3 West Forty-second street, New York city, handle a shock absorber based on the pneumatic principle, two views of which are shown herewith. It consists of a bronze cylinder hinged to a stud secured to the spring cap, which contains a plug piston the rod of which is pivotally secured to the vehicle frame. The cylinder is made open at one end only, and this end is closed by a cap through which the piston rod passes, a tight joint being secured by means of a stuffing box. The piston rod has a hole drilled through its entire length, closed at the upper end with a screw plug, and has also a radial hole just above the piston, so that both ends of the cylinder are continuously in communication with each other. The cylinder is filled with oil, which flows from one end of the cylinder to the other, through the communicating passage in the piston when the springs compress and distend. Owing to the resistance to the flow of the liquid through the small passage, all violent jars and rebounds of the springs are absorbed by the device. It is claimed for this device that once adjusted it remains so, that it increases the life of tires and prevents breaking of the springs.



THE AMERICAN SHOCK ABSORBER.

New Tire Company Formed.

The Salisbury Tire Company has entered the field, with headquarters at Owosso, Mich. The company will manufacture a tire made of viscolized elk skin with canvas lining and steel riveted treads to prevent skidding. The product is the invention of D. W. Salisbury. The officers of the company are: D. W. Salisbury, president; D. P. Walfron, vice president; R. Steele, secretary and treasurer, and A. Caldwell, sales manager. The company is capitalized at $100,000.

OUR FOREIGN EXCHANGES.

Automobile Radiators.

Paper read by F. Edgar Bennett before the Institu n of Mechanical Engineers, London, on January 8, 6.)

The necessity for coolers arises from the ct that air cooling becomes impracticable ith any but small cylinders, even with rced draught. Water jacketing had to be lopted and means found to cool the water ficiently. The following divisions embrace most every known type of cooler:

1. In which a tube or tubes carry the ater and air circulates outside: (*a*) Coil diator, with or without gills or fins consting of one or more tubes, the tubes either at, round, or irregular section; (*b*) a top id bottom or two side water tanks or main pes between which tubes pass.

2. In which tubes form the air passages id water circulates around them: (*a*) The oneycomb (various types); (*b*) tubular tube plate back and front).

3. Diaphragm, in which a plate increases ie length of travel of the water.

4. Series of plates connected to distributig and collecting boxes (water tanks) at ach end.

5. Series of plates interconnected by a ystem of washers. Example: The Fouché nd Lanchester radiators.

6. Rotary. Driven either mechanically or y means of the water pressure.

FLANGED RADIATORS.

The gilled tube radiator in its various orms is, on the whole, the most generally sed at the present time. At first it had the eld almost to itself, the designers of cars eing apparently too busy rectifying mehanical faults to bother about radiators. here was really no reason why they hould do so, the coiled gilled tube as then sed being a most efficient cooler. Indeendent water tanks were general. Down o 1901-2 there was little change. The dvent of the Mercedes radiator (honeyomb) caused many manufacturers to disard the gilled tube in its favor. The gilled ube radiator is now almost always surounded by a case; in France it is called cloisonné radiator. In some cases wire s wound round instead of gills, as in the Kitchen and Clarkson radiators; in others strip of metal, first corrugated, is wound on the tubes. Another form is that in which the gills themselves form the tubes, he collar of one being slipped into the next, and the whole dipped in solder.

Loyal's multi-tubular radiator consists of a number of small tubes in a row with large gills passing over the whole series. Smaller or flattened tubes have greater efficiency, because there is no appreciable core of water in the tube.

Radiators have been made with hollow gills and also fitted with deflecting diaphragms to spread the water over the whole surface. The author made a condenser on this principle some three years back, and undoubtedly the type is efficient, but it is a very old idea; in fact, it may be said in passing that heat transference apparatus has been almost done to death as far as really new ideas are concerned.

The methods of attaching the gills vary. The following are the most usual: (1) Tinning the tube and gills and subsequently sweating them together; (2) soldering on without tinning previously; (3) relying on mere contact of the collars; (4) introducing the collar of one gill into the next, forming thus a wedge contact (Proctor's patent, undoubtedly a very neat method); (5) making the gills continuous, so that they are mutually supporting. (It is found that sufficient contact is secured to enable solder to be dispensed with.)

The usual allowance of gilled tube per horse power is about 3 square feet surface with a fan and twice that amount without. The gill surface should be at least four times, but not more than six times the tube surface, as the receptive is far in excess of the emissive capacity of the tube under the conditions in which radiators work. The Begbie-Audin radiator is the old Loyal type, but with flattened tubes. The Aster radiator has flattened tubes with the gills right across the radiator, and notched out to give the appearance of a Loyal. Another form similar to the above is the Rolls-Royce radiator, with about one quarter inch vertical tubes and horizontal plates not notched out. Other firms have adopted this form of construction.

Another flattened tube construction is the Albany radiator, in which the gills are not placed over the tubes, but between them. The space between the tubes should be at least four times the water space, which should not be more than one-sixteenth inch and as low as one-thirty-second inch. The Burdon radiator has V tubes, vertical, with the edges set to the front. Means are provided for introducing a draught to the back of the V, which precaution is quite necessary. The Daimler cooler is very efficient and distinctive. It is a vertical gilled tube radiator with aluminum removable top and bottom boxes, and was originally made with horizontal tubes and end boxes with baffles. The vertical form assists natural circulation. The Siddeley radiator struck the author as being well thought out. The tubes are three-eighth inch, and pass horizontally across the radiator, being connected by small U bends. This is undoubtedly a most efficient radiator. The Brotherhood radiator has three-eighth inch tubes vertically arranged with continuous aluminum gills. This is also most efficient. The Apprin tube is corrugated circumferentially, and is the same as was used by the author's firm for other heat exchange apparatus. It can only be utilized effectively in a vertical position, and does not appear to be superior to ordinary gilled tube.

VOLATILE LIQUID SYSTEM.

A radiator has recently been constructed which depends upon an old principle, viz., utilizing the latent heat of a very volatile liquid, such as ether, to transfer the heat of the water to the cooling tubes. There is no top water tank; the tubes are screwed into and partly immersed in a bottom water tank and are sealed, and the air is exhausted after the tubes are partly filled with the volatile spirit. The spirit is evaporated by the water and condensed by the air cooled tubes. It is obvious that a good quantity of heat passes along each tube from the tank and is dissipated by the gills, and the author thinks this is the principal cause of the efficiency of the apparatus.

The Rothwell car, using thermo-siphon circulation, has a radiator consisting of top and bottom tanks connected by small coils about three-quarter inch over and of one-quarter inch copper pipe—a similar construction to Kircaldy's Compactum condenser. Undoubtedly this would be most efficient, but the coils appeared to be too closely packed; in fact, looking at the front of the radiator one wondered how the air passed through at all. But the shape of the coils undoubtedly reduces the friction of the air in its passage.

Devices for breaking up the core of water in vertical tube radiators are only to a small extent used. They include: (1) Knotted wire; (2) a twisted piece of metal; (3) an internal displacement tube with wire wound on, leaving an annular concentric space; (4) a Field tube, Wheeler condenser style (the water passes down the iner tube and then up the annulus); (5) an inner tube through which air passes; this is undoubtedly the most practical.

THE CELLULAR RADIATOR.

The honeycomb or cellular radiator is size for size most efficient; in fact sometimes too efficient. As it was originally made the tubes were fitted into tube plates, but afterward other methods were introduced, i. e., separating the tubes by a wire mesh, expanding the ends, fluting them in the centre, etc. A "block" of tubes is assembled and dipped in a solder bath, the casing being afterward added. The usual sizes of tubes are one-quarter inch square, three-eighth inch square, and equivalent sizes in other shapes—triangular, hexagonal, etc. The water either passes between the tubes vertically or is made to travel in a zigzag or sinuous path by baffles. Square tubes are placed diagonally, horizontally or dodged. The former is the best. The water spaces are irregular in some forms, but the average varies from one-thirty-second inch to one-sixteenth inch, generally the former. A fan is fitted behind the radiator or in the engine flywheel, usually the former. It was at first commonly fixed to the radiator by a bolt passing through, but is now usually attached to a bracket on the engine. Driving is by a belt or chain. Chain driving is preferable. Fans are almost all of two types, of which the first largely predominates—propeller and centrifugal—and answers the same purpose to an extent as the old water tank. When a belt driven fan is used overheating may often be traced to slipping.

At the moment a honeycomb radiator, generally speaking, helps to sell a car. Thus imitation honeycombs are much in evidence. There is no doubt that the gills of tinned tube radiators do lose shape. The author has designed a grid which exactly simulates the honeycomb appearance, and which is fixed on the gilled tube. Another form is a manipulation of the gills themselves and addition of strips to give the same result, and was to be seen at the recent Olympia Show. The thickness of honeycomb tubes varies from 0.006 inch to 0.012 inch. They have to be made of best brass; both solid and Triblet drawn qualities are used. Copper "shells" have been drawn, but are not very satisfactory, and are expensive. The thickness of honeycomb tubes within the limits specified has very little effect on efficiency.

CORRUGATED RADIATORS.

The radiators of Type 4 are principally represented by corrugated or flat plates either rebated or with intermediate strips to form the waterway. This type can be made to simulate the honeycomb appearance without its cost, and is very little if at all less efficient than that type. The plates are almost always fixed vertically, either adjacent plates being drawn together and folded and soldered, or distance pieces inserted and soldered to each plate. Very thin plates have been used, as thin as 0.005 inch. A strong form is made by forming flat corrugations out of the strip of metal in such a manner as to give a "square tube" honeycomb appearance when the plates are placed together in series. The Lanchester and Fouché radiators belong to the type in which a series of flat tubes of cellular form are connected together by washers. The water passes through the centre of the washers. The water tank is incorporated in the same manner in the Lanchester radiator. A bolt or perforated tube may be used to hold the tubes together or the whole may be soldered.

CIRCULATION.

Circulation of cooling water is by three methods: (1) Pump; (2) convection (thermo-siphon); (3) revolving the cooler itself. Rotary radiators find little favor. A very ingenious one was shown at the Agricultural Hall early this year. The water entered and left through trunnion joints. The centre of the radiator was in the form of a fan with hollow blades. The water was driven down one set of blades and returned up the other set, which was inclined rearwardly. The water also passed through a honeycomb ring casing. The fan drove the air through the honeycomb. The Cannstatt Daimler cars in 1896 had the water introduced into a channeled flywheel, from which it was driven into a pipe by centrifugal force and so to the storage tank. A system of flat revolving plates has been thought out, but not been used to any large extent.

PUMPS.

A few words concerning pumps may not be out of place. There are four principal types used. Popularity is in the order named: (1) Centrifugal and propeller; (2) gear; (3) eccentric; (4) reciprocating, and (5) semi-rotary (very little used).

The gear pump is not so popular as at one time. It is subject to a great loss of efficiency due to wear, and then becomes noisy. The Albany pump takes advantage of the notion of cutting grooves in pump buckets, long practiced; grooves being cut in the tops of the teeth and down the sides. Water fills these spaces and forms cushions. It is undoubtedly a great improvement. Gear pumps made by the author's firm have outside driving wheels of steel, and the inner wheels are four toothed. Reducing the number of teeth gives a similar result to the Albany method. There is a greater body of water in each space, and the leakage is greatly reduced. Gear pumps do not permit of thermo-siphon circulation if they break down, unless a by-pass (opened and closed at will) is fitted.

Centrifugal pumps do not possess the above defect. They work very silently, and can be designed to perform their work in a very efficient manner. Moreover, they do not, like the gear pumps, wear to any extent and lose efficiency. The type of pump should be chosen which will best suit the radiator. Where the passages are long and tortuous and of restricted section a gear pump of improved form is calculated to give the best results. Otherwise the centrifugal seems the most desirable form. The author was glad to note at Olympia an increased number of pumps positively driven, either by spur gear or chain. The thermo-siphon system is coming largely into favor. More surface is needed and a good quantity of water must be carried above the engine, but these requirements are easily fulfilled. It is no trouble, neither does it cost anything, to put a gallon of water in the radiator every day or so. There should be a good body of water above the engine. Pipes should be of ample diameter.

CONNECTIONS AND BRACKETS.

In thermo-siphon systems these should be of ample size, and should increase toward the radiator. Air locks should be carefully avoided and expansion carefully guarded against by rubber connections or bends. With pump circulation the diameter of the pipes should not be less than the pump suction and delivery. A tap or plug should be fixed at the lowest point in the system to drain it out in cold weather.

These are usually riveted to the sides of the radiator, generaly outside, but sometimes inside. The Spyker cars have ball joint brackets designed to neutralize vibration and frame distortion. Others have simple hinges which are almost as effective. All the above remarks apply to radiators fixed in front of the bonnet.

FILLERS.

These are made in a great variety of sizes and styles from about 1 inch to 3 inches in diameter, and in height from half an inch to over 4 inches. Two inches diameter by 2½ inches high is a good mean. A very ingenious filler is that used on Panhard cars. A centre spindle operates rods held in position by springs. These rods engage with a ring in the filler body, and the lifting of a knob on the centre rod withdraws them and allows the cap to be removed. Vulcanite and woodite caps, generally fluted and with metal screws, find some favor. The author noted at the recent show many filler caps with about three-quarters of an inch of fine thread—too much altogether. Only a few threads are necessary, and these not finer than about eleven to 1 inch. The filler in the Siddeley racer is oblong, and has two wing nuts for quickly releasing the cap. The De Dietrich cap is grooved and fitted with a wire, which has a lot of play and is attached to a lug at the back. This holds the cap when it is unscrewed. It is a neat device.

INCRUSTATION.

This can be avoided by using a scale removing fluid. There is no doubt that radiators of the coil type often become encrusted and thus lose efficiency. Honeycomb radiators have been taken to pieces after a year's use, and found almost as clean inside as when they were first put together. When scale removing fluids are employed the radiator should be washed down occasionally to remove the flakes of lime, etc., which accumulate. Oil greatly reduces efficiency, and should be carefully excluded. Weak hydro-chloric acid, say 5 per cent., will to a great extent remove scale if left a while in the radiator, but it should be well washed out afterward with an alkaline solution.

Like many other things in a motor car, the radiator is a compromise. Even the best radiators sometimes get overhot; thus radiators have to be designed to effectively cool the jacket water under exceptional conditions, with the result that the water is, generally speaking, returned to the engine too cold. When the temperature is maintained at an unnecessarily low degree to save half a gallon of water a day at the expense of loss of power due to that required by the fan, the conditions are certainly not ideal.

ANGLE OF THE TUBES.

It has been found that the angle of the radiator tubes to the wind affects the flow of air. Messrs. Grouville and Arquembourg have experimented, and find that the incoming angle should be about 30 degrees and the outgoing about 7 degrees. Current study at the recent Olympia Show revealed the fact that there will be more cars fitted this year with honeycomb radiators than ever before. The Argyll output alone would the scale down, while the Clément firm, for instance only one, has this year adopted the Liotard honeycomb in place of gilled. The Coventry tendency is strongly towards gilled tube, generally vertically fixed, following the Daimler lead. There are more horizontal tube radiators to be seen with the tubes made good into side tanks which are fitted with circulation partitions. Among others the Napier and Brotherhood cars have back tanks fitted to increase the water capacity.

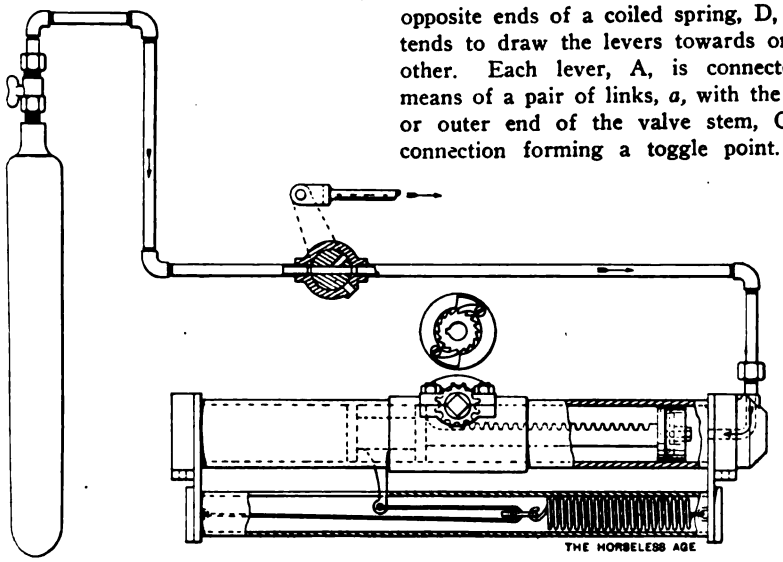
The fall of temperature in a radiator

ally from 30° to 50° Fahr. The amount water passed through per horse power ies generally from about 10 to 15 gal- s per hour. The proportion of heat en up by the jacket is usually 25 to 35 cent. of the total available.

'he ideal radiator will (1) present the t possible resistance to the air—(*a*) hori- tally, (*b*) vertically; (2) be as simple as sible; (3) have the least possible number soldered joints; (4) be that in which the atest quantity of water passes a given ot in the shortest time, and at the same ne; (5) will not overwork the pump;) have no air pockets whatever; (7) igh the least consistent with strength;) be so constructed as to give readily thout leakage under frame strains and vi- ation.—*The Autocar.*

The Cinogene.

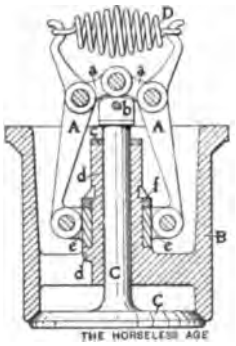
In the recent competition for automatic otor starters organized under the aus- ces of the French Academy of Sports, the rst prize was divided between the Mors rm, of Paris, and Marence Isnard, No. 5 Avenue Alsace-Lorraine, Grenoble, the evices entered by these two competitors eing considered equally meritorious by ne prize jury. The device of Isnard is alled the Cinogene, and is operated by neans of carbonic acid gas derived from iquid carbonic acid carried in a steel bottle t the side of the driver's seat, under a ressure of about 800 pounds a square inch. A two-way valve, placed convenient to the lriver's seat, when opened, admits the car- onic acid gas to a long cylinder placed ransversely at the front of the car. This ylinder contains a piston of the leather up type secured to a rack which is pro- vided at its opposite end, with a guide fit- ting in the cylinder. The rack is in mesh with a spur pinion mounted upon an ex- tension of the motor shaft, and adapted to drive the motor shaft through a pawl and ratchet device. When the driver admits carbonic acid gas to the cylinder, the pis- ton is moved farther into the cylinder by the pressure of the gas, and the motor is thereby started. As soon as the speed of the motor exceeds that of the starting pinion, it runs ahead of the starting device. The driver then closes the communication between the steel bottle and the cylinder and at the same time automatically opens the cylinder to the atmosphere, allowing the gas in the cylinder to escape. The piston and the rack are then drawn back to their original position by means of a coiled spring contained in a metal tube be- low the starting cylinder and connected to the rack by means of a steel cable and an arm extending downward from the rack. It is claimed that a kilogram of liquid car- bonic acid, which can be purchased at 15 cents, is sufficient for starting a four cylin- der, 35 h. p. motor 100 times. With the starting device are furnished two bottles containing 400 litres of carbonic acid and a special union permitting of refilling these bottles from the 10 and 20 kilogram reser- voirs, which can be bought in the market.



SKETCH OF CINOGENE MOTOR STARTER.

A Toggle Action Automatic Inlet Valve.

Self-acting induction valves of internal combusion engines, as heretofore employed, require a greater suction to keep them open than to move them from their seats, and are consequently liable to flutter on their seats during the suction stroke, causing con- siderable noise, and interfering with the regular flow of the gaseous mixture, there- by preventing the proper charge from be- ing drawn through. To overcome this de- fect the Wolseley Tool and Motorcar Com- pany, of Birmingham, have recently taken out a British patent on a valve construction, in which the spring pressure drawing the valve toward its seat is less when the valve is open than when it is closed. Referring to the drawing, the lower or inner ends of two levers, A, are pivoted respectively at fixed points of the valve seating, B, which are at opposite sides of the stem, C^1, of the valve, C. The upper ends of these levers are respectively connected with opposite ends of a coiled spring, D, which tends to draw the levers towards one an- other. Each lever, A, is connected by means of a pair of links, *a*, with the upper or outer end of the valve stem, C^1, the connection forming a toggle point. The



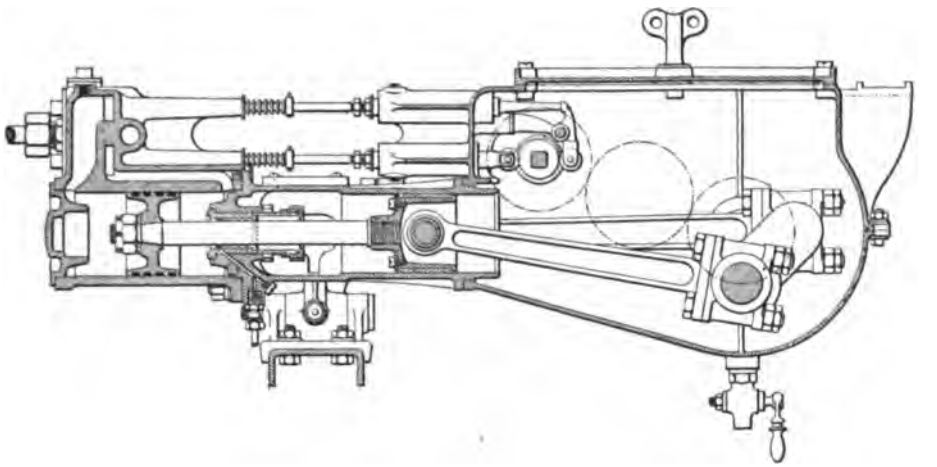
TOGGLE JOINT INLET VALVE.

tension of the spring, D, tending to draw the levers, A, towards one another, tends also to press upwards or outwards the valve stem, C^1, and to hold the valve closed, or to close it if open. Immediately the suction causes the valve to open the ends of the links, *a*, connected with the valve stem are drawn inwards, opening out the levers, A, against the tension of the spring. The increasing angle which the links make as the valve opens lessens the leverage through which the force of the spring is transmitted to the valve, so that the further the valve opens the less will be the tendency of the spring to close it, though, of course, the effective force of the spring upon the valve will always be such as to insure the closing of the valve with the required quickness when the suc- tion ceases. The extent of opening of the valve is limited by the shoulder of the cap, *b*, of the valve stem, C^1, coming against a pad, *c*, at the outer end of the guide, *d*. The inner ends of the levers, A, are shown as fulcrummed between lugs, *e*, which pro- ject from a ring, E. This ring fits around the guide, *d*, and abuts against a shoulder, d^1, and is held by a ring, *f*.

New Serpollet Features.

Serpollet, the apostle of steam, as the French call him, has introduced some rather important changes in the design of his models for 1906. The motor has been en- tirely redesigned, with the object of insur- ing greater steam economy, to prevent loss of oil and to secure greater durability of the wearing surfaces. The cylinders are now made double acting, whereby their temperature is kept more nearly uniform, and the loss by radiation is reduced. In the old motor the projection of the emulsion of oil and water carried in the crank cham- ber onto the cylinder walls resulted in a cooling of these walls at each return stroke, which was very detrimental to the steam economy. On the other hand, in spite of all possible precautions, the piston packing rings would, in the course of time, begin to leak, and steam would pass by the pistons into the crank chamber bringing all the parts contained therein to a high tempera- ture, so that the oil in the crank chamber would occasionally boil and rapidly disap- pear.

In the new motor the cylinders are en-



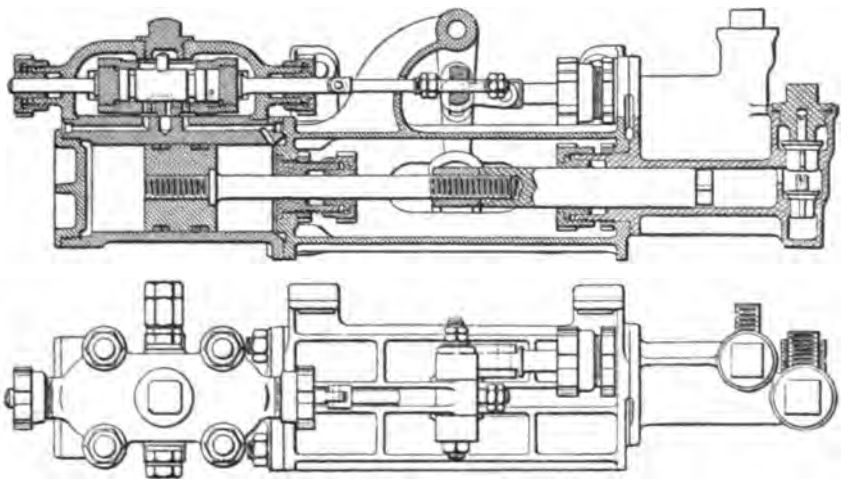
NEW SERPOLLET DOUBLE ACTING ENGINE.

tirely separated from the crank chamber, and their heat can no longer be transmitted to the latter. The crank chamber itself forms a hermetically closed chamber, well isolated, in which the oil remains at a normal temperature. One gallon of oil is now said to be sufficient for crank chamber lubrication for a distance of 1,000 miles. It may be added that the valve motion has been improved so as to admit of a much greater expansion of the steam, the smallest cut-off being 20 per cent. It is claimed that an increase in steam economy of 33 per cent. has been shown in actual tests with this motor on vehicles furnished by the Paris, Lyons and Mediterranean Railroad. The bearing surface of the crank journals and crank pins and the diameter of the crank shaft have been increased considerably.

As will be seen from the drawing, the motor is still fitted with poppet valves. The cylinders are set away from the crank chamber by the crosshead guide, which is of cylindrical section, the crosshead itself being in the form of a trunk piston.

The new design of motor necessitates the use of stuffing boxes, but only on the piston rods. A special form of stuffing box has been designed, which provides a long guide for the piston rod inside the packing, so that the guide alone almost suffices to insure a steam tight joint. The stuffing box is accessible through an opening in the side of the casing, and as prepared packing rings are used the renewal of the packing can be attended to by almost anyone. A two months' test is said to have shown no need for renewing the packing.

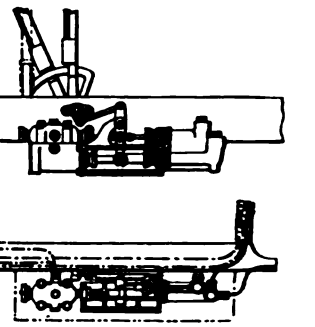
The fuel and water feed is accomplished in the Serpollet vehicle by a device known as the "petit cheval," which is placed in a closed box at the side of the vehicle frame.



SERPOLLET PROPORTIONATE FEED SYSTEM.

This device consists of two pumps, one the water and the other for the fuel, delivery of which is ordinarily proportional but can nevertheless be differently adjusted in order to allow for different grades of oil employed. The "petit cheval" operates by the pressure lubricator by which oil is introduced into the live steam, the feed being absolutely proportional to the speed of the motor.

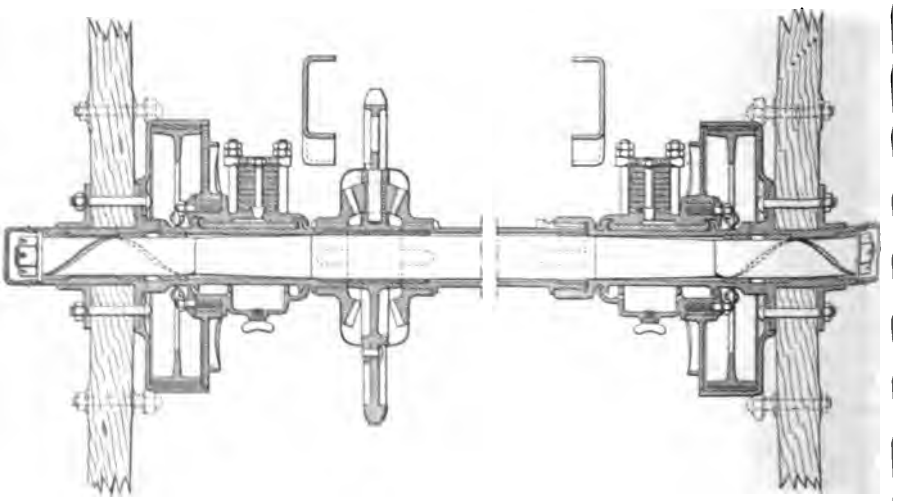
To allow of easily pushing the vehicle around when they are not under steam, Serpollet has introduced a clutch which



MANNER OF MOUNTING "PETIT CHEVAL" FRAME.

connects the motor from the rear axle. This device also permits of running the motor free to heat the cylinders before starting off. The motor is now fitted with a fly-wheel.

The new Serpollet chassis are unique among French cars, in that they employ a single chain drive to the rear axle, which is so popular in the lower priced American cars. The construction, herewith shown, is exceedingly simple. The axle is of the "through" type, carrying the differential gear inside the rear left spring. The side gears of the differential are connected to driving tubes, which are secured by claws to the hubs. All bearings are plain bearings, and the two outer ones are provided with large oil wells and with oil grooves, insuring the return of the oil working through the bearings. Expanding brakes operated by a pedal act on drums fitted to the rear wheels. The hand or emergency brake acts on the fly-wheel of the motor. —*From an article in L'Automobile.*



SERPOLLET CHAIN DRIVEN LIVE REAR AXLE.

ıtomobiles in the English Elections.

The motor car was a winning factor in ≥ Hastings election, where Harvey Du ·os motored to victory with a phalanx of ghty cars, says the *Daily Express* (Lon-ın). His son, Arthur Du Cros, had sixty rs at Bow on January 17. They came by ıad from Hastings on the previous even-g, and arrived in Bow with a fine coating : mud. The East End had never seen so ıany and various motor cars together be-ɔre. Cars of all shapes, colors, and sizes; ∧o-horse power, five, ten, twenty, and even eventy horse power cars were there. Cars pen and covered, cars gorgeously upholtered, half finished cars crude from the actory, motor lorries, and broughams; and very one of the sixty was placarded with Du Cros" in vivid blue and white.

Opponents of Du Cros stood dismayed in ittle groups in Bow road watching the endess whizzing, puffing, exploding procesion. Holiday-making urchins in hundreds crowded round the long line of cars standing outside the Unionist central committee rooms near Bow Station. The line was constantly changing, some cars leaving to pick up distant voters every minute, and others immediately taking their places.

The scent of battle was the odor of gasoline, and, despite the high wind, it was wafted down every street in the constituency. A rattling and puffing and "toot tooting" at the end of the court, and there was a £1,000 carriage waiting to take father to the polling station.

Thirty-nine of these electioneering cars were distributed among the nine wards. The remaining twenty-one were kept in rank on the motor brigade station outside the committee rooms for emergencies. Every few minutes a note or telegram would come from an agent requesting a car to pick up an outlying voter, and at once George Du Cros, the car organizer, would send a car off. One seventy horse power car, it was said, had been sent eighty miles away into the eastern counties to bring up one voter. This record was beaten at Hastings, where a car was driven 280 miles and back for the sake of a solitary vote. All the cars were the personal property of the Du Cros family or of their friends.

Motor Bus Rivalry.

Racing motor omnibuses have become altogether too frequent within the past week or two, especially between Charing-cross and Putney, says a writer in the London *Standard*. The Automobile Association, would do well to give a little attention to the young men driving motor omnibuses on the Putney road. When the rival service was first inaugurated the "Arrow" Line seemed to have matters entirely its own way. Breakdowns were more frequent on the "Blue" Line, and it was a common expression to hear, "If you want to reach your journey's end take the 'Arrow.'" Since that time, however, the "Blue" Line seems to have not only mended its ways, so far as breakdowns are concerned, but to have acquired a speed mania that occasionally approaches dangerously near the limit of recklessness. A "Blue" motor omnibus will usually overtake and pass one or two of its rivals on the journey between Putney Bridge and Charing-cross.

The other evening, when the writer was which exists for the enforcement of the speed law in places where the police in ambush would invite its infringement, a passenger on a "Blue" car, and the roads were in anything but favorable condition for speeding, the car in which he traveled passed three "Arrow" motor omnibuses, and even overtook and passed another "Blue" car, on the Fulham road. From Piccadilly circus to Sloane street it was an out-and-out race between two rivals. At one point, near Hyde Park corner, the "Arrow" had the lead, but the driver of the "Blue" in his eagerness to regain first place took the wrong side of a lamp post "refuge" in the middle of the road. In doing so he missed his mark by a few inches, with the result that the wheels of the car leaped the raised pavement, causing the car itself to tip sideways, much to the terror of its passengers. When the latter remonstrated with the conductor at the end of the journey he remarked by way of consolation, "Oh, this driver's not half so good as the one I had last night. We did the trip from Mile End to Putney in fifty minutes!"



FRENCH AUTOMOBILE HEARSE.

A Motor Hearse.

Probably the first motor propelled vehicle. specially built for the transportation of corpses was exhibited in the commercial vehicle annex to the late Paris Salon. The general tone at burials is usually one of dignified slowness, and one would expect this to be about the last field where modern methods of rapid transportation might find an introduction. The vehicle herewith shown, however, has been actually built to the order of a large Paris undertaking establishment, and is intended specially for the transportation of corpses over long distances. The car is propelled by a 24 horse power, four cylinder De Dion motor, and can therefore attain considerable speed, allowing of reaching the most distant points of France from the capital in a couple of days. It has an enclosed seat for the relatives who may wish to accompany the remains of the departed. According to an old proverb, "Death" approaches rapidly, and hereafter, it would seem, he will also depart rapidly with his prey. It would not be surprising some time in the near future to hear of a hearse being held up by the police for excess of speed.

Bonuses are being given to drivers of motor omnibuses by a firm of Ealing employers, with the object of safeguarding the passengers and the vehicles. The bonus is given in addition to wages, and has had the effect of making the men extremely careful. One man has driven a motor omnibus for twelve months without accident, and has received a considerable sum. The adoption of the same system is suggested for the great London motor omnibus companies. With them, however, it is not so necessary as with a small firm, insurance companies paying all damages. With the smaller firms the bonuses render almost unnecessary the payment of insurance premiums.

The annual general meeting of the Automobile Club of Great Britain and Ireland will be held on Thursday, March 8, at five o'clock, at the clubhouse, 119 Piccadilly. A number of members of the Executive Committee will retire.

COMMUNICATIONS

Comparison of Engines With One to Six Cylinders.

Editor HORSELESS AGE:

It will be familiar to everyone who has followed automobile matters during the past few months that the question of the correct number of cylinders for a powerful high grade car has caused an enormous amount of interest and correspondence from every side, and I think I may say that nobody has been more interested in the matter than myself, for the sinple reason that for powerful cars the six cylinder principle from actual practical test has shown me that it is a very great advance on any commercial motor of a less number of cylinders that has previously been put upon the market. But to get away from generalities and deal with facts has been my wish in the matter. I will, therefore, give clearly the result of the following experiments, but before doing this I will just give a little example of what one has to deal with.

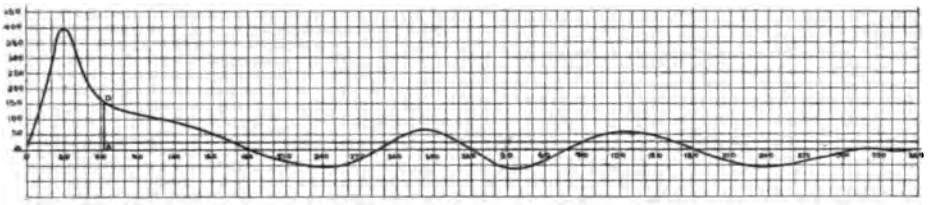


DIAGRAM FOR SINGLE CYLINDER ENGINE.

Let us take for example an ordinary commercial motor required to give about 40 horse power. If we had one cylinder only it would have to be nearly 10 inches in diameter, and would strike a blow at every explosion of 28,282 pounds on the top of the piston. If, however, we were content with two cylinders we could reduce the size of our pistons to about 6 inches and be content with blows of 14,141 pounds per explosion on the top of the piston. Three cylinders are an improvement on two, as we can reduce our cylinder dimensions to about 5⅝ inches and our blows on the top of the pistons to 9,427 pounds. There is no question that a three cylinder engine is infinitely, in every way, to be preferred to a two cylinder; in fact, speaking mechanically, there is hardly any good word that can be said for the two cylinder. They are a poor compromise between one and four, and are bound to be out of balance either mechanically or on account of the irregularity of impulse. The three cylinder engine certainly appears to have advantages, but for a cheap car it is quite open to question whether it is an advantage over four. There is a decided saving in cost, but it will not, of course, run so smoothly.

When we come to four cylinders we require a piston diameter of very nearly 5 inches, and we have reduced the blows on the top of the piston to 7,070 pounds. The five cylinder engine helps things along further still, as we only have blows of 5,656 pounds on the tops of the pistons, but I think at the present time the six cylinder may be taken as ideal; it reduces the blows on the top of the pistons to 4,713 pounds.

In order that the steadiness of torque or turning effort in a six cylinder engine may be fully appreciated the following diagrams have been constructed from actual tests: The first consideration to be taken into account is, of course, the variation of pressure in the cylinder. For the purpose of discovering what actually takes place a standard 40 horse power, six cylinder engine was put under test, and a large number of observations were made with a manograph indicator and a pressure recorder. As a mean of these readings the indicator diagram shown in Fig. 1 has been constructed.

The vertical line is graduated to give pressures in pounds per square inch. From the figure it will be noticed that the compression is carried to about 75 pounds per square inch. The ignition takes place considerably before the end of this stroke, and the pressure rises very rapidly to nearly 450 pounds per square inch. The enormity of this pressure can be better appreciated when given in total pressure on the piston. The bore of the cylinder is 4 inches, the area of the piston 1,256 square inches, and

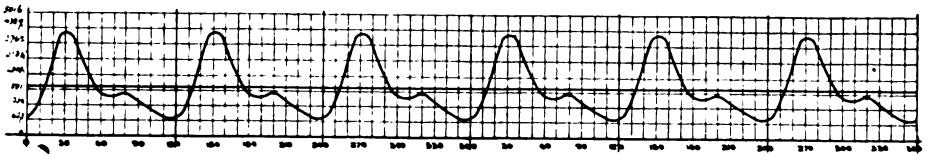
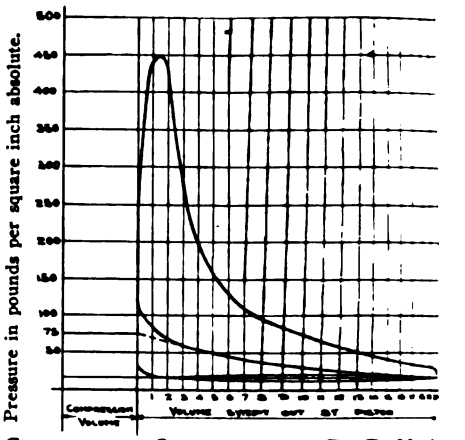


DIAGRAM FOR SIX CYLINDER MOTOR WITH CRANKS AT 120 DEGREES.



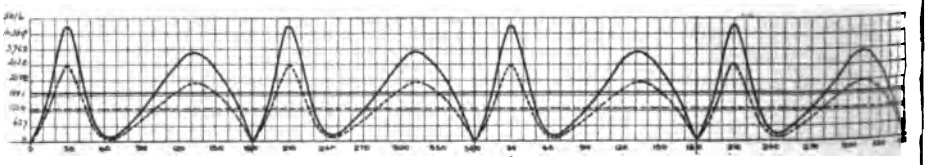
CYLINDER 4X4 INCHES, 1,700 R. P. M.
E. P. 82 POUNDS PER SQUARE INCH.
I. H. P. = 8.8 PER CYLINDER.

therefore the total pressure on each piston is roughly 2 tons.

Here at the outset is a great advantage in six cylinders. A four cylinder engine must have cylinders of nearly 5 inches bore to develop the same power under similar conditions, and the corresponding pressure on the 5 inch piston would be no less than 3 tons. This enormous pressure coming practically as a hammer blow on the piston has, in time, a very deleterious effect on the steel of the connecting rod and crank.

The diagram also clearly shows the fall of pressure during the working stroke, and the slight rise and fall above and below the atmospheric pressure during exhaust and suction strokes.

As stated above, the indicator card shows merely what is going on in each cylinder, as far as the pressures are concerned, but there are other factors at work.



------ DIAGRAM FOR FOUR CYLINDER MOTOR, WITH CRANKS AT 180 DEGREES.
——— DIAGRAM FOR FOUR CYLINDER MOTOR OF SAME POWER AS SIX CYLINDER MOTOR.

At the beginning of the suction stroke, for instance, the piston is being pulled along at an ever increasing rate, while the crank travels through approximately 90 degrees. Then, until the end of the stroke, the piston tends to keep on moving, and has to be retarded and brought to rest by the crank shaft. In other words, the inertia of the piston and parts moving with it is retarding the crank during the first half of each stroke, and urging it on during the latter half.

The pressure in the cylinder and the force necessary to acelerate the piston have both been taken into account in Fig. 2 which is the torque diagram for a single cylinder motor. The turning effort is given in inch pounds—for example, at point A, Fig. 2. 400 inch pounds represents a pressure of 200 pounds on the crank pin, tangential to the crank arm and acting at a 2 inch radius.

The thick horizontal line represents the

age turning effort during the four ces which constitute the cycle. It also rs the effort of the inertia of the piston iving negative and positive turning ef- ı at the beginning and end of each ke. At the end of the compression se, instead of getting a large negative ing effort on account of the increased sure in the cylinder, it will be seen that torque has only a small negative value. shows that the inertia of the piston ing to rest at the top of the stroke is ly sufficient to compress the charge. ı, when the crank is on the dead centres, e is no turning effort. It is from this ram with its large variations that we t start and endeavor to obtain a con- t torque.

he dotted line in Fig. 3 is found by su- mposing four of these diagrams corre- ıding to four cylinders, with cranks at degrees. Fig. 4 is the torque diagram six cylinders, one cylinder firing at y 120 degrees.

is not fair to compare these two dia- ns, for the cylinders being all the same the six cylinder engine will be giving and a half times the power of the four, therefore each vertical height of the ed figure has been increased one and a times to the full line, corresponding to er pistons, to equalize the powers of the engines.

he most important point to be noticed ıat with six cylinders there is always a tive turning effort of at least 700 inch nds on the crank shaft, and at no point he cycle does it approach zero. With cylinders, and cranks at 180 degrees, e must of necessity be four points in the e, viz., when the cranks are on the dead res, at which there can be no turning rt.

ig. 3 shows also four other points where torque has only a very small positive ıe, namely, less than 300 inch pounds. ı is accounted for by the retarding force he pistons when being accelerated, after effect of the explosion has passed. Had diagram been constructed for any other ons than the extremely light ones used his engine, it is extremely probable that his point the torque would have had a iiderable negative value. The next rise ıe torque is due to the forward pressure n nearing the end of the stroke.

comparison of the two diagrams will far more convincing than anything that be written about them. The total inch nds pressure are given for convenience. ıne factor which has not been taken account in the construction of these grams is the variation of pressures in crank case. Obviously, the pressure be- d the piston in a fast running engine not remain constant. On the down ıke it will be higher, and on the up ıke it will be lower than atmospheric. e disturbing effect which this has on the que is all in favor of the six cylinder ine for two reasons: Firstly, the four nder engine must have larger cylinders on which the effect will be more apparent, and, secondly, in the six cylinder engine the small effect will be reproduced six times as compared with four times that the large effect is produced in the four cylinder engine. S. F. EDGE.

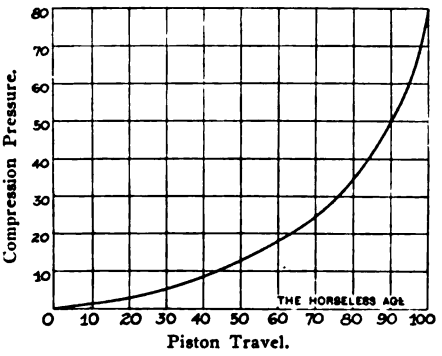
[In speaking of two cylinder motors Mr. Edge evidently had in mind the two cylinder twin type, for the two cylinder opposed motor, so popular in this country, has certainly much to be said in its favor.

For the benefit of novices it may also be pointed out that the torque represented in the diagrams is the torque impressed by the pistons on the crank shaft, and the variations in this factor are, of course, much greater than the variations in the torque on the transmission shafts and the tires, as the engine flywheel intervenes to even out the turning effort of the motor. —ED.]

Pressure Obtainable From Explosion Engine Cylinders.

Editor HORSELESS AGE:

If a ⅛ inch pipe were connected to the cylinder of a motor of average size and compression running under load, what approximate pressure would be counted upon in a tank of a size five or six times the capacity of the motor cylinder? The motor is supposed to run any length of time.

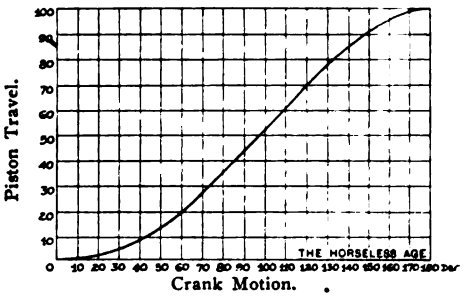


CURVE I.

About what pull does it take with a 12 inch crank to turn over an average two or four cylinder motor with reliefs closed and pulling slowly, letting the piston leakage take effect? R. C. PIERCE.

[We understand that more than 100 pounds per square inch pressure has been obtained from high compression gasoline motors under the conditions named.

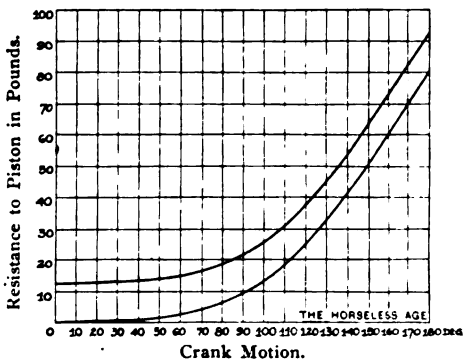
The pull required to start a motor depends upon the size of the cylinder, the compression and the number of cylinders, and varies therefore within wide limits, as each of these variables is independent of the other. For instance, a small single cylinder low compression engine requires many times less power to start it than a multi-cylinder high compression engine with big cylinders. We have never made any measurements as to the power required for such a purpose nor heard of any such measurements being made. Presumably you intend to build an automobile starter of the air engine type. We do not know whether in such a case it would be advisable to build one starter for all sizes of engines. If we were confronted with this problem we would calculate the approximate starting effort required by the different current sizes of engines, proceeding about as follows:



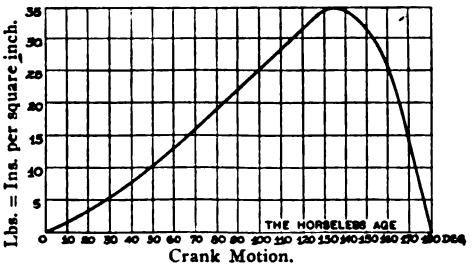
CURVE II.

We can figure on a compression of 80 pounds gauge, as comparatively few engines exceed this. The total loss by friction can be calculated on the basis of 3 pounds per square inch of piston area in each cylinder, which would be a little less than 20 per cent. of the power developed. This factor is, of course, subject to considerable variation in different engines, but as it is only a small factor compared with the compression pressure at the moment of maximum crank effort, a little error in its estimation is negligible. It is now necessary to find the maximum crank effort required during the compression stroke in starting the motor.

Curve I herewith shows the compression in the cylinder at different points of the piston stroke. Curve II shows the relation between the angular motion of the crank shaft and the linear motion of the piston, the connecting rod being assumed to be double the length of the piston stroke. From these two curves the lower curve III is drawn, which shows the compression in the cylinder for different angles of crank motion. The upper curve III is obtained by adding 12 pounds (for friction) to the compression pressure for all crank positions. The last mentioned curve shows, therefore, the resistance per square inch of one piston head to the motion of the pistons in a four cylinder engine at different crank positions. To find from this the tangential crank effort required to overcome this resistance, it is only necessary to multiply by the sine of the angle of crank motion, starting at the lower dead centre, and this again by the piston



CURVE III.



CURVE IV.

head area. This has been done in curve IV, from which it will be seen that the greatest crank effort, about 35 pounds per square inch, is required when the crank has moved through an angle of about 135° from its lower dead centre position.

This latter curve allows of easily determining the crank pull necessary to start any size of four cylinder engine. Take a 4×5 inch engine, for instance. The piston head area is 4×4×.7854=12.56 square inches. The maximum crank effort required is therefore 12.56×35=440 pounds. This is at a radius of 2½ inches, so at a radius of 12 inches a pull of (440×2.5)÷12=91.7 pounds. With a two cylinder of the same cylinder size the only difference would be that two less pistons would have to be turned idly, which would reduce the pull required about 7 per cent.—ED.]

Queries.

Editor HORSELESS AGE:

I have a frame and running gear in which I wish to install a double opposed motor. The sprocket on the rear axle is so far to the right of the centre that I cannot get a transmission such that the sprockets will line up. Do you think it would be practical to put in a countershaft and run a chain from the engine to the countershaft and from the countershaft to the rear sprocket? CHAS. E. HOWE.

[We have no doubt that this can be done, though it is, of course, not as good as the direct drive. Place the countershaft as far forward of the rear axle as possible and place distance rods or chain tightener between the bearings of the countershaft and the rear axle.—ED.[

Ignition Advance.

Editor HORSELESS AGE:

In your last week's issue, page 135, I noticed something about spark advance. Will you be so kind as to inform me at what speed of the engine the sparker or timer should start to advance, and how far. Also, should the timer increase to advance as the speed of the engine increases, or how far advanced should the sparker be at 1,000 and 1,500 revolutions of the engine. I don't remember seeing any rule about the amount of advance, etc.

DWIGHT GRAHAM.

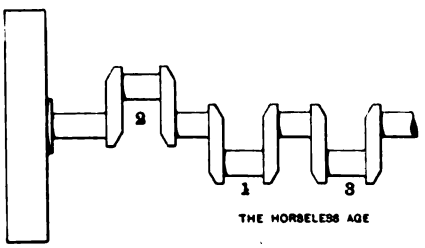
[There can be no simple rule for the advance that should be given to the spark for different speeds, as this depends upon the heat of the spark and upon the point within the combustion chamber where it is produced, not to mention the quality of the mixture. To illustrate how widely the advance of the most advantageous point of ignition varies it may be stated that some manufacturers of motors with low tension ignition do not advance the spark at all, while in bicycle motors using jump spark the time of ignition must be advanced about three-quarter stroke to get the best results at, say, 3,000 r. p. m. At the lowest speed of stable running on full throttle the spark should occur in the dead centre, and should be advanced gradually with the speed from that point.—ED.]

Dispensing With the Spark Timer.

Editor HORSELESS AGE:

In a description of the Renault machines, which appeared lately in your columns, I note that you say that the time of ignition is "fixed." Now if it is true that no spark advancer is considered necessary on a machine of the highest reputation, then why should it be so common in cheap machines? As a matter of fact it is out of the question to perfectly regulate the timing in an automobile motor; no governor will do it, and the chauffeur can only approximate it, so if a point can be determined for ignition that will be the best, all speeds considered, why should it not be good practice? A little light on this question will be greatly appreciated. W. C. S.

[The Renault firm uses magneto ignition, and the heat of the spark increases with the speed of the engine and of the magneto, which gives to a certain extent the same effect as mechanically advancing the spark. —ED.]



Explosion Engine Query.

Editor HORSELESS AGE:

I have a two cylinder upright motor, 4x5 inches, rated at 12 horse power. The cranks are set opposite, and there are two explosions in two revolutions. I want to put on another cylinder and lengthen the crank shaft. The explosions will then occur as shown in the sketch, there being two explosions during one revolution, and only one during the next. I do not want to get a new crank shaft. Do you think the motor will run steadier or not?

W. F. T.

[The maximum power of the motor will, of course, be increased 50 per cent. by the addition of a third cylinder. If you use the motor on the same car as now, and gear it the same, so that it is not delivering its full horse power—in other words, compared on the basis of the same horse power delivered—it will run steadier than the old motor. When fully loaded, however, the fluctuations at a given [illegible] would be practically the same as be[fore]. ED.]

Queries.

Editor HORSELESS AGE:

There are a few questions which I [would] like to ask, and which I think will [not] be of interest to me but all of your [readers].

First—There are a number of firms [which] claim to be the first ones to put out a [single] cylinder car. I should like to know [which] which one was the first.

Second—Are not all, or at least most, the gasoline cars overrated? If not, I would like very much to know how [it is] possible for a 15 horse power steamer [of a] well known make to do all and more [than] most gasoline cars of 30 horse power [and] over. How it is possible for a 20 [horse] power steam racer to beat, not only but even play with high powered gas cars of 60 to 90 horse power on a track, and for another racer to not equal but break the record at Ormond Beach of a 120 horse power monster (although it was not official).

If a horse power is a horse power it is beyond my comprehension how these things are possible. As I am an intending buyer I would like to have this perplexing matter made clear to me. Gasoline seems to be universally used as the motive power for automobiles. On the other hand, steam has the reputation of being the motive power of the world, and not only that but, as I have said before, it seems just as good for an automobile as a locomotive.

ELMER G. GRIESS.

[We believe that the first four cylinder car was built by the Panhard firm of Paris in 1896 and run by them in the Paris-Marseilles race of that year, which it won. The Mors firm exhibited a four cylinder water cooled car at the Paris Show in December, 1896.

There is undoubtedly a tendency to overrate gasoline motors. At the same time a comparison with steam car performances on the track is worthless, as the rating of steam plants depends mostly upon the boiler, and in races, we understand, steamers sometimes start with as much as 1,200 pounds pressure to the square inch, so that they have a great amount of energy stored up in the boiler, which, as the pressure decreases during the race, is made available in the engine. In practical, everyday operation such high pressures are not used. Moreover all long distance records are held by gasoline cars, showing that the steamers are superior spurters only. All this, however, has absolutely nothing to do with the suitability of either power for practical purposes. The comparison of the 15 horse power stock steamer with stock gasoline cars is more apropos, and it tends to show that gasoline cars are less conservatively rated.—ED.]

ıe True Function of the Pneumatic Tire.

itor HORSELESS AGE:

:t seems to be the impression of most the automobile users and a great many hnical people also that the pneumatic e is used to make the vehicle ride easier, d for this purpose alone; the true func- n not being understood at all.

The purpose of the pneumatic tire is to isen traction resistance; that is, to allow e vehicle to move with the minimum of wer. Although a great deal of road bration is absorbed incidentally, it is of mparatively small importance, as ample rings of proper design and wheels of rge diameter give riding qualities that e tire alone cannot give.

Compare the riding qualities of one of the st horse-drawn victorias with those of ıy pneumatic-tired automobile having the ıort stiff springs used on most machines; ou will doubtless acknowledge that the rig ithout the pneumatic tires has the best of . If the horse-drawn rig had iron tires ıere would be a trace of a very fine short ibration caused by small pebbles and par- cles of gravel, which the springs did not ntirely absorb on account of their inertia; ny vibrations as short as these, however, ıay be absorbed in a small solid rubber re on the large diameter wheel which we efer to, the resulting smoothness leaving othing to be desired from a riding stand- oint.

The quality possessed by the pneumatic ire of diminishing traction resistance has lone made the high-speed automobile pos- ible. It also has made a practical bicycle ossible, as without it one man's strength vould have been insufficient to propel the nachine at practical speeds. The riding ıualities of the bicycle were taken care of efore the pneumatic tire came into use, by means of the spring frame; in fact, the old hard rubber-tired machines with the spring frames were easier riding than the present kinds. High speeds with the auto- mobile without the pneumatic tire would only be possible by prodigious expenditure of power.

If the road surface was ideal there would be no tractional advantages of the pneu- matic over the iron tire, on any form of vehicle. By ideal we mean a surface abso- lutely hard and smooth, such as hardened and polished steel, for instance.

But as our roads are not ideal we must consider a surface somewhat yielding, more or less, according to the nature of its ma- terial. The iron tire will sink into this sur- face until enough is in contact to support the load on the wheel; it must be remem- bered that the actual contact of a circle with a flat surface is only a line, so that the wheel must sink in to get a bearing. Load and road being constant, a large wheel will sink less than a small one.

Now before the rig can move ahead the wheels must either climb out of the hollow they are in or pack it down ahead of them, which of course is what occurs; although about as much power is required as though the rig were climbing an incline corre- sponding to the depression the wheel is in.

Of course on an asphalt pavement, or hard gravel, which more nearly approaches an ideal road surface, the depression under the wheels would be very slight, hardly measurable, but it always exists, and the power required to move the rig is in direct proportion to its extent.

Now consider the pneumatic tire. To obtain the necessary bearing on the ground to sustain the load on the wheel, the tire itself is flattened; the amount it will be flattened will be determined by the rela- tion of the tire to the load, rather than by the road surface.

Now in moving the rig ahead, instead of having to compress the road surface to get a bearing, the tire itself is compressed. But instead of the power required to com- press it being lost, as it is with the iron tire, it is restored again on the side leav- ing the ground, by means of the elasticity of the rubber and the compressed air which it contains.

Instead of a pneumatic tire having to roll down a bearing for itself in the road, it rolls down or flattens a bearing on itself; and instead of the power required to do this being lost it is nearly all recovered by the ability of the tire to force itself into a true circle again as the wheel progresses. It being obvious that just as much power as it took to flatten the tire on the approach- ing side will be given out on its leaving side, or just as much as the wheel is held back by the flattening of the tire in approaching the ground, just so much is it forced ahead by the tire forcing itself into a circle again in leaving the ground.

Of course there is some slight loss in the friction of the tire itself, and more or less from a tendency to flatten the road as well as the tire. This last named loss will be directly according to the road and the pro- portion of the tire to the load; of course, the poorer and softer the road the greater the loss from a tire of given form; the larger the tire, however, both in section and wheel diameter, the less power lost on any road.

Theoretically if the flat bearing of the tire was of sufficient area there would be no de- pression of the road, no matter how soft it was, and consequently no road loss what- ever. But, of course, in practice we can only approximate the ideal. The tire should be as large as possible, however.

The amount that a tire will be flattened will be determined by the pressure of the air and the load it carries: for instance, if a tire carries 1,000 pounds and is inflated to a pressure of 100 pounds to the inch it will flatten until 10 square inches rest on the ground. If the tire is large this will only represent a slight distortion, but if it is small the distortion soon becomes destruct- ive, besides creating friction losses in itself. If the pressure is increased, for example, to 200 pounds to the inch, then only 5 square inches would rest on the ground, but it then would more nearly resemble the iron tire and the road depression would be greater.

It is hardly possible to get a tire too large from a traction standpoint, for as the size increases the road resistance decreases, owing to the greater surface bearing on the ground, without undue distortion.

From the standpoint of tire economy the same factors that diminish road resistance safeguard the tire; for instance, a large tire under low air pressure has a corre- spondingly low pressure on the ground for each inch that it presents. Consequently it is comparatively free to yield to inequalities and substances that would tear and puncture it if it were more rigid. A tire carrying a load of 1,000 pounds with 10 inches on the ground is as safe as one carrying 500 pounds with only 5 inches on the ground, provided the distortion is in the same pro- portion. It is obvious also that light air pressures, other things being equal, are bet- ter for the tire than heavy ones.

ALFRED C. STEWART.

[While the pneumatic tire undoubtedly decreases the traction resistance at high speed and on rough road, we believe that the solid rubber tire gives the lowest trac- tion resistance on smooth hard roads, such as macadam or asphalt, at speeds of, say, 10 or 12 miles per hour. We should like to hear on this subject from readers hav- ing tested both kinds of tires under such conditions, users or manufacturers of elec- tric vehicles, for instance.—ED.]

Solid Tires—Comparison of Engine Types.

Editor HORSELESS AGE:

I have been much interested in what has recently been said in your journal concern- ing large wheels and solid tires. The auto- mobile manufacturers are gradually in- creasing the size of their wheels, but on most automobiles they are still too small, and no manufacturer as yet seems to dare to take the initiative and give an option on solid tires. From a study of the Doctors' Number of THE HORSELESS AGE it is ap- parent that there are numerous users of a popular make of solid tires who claim en- tire freedom from tire troubles, and no in- crease of repairs to the mechanism on ac- count of the extra vibration. They also claim comfort in riding. I see no reason why the most of this testimony may not be accepted as unbiased. I expect to get a gasoline car this spring, and I want large wheels with solid tires. It is perfectly well known that the larger the wheel the less will the inequalities in the road be felt, and as I do not wish to ride faster than 20 miles an hour I expect sufficient comfort with solid tires and an immense amount of satisfaction in freedom from tire troubles.

Will you kindly inform me what is the relative nicety of balance and freedom from vibration between a three cylinder two cycle engine, and a four cylinder four

cycle engine? Also what is the difference in reliability between two such engines? By reliability I wish to cover the possibility of getting stalled on the road and the probable frequency of repairs. What are the "outs" of a two cycle engine beside the difficulty of keeping the crank case tight?

AN OLD SUBSCRIBER.

[We believe there is little difference in the balance of a three cylinder two cycle and a four cylinder four cycle motor. The latter has a better balance of moving parts, while in the former, as the power strokes overlap, the vibration due to the torque reaction (the sideward pressure of the pistons on the cylinders) is less. The reliability depends so much upon the construction and so little on the type of the motor that a general comparison of types on this basis is impossible. The two cycle motor is liable to the faults common to all gasoline motors, such as ignition and carburation defects, loss of compression, etc. Of special "outs" we can at the moment think only of one, namely, that the flame may under conditions light back into the crank chamber.—ED.]

Motor Touring Difficulties in Jamaica.

Editor HORSELESS AGE:

Lately some of the daily papers have spoken very highly of Jamaica, W. I., for automobilists. The circulars and printed matter of some of the steamship lines have also spoken very highly of Jamaica and its roads and its various attractions for automobilists. As I have just returned from Jamaica it may be of interest to your readers to learn that, while the island is more than lovely in climate and natural beauties, and has most excellent roads, yet there are drawbacks there to the operation of an automobile, and there is at least one very good reason why the motorist should not venture there at the present time, if his machine happens to be one that uses gasoline.

Generally speaking the roads are quite as good if not better than those around New York. There are, however, some rather deep streams to ford, and some very severe and sharp grades. The roads are also much narrower than the roads here in the United States.

About the only safe kind of an automobile to take there at the present time is a steamer, and one that has a kerosene burner. You can obtain kerosene anywhere on the island, but it is next to impossible to obtain any gasoline except at Port Antonio. During the past month two gentlemen from Philadelphia had a car there, and were not able to obtain gasoline in Kingston, the largest and the chief city on the island. They were obliged to give up all further traveling with the car and put it on board the steamer at Kingston. There was another car that got as far as Spanishtown; it carried a reserve tank, but owing to a leak or some other reason the reserve of gasoline had disappeared and they were stalled. Whether they were towed to Kingston or what became of them I do not know.

It costs about $15 for transportation for an automobile from Philadelphia to Port Antonio, and the cost from New York to Kingston may be not far from the same amount. There is an additional charge of 5 shillings wharfage, and it is necessary to put up one-sixth of the value of the machine in the hands of the collector of taxes. This sum is returned to the owner when the machine leaves the country. It is also necessary to pay a fee of 10 shillings to the collector of taxes for the registration of the machine.

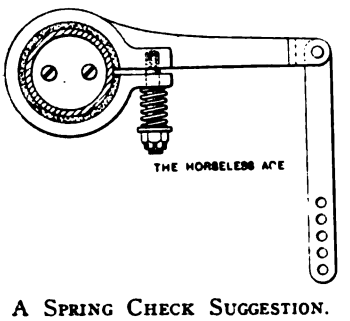
There are regular motor vehicle laws established by the Government, copies of which are placed in the hands of the owner or driver of the machine upon his arrival.

G. E. L.

A Simple Spring Rebound Check.

Editor HORSELESS AGE:

The writer was very much interested in Mr. Heldt's article on spring checks in THE HORSELESS AGE of January 10. The value of an efficient device of this sort in



A SPRING CHECK SUGGESTION.

smoothing the road and in saving springs and tires cannot be questioned. As some of the devices offered check both compression and recoil, and others the recoil alone, a question naturally arises as to which is correct. The reply is not far to seek; those which check both ways are a little better than none, while those which check recoil alone are correct.

A spring which is strong enough to carry its load safely is stiff enough for the comfort of the passengers, and any additional resistance due to the check will add to this discomfort; therefore the check should offer no resistance to the yielding of the spring. But when the spring recoils the check should prevent its doing so suddenly. It should offer sufficient resistance to render the recoil gradual, and should be so adjusted that the spring cannot recoil quickly enough to throw the load above its normal level.

In order to accomplish this the resistance offered by the check must be nearly equal to the difference in pounds between load and the upward pressure of the spring in its compressed condition.

I am sending herewith a sketch showing a simple form of spring check, which is similar in its action to the strap [illegible] The arm will move quite freely in one direction, but will offer considerable resistance in the other. By using a suitable spring and adjusting its compression with the nut the device may be made to offer any resistance required. This device is not covered by any patent that I am aware of and it offers an effective and economical solution of the spring check problem.

B. LOUIS TOWNSEND

Cork Inserts for Clutches.

Editor HORSELESS AGE:

I notice under "Communications" in your issue of January 3 a letter signed "B." in which the writer criticizes the builders of motor cars, in that they use such heavy springs in connection with their clutches (250 to 300 pounds pressure) that the extra work incident to traveling through crowded portions of a street or where gear shifting is constant becomes wearisome, and in the case of many cars would make it impossible for a lady or for a man who was not an athlete to operate the same.

Two manufacturers have already adopted cork inserts in their clutches in place of metal-to-metal or leather-to-metal for frictional purposes, and some half dozen more of the large manufacturers are at present experimenting with this device. Tests made at the Worcester Polytechnic Institute and elsewhere show that cork insert clutches are capable of transmitting the same power at one-half the spring pressure, to say nothing of their other good qualities, and, therefore, if manufacturers generally equip their clutches with cork inserts the spring tension can be materially reduced, and we who own cars will find the pleasure of operating them increased thereby.

LAWRENCE WHITCOMB

After Effects of the Shows.

Editor HORSELESS AGE:

Now that the Shows are over, and the satisfaction is deeply planted in the innermost recesses of our hearts that the automobile is the joy and blessing of this century, it only remains for us to limber up and get the soreness out of our limbs. The last day of the Show I provided *myself* with a pedometer to register my steps or distance that I walked, and after twelve hours' of tramping my pedometer registered 12 miles, and my avoirdupois being about 190 pounds, it is quite apparent that my 190 pounds were moving at some 88 feet per minute, which equals 16,720 foot pounds per minute, and dividing by 33,000 the result is equal to about one-half horse power developed continuously for twelve hours, or 1 horse power for six hours. Is it any wonder that one should feel tired and sore?

EDWARD A. OSSE

[This method of calculating the power required for locomotion per pedes is new to us.—ED.]

Piston Clearance.

itor HORSELESS AGE:

Will you kindly give me some informa- n as to what is considered the best prac- e in the clearances between the body of e piston and the cylinder walls of the gas gine? In other words, what should be e difference in diameter in thousandths of e piston body and the cylinder of a 3½×4 ch stroke engine? I have been told that me manufacturers make this 4/1000 and hers recommend making the piston 2/1000 naller at the top than at the bottom on ac- unt of the higher temperature reached by e top of the piston. I have had my cylin- rs ground and am now making new pis- ns and, having facilities for doing this ork very exactly, wish to know how small clearance I can allow without danger of e piston sticking. The engine is four linder, water-cooled with mechanically perated valves and on high speed reaches ,800 revolutions, and possibly more, a inute. L. W. DOWNES.

[We have not sufficient data on this point n hand to say what is average American ractice. In an article on French practice hich appeared in our columns some years go it was brought out that in France the sual clearance allowance is .0015 inch per nch diameter at the top end and .0004 inch er inch diameter at the bottom end. If our cylinder is exactly of 3½ inches bore, our piston should, therefore, be made of 3½—3½×.0015=3.4948 inches at the top end and 3.5—3.5×.0004=3.4986 inches at the bot- om end.—ED.]

Carbon Deposits on Piston—Oval Cylinder.

Editor HORSELESS AGE:

Information upon almost everything conceivable connected with the construction, running and care of automobiles has appeared in your valuable paper, yet I have to request help upon two points: (1) What causes an accumulation of hard carbon between the piston rings of a horizontal gasoline cylinder, and how can this be prevented? (2) This same horizontal cylinder is beginning to wear oval, which is shown in two ways: (*a*) The piston, in moving back and forth the length of the cylinder, also rotates slightly, so that at one end you can see under, say, its lower edge, at the other end the upper edge; (*b*) when thin oil is used to lubricate, and the compression is tested with the starting crank while the engine is hot, there is a hissing sound in the cylinder, and the compression is slight and of short duration. Now, how long ought this to be allowed to go? Should it be fixed right off, or should I wait until the engine shows loss of power? What is the most satisfactory method of repair, considering durability and expense?

I don't remember that either of these points has been discussed in THE HORSELESS AGE; in fact, from my reading I had the impression that a cylinder would be about the last thing in an automobile to wear out. J. T. FISCHER.

[If we understand you correctly, carbon is deposited on the cylindrical surface of the piston, between rings. This tends to indicate that gases blow through under the rings upon explosion, and the solid carbon particles contained in the gases are deposited in the spaces between the ill fitting piston and the cylinder. If both piston and rings are a good fit this could not occur. If the cylinder has worn considerably out of shape the only effective remedy is to rebore it and make a new, larger piston and corresponding rings. When this should be done is a question of personal preference. We would defer it until the power of the motor had become insufficient for our purposes.—ED.]

Theory of Disc Clutches.

Editor HORSELESS AGE:

Will you kindly inform me why the power which a disc clutch is capable of transmitting increases directly as the number of plates? JOSEPH A. ANGLADA.

[The power which a friction clutch is capable of transmitting depends upon three factors, viz., the number of revolutions of the clutch, the friction between the two parts of the clutch and the mean effective radius of the clutch surfaces. Now the speed and the mean effective radius are not affected by the number of plates, so the friction between the two sets must vary as the number of plates, and this it does. It will readily be seen that the pressure between any two plates is equal to the pressure of the clutch spring, except for the friction of the plates on their keys. The friction between each pair of plates is therefore equal to the pressure of the spring multiplied by the friction coefficient for the materials out of which the plates are made. The way these clutches are constructed it is impossible for one plate to slip with relation to a neighboring one without all the other plates of the same set simultaneously slipping with relation to all the plates of the other set, and hence no slipping can occur until the load is so great as to exceed the combined friction at all the frictional surfaces. Hence a clutch with sixteen plates of a given size will transmit twice the torque or pull as a clutch with only eight plates of the same size and using the same spring, and at the same speed will transmit twice the power.—ED.]

It is reported from France that Leon Thery has left the Richard-Brasier firm and has taken charge of another firm, which will produce cars under his name and which are to be sold evidently on the strength of his racing reputation. This recalls the Fournier-Searchmont combination, which was effected in this country a few years ago.

The Motor Vehicle Recognized by the Army.

BY CAPT. F. P. AVERY, U. S. A.

An entering wedge has been driven into the conservative military department of the United States. Brigadier General A. W. Greely, chief of the Signal Corps, U. S. Army, in the order below given has firmly established the position of the automobile in his department, and henceforth it will appear there as the copartner of the dignified Government mule.

In the Signal Corps there exists a board of equipment, whose duty it is to pass upon all matters pertaining to the equipment of the different trains fitted out by the corps. The following is a copy of the proceedings of a meeting of this board, with the indorsement of General Greely:

"The board met at 2:30 p. m., January 6,

"WAR DEPARTMENT, SIGNAL OFFICE,
"WASHINGTON, January 8, 1906.

"In the matter of wagons for field telegraph trains, which subject the board has had under consideration for several weeks, the following recommendations are now submitted:

"1—That the transportation of a field telegraph company of the Signal Corps, assigned to furnish semi-permanent and flying lines, and perform the visual signaling for a division of troops, be as follows: 3. Escort wagons * * *, supplied by the Quartermaster's Department; 3. Construction wagons * * *, supplied by the Quartermaster's Department; special wagons, supplied by the Signal Corps; 4. Lance trucks; 4. Wire wagons; 4. Instrument wagons; 6. Reel carts. * * * (Details of construction) * * *

"9—That the construction of these wagons should be only by the largest manufacturers in the United States. This to enable the Signal Corps to duplicate quickly a large quantity in case of war.

"(Signed by the members of the board.)

"Approved:

"Recommendations approved with the addition of an auto telegraph wagon and one auto repair wagon, to be of types later determined upon.

"(Signed) A. W. GREELY,
"Brigadier General,
"Chief Signal Officer of the Army."

As this action of General Greely is final the official status of the automobile in his department is fixed. The types to be adopted by the board of equipment in compliance with the above action have not been formally decided upon, but as the types now in use have proven satisfactory they undoubtedly will be adopted. These were described in THE HORSELESS AGE of December 6, 1905.

As soon as this action is taken the Signal Corps will be in the market for some of these machines. The present purchases will probably be limited to a few, but, as will be noticed in paragraph 9 of the proceedings, the manufacturer who secures the order will have something in sight in case of military activity.

MAINTENANCE AND REPAIRS

[Suitable contributions to this department, accompanied by sketches, are solicited and will be well paid for.]

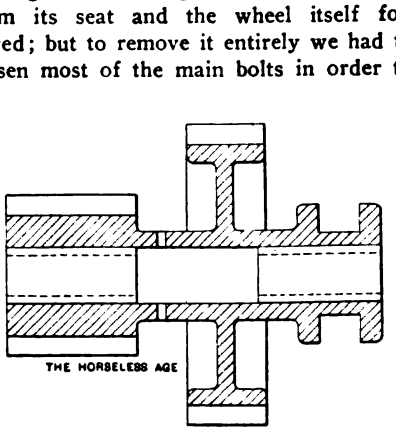
Repairing a "Seized" Sliding Member.

By Jules Ouvrier.

Deliveries of so called "1906 models" are being made early, so early that many of the cars are sent out in a more or less unfinished and incomplete condition, both as to design and workmanship. Some few days ago I was called upon to tow in a car that was stalled in a distant suburb, a job I like, as many valuable suggestions are always forthcoming from the assembled multitude. Without having anything out of the usual run occur to mar the keen enjoyment of such an episode, I arrived home with the outfit. The disabled machine turned out to be a 1906 touring car, weighing 2,150 pounds, with a 5½x6 inch double opposed engine (tested at the factory and claimed to develop 31 actual horse power), and sliding gear transmission. Though the engine ran nicely no power was delivered to the driving wheels.

TROUBLE IN GETTING AT THE TROUBLE.

The body was removed after taking out four bolts in the body proper and two in the dash, and disconnecting the battery connections. I was told the transmission could not be removed without taking out the crank shaft, involving loosening the bearings and removing other parts, and it certainly looked that way. After taking off the aluminum crank case cover plates, held on by a multitude of screws, the gears were exposed to view. This was a sight good for sore eyes; the gear box is certainly the finest I have seen in many a day. By a double gear movement no gears run idle when the high speed is in use. Removing more screws from the lower half of the gear case cover we still found it impossible to get it off. On the extreme end of the shaft a brake wheel is keyed. To get this off involved much labor, but by making a steel wedge we forced the key from its seat and the wheel itself followed; but to remove it entirely we had to loosen most of the main bolts in order to force down the brake wheel low enough to clear the frame. This wheel is cupped on the inside and projects over the bearings. It was quite a lot of work to do all this, and could have been made much easier by foresight in the draughting room.



The Rebushed Gears.

THE TROUBLE REMOVED.

Behind this wheel were two more bolts holding the case together. Blocking up the transmission we removed these bolts and after marking all parts so as to save time in replacing we dropped the lower half of the case, took out the countershaft and found that the compound gear had "seized" its hollow shaft. It was bushed with common brass, and from running some time on the low gear without effective lubrication had stuck fast. We drove the gear off, one-half of the double bushing remaining on the shaft. To get this off it was suggested that we saw or use a chisel, but by hammering and thus expanding it it was easily removed, much to the edification of the wiseacres looking on. We made new bushings, not of yellow brass but of the best bronze. In the original no oilways had been provided, but a cavity was left in the middle and three holes drilled connecting this with the face of the gear. It seems to me that instead of oil working in the tendency would be for centrifugal force to drain the cavity. To remedy this we cut a shallow oil groove in each bushing, i. e., a spiral thread cut so that when running the oil would be drawn in from the sides to the cavity.

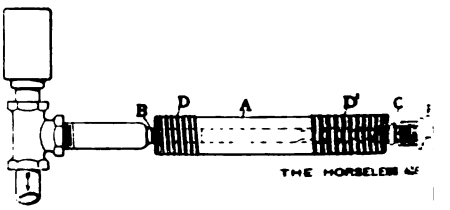
In cleaning out the crank case quite a lot (about a tablespoonful) of fine steel slivers was found in the bottom which came from the clashing of the gears in shifting. This part should be cleaned quite often, especially in the case of a new car, until the sharp edges are worn off the gears.

A Bad Air Valve Repaired on the Road.

By "Doc" Dunlop.

A short time ago while taking a cross-country ride on my new motor cycle I came upon a couple of fellows trying very hard to pump air into the air tank of a small steam runabout. As I passed them one of them hailed me and wanted to know if I would send out a machine from the city to tow them home, which, by the way, was some 25 miles away. I stopped my motor, alighted and returned to where they were working with the machine, naturally curious to know just what was wrong. At a glance I saw that their trouble was either with their pump or the valve attached to the machine.

The accompanying sketch shows quite plainly where the trouble was and how it was repaired without having the machine "towed in." At B in the sketch is shown the original valve connection, from which the valve and cap had been lost by the jarring of the machine while running over the rough country roads in that vicinity. I looked through my pair kit and spare parts, and found complete valve and cap, but, unfortunately, this would not fit the connection the tank, neither valve nor valve so the next thing to do was to find a of attaching this valve. I cut off 4 inches of the hose attached to the pump, and next to the pump, and one end of this piece of hose I inse the spare valve body, as is shown with the cap at E. I then forced other end of the hose on the connec at B, and to make these connec tight I wound both ends of the hose wire, as is shown at D and D¹. W this arrangement and the hand pump tached to it, after removing cap E took but a few strokes of the pu plunger to bring the pressure up



The Repaired Valve.

air reservoir sufficient to force the ga line to the generator and burner. It w less than a half hour from the time discovered those fellows in their pl before they were again on their way joicing.

The Law Brought Up to Date.

A correspondent sends us the following "Newberry, Mich., boasts of one au mobile. The village fathers there have n taken the advent of the automobile so se ously as have the officials of some othe towns. They have a saving sense of humor and have adopted the following regulation governing the use of gas buggies in the vi lage limits: 'Resolved. That the owner o said automobile be and is hereby instructe not to run said machine at a rate exceed ing three miles an hour while within th village limits; resolved, further, that all th provisions of the ordinance relative to pounds and impounding beasts be and the same are hereby extended to include said automobile, and that the health officer be instructed to enforce all ordinances relative to nuisances and noxious smells; resolved that parents be and are instructed to keep their children off the street at all hours of the day and night, including Sundays and election days.'"

The Minister of the Interior for Austria has issued a series of regulations for observance throughout the empire by drivers of motor vehicles. In the towns speed is limited to nine miles an hour, 27 miles per hour being permitted in the country. The lower speed applies to villages, etc.

LEGISLATIVE and LEGAL

L'Hommedieu Taxation Bill Up Again at Albany.

ANY, N. Y.—Senator L'Hommedieu reintroduced his act "To amend the r vehicle law, by imposing a State tax notor vehicles, and providing for the ction thereof." It was brought forth Monday of last week, and after a sec- reading was referred to the Senate mittee on Taxation and Retrenchment. rrespondent of THE HORSELESS AGE ed an interview with Mr. L'Homme- in which a free discussion of the act place.

said that his object in introducing the as to place the burden of taxation e new State roads where it belonged, the automobilists. The latter, he said, ery largely instrumental in the con- ion of the present roads. While the : of the country districts, of course, equal benefit from the State roads, o not actually need roads of so elab- a character. The State pays 50 per of the expense of the roads, the 35 per cent. and the township 15 nt. The automobilists, who use the perhaps more than any other class, thing. This he thinks is not a fair ation of the expense. Last year, he after the act had died in the Senate reaching the Assembly, he had been ed strong support, probably suffi- carry the measure, if he would post- urther action till 1906. This he to do. An attractive feature of the he thinks, the fact that it involves dition of all other laws regarding ation of automobiles. He believes much revenue will be raised by the ns of the act as by direct taxation. that, while he had not made a can- to what support he would receive in ate, he strongly believed that, in the promises of last year, men- above, and for other reasons, the will go through.

ct was first introduced on March 8 ; was changed to an Assembly bill; the Committee on Taxation and ment. It was reported favorably e Committee on Taxation and Re- ent, with amendments, and finally erred to the Committee of the with whom it rested.

: Committee on Taxation and Re- nt remains the same this year, it able to suppose that the act will : reported favorably, especially as Iommedieu is a member of the e. It will be recalled that the prin- ovisions of the bill are for the f all motor cars at a rate of $1 per horse power and the expenditure of the amount so collected under the direction of the State Engineer and Surveyor for the construction and maintenance of highways.

New Jersey Automobile Law Upheld—A Decision in the Test Case.

JERSEY CITY, N. J.—After withholding his decision for many months in the case of Harry Unwin, who, with the support of the National Association of Automobile Manufacturers, is testing the constitutionality of the State law which provides that non-residents must obtain licenses at a cost of $1 each in order to operate motor cars in the State, Judge Blair, of the Court of Common Pleas, on January 23 sustained the decision of the lower court, which fined Mr. Unwin $10 for not having such license. In his decision Judge Blair holds that:

First—The requirement of the statute that every person should procure a certificate at a fee of $1 is not the imposition of an additional tax upon such vehicle.

Second—That the filing of a certificate and the $1 fee is a license fee, and its exaction is the exercise of the legitimate police power of the State.

Third—That the exaction of this fee is not the creation of a new and distinct class among those entitled to the use of the public highways.

Fourth—That a distinction may be legally made in the matter of a license fee between the manufacturer of motor vehicles and owners who use them for pleasure.

Fifth—That the law in question, though it may not accomplish the whole purpose of its enactment, to wit, the complete identity of the owner of the vehicle, it does accomplish that object in a measure and is therefore valid.

In regard to the decision Charles T. Terry, counsel for Mr. Unwin and the National Association of Automobile Manufacturers, is quoted as saying:

"The case will be appealed in the State of New Jersey. The decision of the Court of Common Pleas against us makes this more easily possible than if the finding of the police court had been reversed. What we want is to get the case finally to the United States Supreme Court and to get as much opinion from the courts as possible on the way there. We would like to go to the highest court with the reasons for previous decisions spread out in full."

New Bill Stirs Up Strife in New Jersey.

TRENTON, N. J.—On January 23 Senator Frelinghuysen, of Somerset County, introduced in the State Legislature a bill to regulate the use of automobiles within the limits of the State, which has considerably stirred up motorists in and out of the State because of what are regarded as drastic provisions. It is radically different in character from the law now in force and quite different, in fact, from the laws of any other States. Senator Freylinghuysen, who is himself a motorist, and has toured extensively here and abroad, explains that his bill embraces many provisions of the French and Austrian regulations.

The measure provides for the appointment of a commissioner of motor vehicles, together with a force of inspectors, authorized to make arrests without warrants for all violations of the law. The commissioner is to make an annual report to the Governor, with such recommendations as he may desire.

Annual licenses are to be issued by the Secretary of State and by the chiefs of police, the latter with the authority given them by the motor commissioner. The annual fee is to be fifty cents per horse power for each machine, with an additional twenty-five cents per horse power for the driver. Short time tourists may be registered at $1 per day. All drivers must be examined before being licensed. Manufacturers may secure licenses good for five days. The age of a driver is limited to eighteen years, and his photograph must be attached to his license certificate. Any license may be revoked by any magistrate for violations, but may be renewed at the option of the commissioner.

The speed limit is one mile in seven minutes in cities and towns, on crossings and while passing other vehicles. Elsewhere it is one mile in three minutes, all speed to be in keeping with common safety. Violations are punishable by a fine not exceeding $500 and imprisonment not exceeding sixty days. All fees are to be paid into the State Road Fund. It is estimated that such fees will amount to $100,000 to $150,000 annually.

The fight against the passage of the bill is being led by the Associated Automobile Clubs of New Jersey. Letters have been mailed to many motorists throughout the State asking for their support and inviting them to attend the hearing which will be asked of the committee to which the bill has been referred. The principal objections made to the measure by the association are to the appointment of a high salaried commissioner, who they say will have power to dictate as to the kind of tire protectors, skidding preventers and similar devices to be used on machines; the payment of fees based on horse power ratings; the authorizing of constables to make arrests without warrants, and the examination of operators.

A Solid Tire Suit.

As we announced last week the Swinehart Clincher Tire and Rubber Company, of Akron, Ohio, have brought suit against the Motz Clincher Tire and Rubber Company, of the same city, for alleged infringement of certain patents owned by the plaintiffs. It is understood that there are several patents involved, but the suit is based chiefly upon patent No. 772,636, granted on October 18

1904, to James A. Swinehart, and of which the claims are given below:

1. A tire for wheels comprising an elastic body solid throughout with concave sides and narrowed central portion and a convex tread surface with an enlarged rib centrally about the circumference of the tread.

2. A tire of rubber constructed with a widened base and a widened tread and a solid central portion of narrower cross section than said base and tread, said tread being convex in form and provided with ribs of varying sizes running circumferentially around the tire.

3. A tire for vehicle wheels constructed with a widened base and a widened tread with a solid connecting portion of less width than said base and tread, a groove in the sides of the base of said tire and an enlarged rib running circumferentially about the centre of the tread.

ST. LOUIS, Mo.—Bankruptcy proceedings have been started in the Federal Court against the A. L. Dyke Automobile Supply Company, by three creditors whose claims aggregate $1.515.

BOSTON.—A bill introduced in the House provides that every automobile or motor cycle used in Massachusetts shall be equipped with a gong or bell, which shall sound or strike at every revolution of the wheel.

UTICA, N. Y.—Report has it that the involuntary bankruptcy proceedings against the Black Diamond Automobile Company are to be dismissed, the company having given checks and notes in settlement of their debts.

PLAINFIELD, N. J.—The F. L. C. Martin Automobile Company have filed papers in a suit for $10,000 against the Pope Manufacturing Company in the Supreme Court at Trenton. The suit is based on a claim that cars sold to the plaintiffs were of a character to cause a loss of trade.

RICHMOND, Va.—Two bills were introduced in the Legislature last week regulating the running of automobiles and limiting the speed to 15 miles per hour, and requiring the driver to give the right of way to horse drawn vehicles. A fine of not less than $10 nor more than $100 or imprisonment in jail for not less than five nor more than thirty days is the penalty for the violation of the provisions of this bill.

Club Notes.

ALBANY A. C.

The summer season will be inaugurated by an endurance run over a course of about 1,000 miles; three prizes will be offered.

A. C. OF SYRACUSE.

The club will hold its annual banquet at the Yates Hotel on February 14. C. Arthur Benjamin will act as toastmaster.

GRANITE STATE A. C.

Albert L. Clough addressed the members of the club on the evening of January 23, using "Grades" as his subject.

Motor Cars for Traveling Grocery Salesmen.

In seeking confirmation of a report that the firm of J. H. Blackwell & Sons, wholesale grocers, Trenton, N. J., are contemplating equipping their traveling salesmen with motor cars, a representative of THE HORSELESS AGE called upon them last week and secured an interview with Mr. Blackwell, in which he stated that although they have not yet bought their cars, they will soon purchase a runabout with which to experiment before ordering a number.

They desire to have their salesmen cover about 60 miles per day in their territory securing orders, for which purpose it will be necessary for them to carry about 50 pounds of samples each. The salesmen will be expected to operate their own cars. There are a number of possible customers whom they are not now able to reach readily located in out of the way places, from 5 to 6 miles off the direct line of travel, and they figure that with horse travel a sufficiently large amount of territory cannot be covered to make the extra cost of traveling pay. They propose to visit all these places, large and small, when the salesmen are equipped with automobiles. With the horse vehicles used now only about 30 miles per day are covered, and only the larger towns visited. Even these are not visited so often as it is hoped they will be when motor cars are employed.

The practicability of automobiles is to be determined by the tests about to be made, and, according to Mr. Blackwell, there are a number of points that are doubtful. In the first place, they estimate the cost of a suitable motor car will be about $750, while a horse and carriage costs about $300. A horse drawn equipment lasts about two years, they say, while the length of life of an automobile in their work is yet to be determined. Another point which gives them concern is, that their salesmen are employed more for their ability to sell groceries than to run automobiles, and may, therefore, be seriously lacking in the latter qualification, while very proficient in the former, which they naturally regard as the more important.

Commercial Vehicle Notes.

The Hilo Sugar Refining Company, Honolulu, T. H., have placed a 3 ton Pope-Waverley electric truck in operation, to be used for carrying freight.

C. W. Gray, Watertown, N. Y., has purchased a Packard truck with a specially constructed body, to be used for the transportation of passengers on streets through which cars do not run. He has applied to the city board of aldermen for a franchise.

The city of Syracuse has appointed W. H. Bex to have charge of the automobiles belonging to the city. The authorities contemplate the purchase of additional motor cars for the various departments in the near future.

Ormond-Daytona Races.

New speed records were made dur[ing] past week while the Florida races [were] progress. The course was in fairly [good] condition, and the weather favorable [for] greater part of the time. The [Stanley] steamer, which was driven by [Marriott] covered a mile in 28 1-5 seconds. Fol[low]ing are the summaries of the races:

One Mile International for Dewar [Cup]—Won by Marriott (Stanley), in 33 [seconds].

One Mile Heavyweight Championship—[Won] First Heat—Won by Lancia (Fiat), [in] seconds.

One Mile Steam Championship—[Won] Marriott (Stanley), in 34 4-5 seconds.

Five Mile Open Championship—[Won] Lancia (Fiat), in 3m. 1 1-5s.

Five Mile Middleweight Championship—[Won] Won by Cedrino (24 h. p. Fiat), in [3m.] 3-5s.

Five Mile Heavyweight Championship—[Won] Won by Clifford Earp (100 h. p. Napier) in 2m. 56s.

Fifteen Mile Race for American Touring Cars—Handicap; pace according to [power]. Won by Durbin (15 h. p. Stanley), with [45] seconds start, in 13m. 42 2-5s.

Ten Mile Corinthian Championship—[Won] Won by S. B. Stevens (Fiat), in 9m. [40]

Ten Mile Middleweight Championship—[Won] Won by Vaughan (80 h. p. Darracq) [in] 7 minutes.

Ten Mile Corinthian Handicap—[Won] H. N. Harding (45 h. p. Daimler), with [a] 30s. start, in 8m. 48 4-5s.

Kilometres, Record Trials, All Classes—[Won] Marriott (Stanley steamer), 18 2-5 seconds.

Kilometre Record for Gasoline Cars—[Won] Won by Clifford Earp (100 h. p. Napier) in 21 3-5 seconds.

Mile Record Trials, All Classes—[Won] by Marriott (Stanley steamer), 28 1-5 [sec]onds.

Record for Middleweight Cars—[Won] Wurgis (32 h. p. Reo), in 52 3-5 seconds.

One Hundred Mile International Championship for Minneapolis Cup—[Won] Earp (100 h. p. Napier), in 1h. 15m. 40 [2-5]s.

Ten Mile Open Handicap—Won by [Lan]cia (110 h. p. Fiat), from scratch in [8m.] 18 2-5s.

Thirty Mile Championship for American Built Cars—Won by Marriott (Stanley), [in] 34m. 18 2-5s.

Fifteen Mile Championship—Won [by] Lancia (110 h. p. Fiat), in 10 minutes.

Ten Mile Open Championship, Combined with Ten Mile Heavyweight Championship—Won by Lancia (110 h. p. Fiat), in [8m.] 19 3-5s.

Two Mile a Minute Record Trials—Won by Demogeot (200 horse power Darracq) [in] 58 4-5 seconds; Marriott (Stanley), second, in 59 3-5 seconds.

The Ormond meet, reported above, [was] even a greater disappointment to those who went to Florida to witness keen competition than the meet last year. Records were broken, but interest was entirely lacking.

Aluminum Production.

ne price of aluminum has doubled in last five years, reports Consul General nther, of Frankfort, and that produc- is largely increasing in Europe. The orts is from German sources, as fol- s:

he companies at present producing ninum are:

Aluminum Industry A. G., in Neuhau-, Switzerland, which also has works at id-Gastein, Austria, and at Rheinfelden, len. The total annual production of the ee works of this company was esti- ted at 3,675 tons (at 2,204 metric nds), employing 88 bureau officials and workmen. The Neuhausen company ured territory in the Swiss Canton of allis, where it has the use of 50,000 rse power of water power. New works to be erected there. It has also pur- ased the stock of and now owns the emical works of H. Bergins & Co. in utsch Lissa, Silesia, where about 200 rkmen are employed, mainly in making ts of aluminum.

2. British Aluminum Company, at Feyer, otland, which has also works in Sarps- s, Norway; its total production per year s been estimated at 2,250 tons.

3. Société électro-métallurgique française, French company, with works at La Praz id Les Sordrettes, in Savoy, produces out 2,325 tons of aluminum per year.

4. Société des produits chimiques d'Alois de la Camargne has works at Calypse id at St. Felix, in Savoy, whose combined nual production is stated to be 2,100 ns. The French aluminum works were osed for some months owing to a strike.

5. The Pittsburg Reduction Company as works at Niagara Falls, N. Y., Shawen- an, Canada, and at Massena, N. Y., whose ombined production is said to be 4,200 ns.

The manufacture of this metal has been ery profitable, the price having almost oubled since the year 1900. One of the European aluminum manufacturing firms as its entire production of the metal sold head for several years. The great de- nand for the metal and the profitable rices it commands will cause a large in- rease in production.—*Consular Reports.*

New Incorporations.

Sioux City Motor Company, Des Moines, Ia.—Capital, $10,000.

The Newark Motor Car Company, Newark, N. J.—Capital, $100,000. Incorporators, Peter Broderson, James F. Kelly, George H. Walters.

The Detroit Ignition and Supply Company, Detroit.—Capital, $25,000. Incorporators, E. J. Pennington, M. Pennington and S. Swatridge.

The Summit Garage, Summit, N. J.—Capital, $25,000. Incorporators, C. S. Hardy, W. C. Johnson. John C. Sparks, Edward E. Benedict and R. C. Wilson. Officers, C. H. Grant, W. C. Sampson and William Lampson.

The Angelus Motor Car Company, Los Angeles, Cal.—Capital, $30,000. Directors, F. K. Eckley, A. C. Lusby, W. G. Nevan.

The Trans-River Auto Company, Brooklyn, N. Y.—Capital, $15,000. Incorporators, A. T. Herd, R. Ferguson and C. W. Baker.

Motor Car and Storage Company, Paterson, N. J.—Capital, $10,000. Incorporators, Hattie A. Berry, H. Coulson Fairchild and Alfreda Fairchild.

Oliver Electric Vehicle Company, Cleveland.—Capital, $10,000. Incorporators, A. H. Parrott, E. C. Mullen, H. A. Mullen, Sherman Arter and M. Barnes.

The Matheson Company of New York, Huntington, N. Y.—To manufacture automobiles. Capital, $100,000. Directors, H. U. Palmer, A. P. Palmer, C. O. Singer.

The Auto Shop Company, Cleveland, Ohio.—Capital, $50,000. Incorporators, Clark F. Schroeder, Ira B. Sperry, Walter C. Schroeder, Milton W. Lusk and A. L. Maurer.

Manhattan Auto Car Company, New York.—To manufacture and operate motor vehicles. Capital, $1,000. Incorporators, B. W. Wrenn, F. DeC. Sullivan, Sidney H. Hartsborne.

Graham & Goodman Company, Incorporated, New York city.—To manufacture automobiles. Capital, $10,000. Incorporators, Charles W. Graham, J. Monroe Graham and Frederick F. Goodman.

The Alameda Garage, Oakland, Cal.—To manufacture, sell and repair automobiles. Capital, $20,000. Directors, Paul K. Buckley, Frank Smith, E. K. Taylor, William E. Keene and John F. Buttrick.

The Salisbury Tire Company, Owosso, Mich.—Capital, $100,000. Officers, E. R. Salisbury, president and general manager; Oliver Salisbury, assistant manager; E. P. Waldron, vice president, and Robert Steel, secretary and treasurer.

Agency and Garage Notes.

A garage is to be erected at Halsteads, Park Heights avenue, Baltimore, Md.

The Chadwick Motor Car Company have opened salesrooms at 621 Broadway, New York city.

C. W. Worthing, of Fond du Lac, Wis., expects to open in that town a garage about March 1.

W. S. Hunt is building a garage on Chester avenue and Eighteenth street, Bakersfield, Cal.

John L. Silleck will represent the Rambler, Marion and National cars this season in Peekskill, N. Y.

The Bartholomew Company, of Peoria, Ill., have opened a branch at 131 Second street, Des Moines, Ia.

The Eastern Automobile Company, of 326 North Broad street, Philadelphia, are building a large addition to their garage.

The Antler Automobile Company and the Colburn Automobile Company, of Denver, Col., are moving their garages to the new Colburn Building, at Broadway and Fifteenth street.

The Albany Garage Company are erecting a garage on Howard street, Albany, N. Y.

The Austin car will be handled in New York during 1906 by Frank A. Sanford.

The Grant Brothers Auto Company, Detroit, have become agents for the Thomas and Buick cars.

Bankers Brothers Company, Pittsburg, Pa., are opening a downtown salesroom on Diamond street.

The Pope-Toledo car will hereafter be represented in Pittsburg by the Electric Automobile Company.

The Duluth Electric Construction Company, Duluth, Minn., have acquired the agency for Pope-Waverley cars.

The Troy Auto Exchange, Troy, N. Y., have bought out the garage of the Lucey-Reynolds Company, Albany, N. Y.

The agency for the Majestic tires in San Francisco has been placed with the Midland Automobile and Bicycle Supply Company.

J. A. Clairmonte, Los Angeles, Cal., will erect a garage on the west side of Spring street, between Seventh and Eighth streets.

The Philadelphia Auto Tire Repair and Rubber Company, of 711 North Broad street, Philadelphia, have acquired the agency for G. & J. tires.

John Wolf, Alexander Lindgren and Martin Weber have formed a company to erect a garage at La Porte, Ind., and will act as agents for Buick cars.

Harry Marvel, formerly in the employ of the Pope Manufacturing Company, Philadelphia, has been appointed manager of the Amos-Pierce Automobile Company, Syracuse, N. Y.

The Covell & Crosby Motor Company, 1621 Broadway, New York city, was recently incorporated to handle Ariel motor cars in Greater New York, Long Island and Westchester County.

The Atlas Automobile Company, Pittsburg, Pa., have acquired the agency for Premier and Maxwell cars for western Pennsylvania, southern Ohio, western Maryland and West Virginia.

The Acme Motor Car Company, of Reading, Pa., are establishing a branch at 713 North Broad street, Philadelphia, which they expect to occupy about February 1. D. W. Webster will be manager.

The Motor Car Company, Baltimore, Md., are erecting a garage at the corner of Mt. Royal and Maryland avenues. They will act as agents for the Thomas Flyer, Baker electric and Peerless cars.

The Northern Manufacturing Company, of Detroit, have lately appointed the following new agencies: The Bonney Auto Company, Kansas City, Mo.; Northern Car Agency, Boston, Mass.; the Diamond Motor Car Company, Los Angeles, Cal.; the Mechaley Brothers, Stafford, Conn.; Welch-Estberg Company, Milwaukee, Wis.; the Bagnall Auto Company, St. Louis, Mo., and the Crescent City Automobile Company, New Orleans, La.

MINOR MENTION

There are said to be 280 automobiles and motor cycles in use in Denver, Col.

The Denver Auto Goods Company have removed to 1614 Broadway, Denver, Col.

The Schubert Brothers Gear Company, Oneida, N. Y., have increased their capital stock to $75,000.

The Holmes-Booth Motor Car Company, of Willson avenue, Cleveland, succeed W. M. Booth, of that address.

The Wright Cooler and Hood Manufacturing Company, 335 Wabash avenue, Chicago, have begun operations.

C. P. Weeber will, it is reported, erect a new factory at Central avenue and Bradford street, Albany, N. Y.

The Iron Pneumatic Wheel Company have moved their offices and salesrooms to 251 Fifth avenue, New York city.

It is reported that the Consumers Brewery building on Whitehead's road, Trenton, N. J., is to be converted into an automobile factory.

D. M. Dearing and P. B. White, of Jackson, are said to be organizing a company to manufacture children's automobiles at Leslie, Mich.

The Hotchkin Anti-Jolt device is a new shock absorber which has been placed on the market by P. M. Hotchkin, 4021 Lake avenue, Chicago, Ill.

The Mack Brothers Motor Car Company, Allentown, Pa., have sold their foundry and pattern shop to the Taylor Manufacturing and Construction Company.

A. Ekaf, a Japanese who is a graduate of the Massachusetts Institute of Technology, is said to be starting negotiations for the founding of an automobile factory in Japan.

It is reported that a number of Trenton capitalists have purchased the rights to manufacture the Walters car, and expect to start a factory at Trenton for this purpose.

C. Arthur Benjamin, formerly sales manager of the H. H. Franklin Company, of Syracuse, has taken a position with the Babcock Electric Company, of Buffalo, N. Y.

The Baldwin Chain and Manufacturing Company, Worcester, Mass., have purchased a four story building on the corner of Chandler and Bellevue streets, as an addition to their plant.

The Krueger Manufacturing Company, Milwaukee, Wis., are erecting a factory at the corner of Water and Biddle streets, where they will manufacture a 40 horse power four cylinder car.

We have just received a copy of "Two Americans in a Motor Car Touring in Europe," a small volume by Herbert F. Gunnison, published by the Brooklyn *Daily Eagle*, which contains accounts of ten tours in Europe by two residents of Brook- the routeings for some sixty more. It would seem to be very helpful to those motorists who contemplate European tours.

After February 1 the Philadelphia Ornamental Wire Company will be installed in their new factory at Camden, N. J., with offices and salesrooms at 525 Commerce street.

The Mercedes Import Company, New York city, will now handle the retail sales of German Mercedes cars in America, having opened a salesroom on the ground floor of the new Times Building.

Plans are being made by the officials of the Westinghouse Machine Company, East Pittsburg, Pa., for the manufacture of automobiles. The machines which now bear the company's name are made in France.

The Professional Chauffeurs' Club of America, New York city, has been organized, with the following directors: Valentine Coch, Frederick W. Walsh, Wm. H. Walter, Frederick H. Brebogle and Martin McGuire.

W. H. Anderson & Sons, of 28 St. Albans avenue, Detroit, have been merged into a new company known as the Anderson Forge and Machine Company. Russell A. Alger, Jr., is president. They have greatly increased facilities.

In the Show catalogue printed in our issue of January 10 the price of the Duryea double victoria was given as $2,000. It should be $1,900, and the motor should have been rated at 25-30 horse power, instead of 15 horse power.

At a special meeting of the board of directors of the Diezemann Shock Absorber Company, 1311 Hudson street, Hoboken, N. J., the following directors resigned: Malcolm C. Anderson, Halcott Anderson, Henry L. Scheuerman and Geo. E. Armstrong. They are succeeded by Sam Fisher as president; Henry Fisher, vice president and manager; Carl Bomeisler, as secretary and treasurer, and Isidor Springer and Adolph Boskowitz, as directors.

Patents of January 16.

809,946. Spring Gear for Vehicles.—Charles A. Hennicke, Buffalo, N. Y. Filed January 12, 1905.

809,986. Tire and Other Valves.—George H. F. Schrader, New York, N. Y. Filed February 6, 1897.

810,061. Pneumatic Cushion Wheel.—Charles A. Lee, Kansas City, Kan. Filed June 28, 1905.

810,206. Locking Device for Motor Cars, Automobiles and the Like.—Isaac W. Heysinger, Philadelphia, Pa. Filed August 21, 1905.

810,261. Steering Gear for Traction Engines.—Peter L. Cantelou, Hillsboro, Tex. Filed June 26, 1905.

810,282. Recoil Check for Vehicles.—Henry A. House, Bridgeport, Conn. Filed April 20, 1905.

810,337. Wheel.—Gustave L. Hinsch, Waverly, Ia. Filed March 3, 1905.

810,362. Street Cleaning Apparatus.—Napoleon St. Peter, Jr., Fairfield, Me. Filed March 2, 1904.

810,372. Steering Knuckle for Vehicles.—Jackson O. Haas, Pottsville, Pa. Filed February 16, 1905.

810,379. Motor Vehicle.—Harry M. Pope, Chicopee Falls, Mass. Filed September 1903.

12,437. Frictional Retarding Means for Spring Vehicles.—Jules M. M. Trauffaut, Paris, France. Filed June 9, 1905. Original No. 695,508, dated March 18, 1902.

Patents of January 23.

810,419. Attachment for Vehicle Wheels.—George W. Kirkpatrick, Rochester, N. Y. Filed February 3, 1904.

810,420. Attachment for Vehicle Wheels.—George W. Kirkpatrick, Rochester, N. Y. Filed August 8, 1904.

810,487. Wheel for Traction Engines.—Irvin O. Hotaling, Crab Orchard, Neb. Filed June 12, 1905.

810,526. Wheel for Vehicles.—Thomas Gare, New Brighton, England. Filed January 15, 1904.

810,636. Automobile.—Leonard B. Taylor, Newton Center, Mass. Filed March 21, 1905.

810,643. Cooling Means for Explosive Engine Cylinders.—Simeon Ham, Indianapolis, Ind. Filed May 8, 1905.

810,673. Vehicle Steering Mechanism.—Frank B. Rae, Chicago, Ill. Filed June 4, 1898.

810,674. Vehicle Motor Suspension Mechanism.—Frank B. Rae, Detroit, Mich. Filed September 7, 1905.

810,679. Steering Device for Vehicles.—George K. Rudert, Wilmington, Del. Filed March 7, 1905.

810,697. Cap.—Louis Balsam, New York, N. Y. Filed May 17, 1905.

810,783. Friction Clutch.—Jonathan D. Maxwell, Detroit, Mich. Filed July 8, 1904.

810,792. Carburetor.—James McIntosh, Lansing, Mich. Filed October 15, 1904.

810,869. Power Transmitting Mechanism.—John B. King, Plymouth, England. Filed April 10, 1905.

810,881. Motor Vehicle.—Leroy S. Pierce, Canton, Ohio. Filed April 1, 1905.

810,888. Vehicle Tire.—Charles Seiberling, Akron, Ohio. Filed September 29, 1904.

Trade Literature Received.

The American Shock Absorber Company, Easton, Pa.—Folder telling about their hydraulic shock absorber.

The Milwaukee Rubber Works Company, Cudahy, Wis.—Pamphlet describing the Fawkes clincher tires.

The Baker Motor Vehicle Company, Cleveland, Ohio.—Illustrated booklet, "Aristocrats of Motordom," showing the various models.

American Motor Car Manufacturers' Association, Chicago, Ill.—Booklet containing illustrations and specifications of 1906 models of manufacturers who are members of the association.

...THE...

Horseless Age

UME 17 FEBRUARY 7, 1906 NUMBER 6

VINTON MODEL-K



DELIVERY NOTICE NUMBER 2

In November we suggested that prospective purchasers of the VINTON MODEL K place their orders early, and thus avoid elayed delivery.

Those who accepted the suggestion have either already received heir cars or will receive them on promised dates. This includes rders placed at the New York Show.

Now we have a second suggestion to offer.

We have gone over our order book and compared delivery promses with our output from day to day.

WE FIND THAT THE NUMBER OF FUTURE DELIVERIES ALREADY PROMISED LEAVES BUT VERY FEW CARS AVAILABLE FOR EARLY SHIPMENT.

Consequently orders that reach us promptly will be entered for these choice delivery dates.

Orders received after preferred dates are gone must await their turn.

PURCHASERS WILL BE GIVEN THEIR CHOICE OF DATES IN THE ROTATION IN WHICH ORDERS ARE RECEIVED AT OUR MAIN OFFICE.

MODEL K WINTON.—Four vertical, water-cooled cylinders. Thirty horse power or more. Quiet running. Splendid reserve power. Velvety, non-jar, non-shock, non-breaking transmission. Flexible speed control. Shooting Oiler. Exclusive twin springs. Easy riding. And every other feature that a first quality car should have. $2,500 f. o. b. Cleveland. Compare it with cars selling at $3,500 and more.

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THE TWO-CYCLE ELMORE

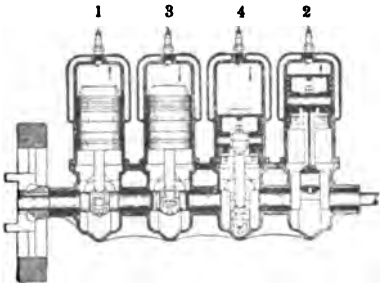


"Put a Strong Heart to the Steep Hill."

The two-cycle in practical results is as strong up a hill as on the level road. The explanation of the two-cycle principle is as simple as human s
It is merely a uniform, unbroken application of power—something which is a physical impossibility in the four cycle.
If you want to understand this clearly send for "The Heart of the Man and the Machine."

Study This Diagram—It's Important

Cylinder No. 1.—Explosion has forced piston half way down.
Cylinder No. 2.—Just starting down from explosion.
Cylinder No. 3.—Coming into action before force of explosion in Cylinder No. 2 is exhausted.
Cylinder No. 4.—Will come into action when piston of Cylinder No. 3 is half way through.



A SINGLE FACT IS WORTH A SHIPLOAD OF ARGUM

The single fact that we wish to impress upon you is that the Two-Cycle Elmore is the most e
car made. From 18 to 20 parts on every cylinder eliminated—actually 50 per cent. of the working parts e
All inlet and exhaust valves entirely done away with. One, two, or three cylinders may be cut out at will.
The Two-Cycle Car goes anywhere without change of gear; always a steady, unbroken appl
power. Can be throttled down on the high speed to two miles an hour or speed along at the rate of
will climb steep, difficult grades without strain or effort.

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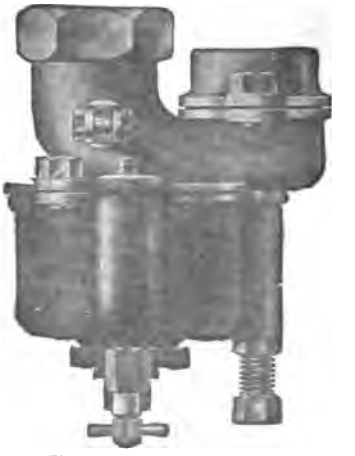
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Motor Car Speed.

By Thos. J. Fay, E. E.

t sometimes happens that two cars, well tched one with the other, run a neck and k race down the "king's highway" at ybe as much as 30 miles per hour. Each torist knows he is no faster than the er, but at the road house over the hill y join in agreeing that both cars are y fast. Much harm follows these bar- m claims of express speed, for in the rse of events farmers and the police, knowing the vanities of these gentry, e stock in their claims of breakneck ed, and end up by dealing accordingly h honest motorists. Time will sure- eliminate this trouble, for, after all, the ed craze is only a passing phenomenon, time must also deal with the real speed blem.

ust how fast a car can go is, then, the in problem at the present time; for, as one can readily understand, motorists l be likely to travel as fast as the car l go, road conditions permitting, if the ice do not interfere. The interference the police does not really reduce the dan- of high speed, no more than locking the ble door after the horse is stolen gives k the horse. On the other hand, stories imaginary speed performances compli- e the situation, so that, in order to clear matters up a bit, first an effort will be made to fix upon the speed actually realized, for then it will be possible to advance an argument based upon facts.

Table I shows the speed attained by the Mercedes 35 horse power touring car in road condition, with a total weight of 3,760 pounds, passengers and all. This table shows the speed possible to attain on various grades with the motor doing its utmost. These speeds are too high for regular daily touring work, but the speed of the motor, viz., 1,200 revolutions per minute, is readily realized, hence it is the speed to take into account in the calculations. At this motor speed a motorist with a 35 horse power Mercedes car could make a maximum of 56 miles per hour on a level, hard road in still air—that is, with no wind to retard the progress of the car—but the car must be in good order, the road in good repair, and the motorist very familiar with the workings of the car. This speed is probably 10 miles per hour faster than the average motorist ever goes with a 35 horse power Mercedes touring car.

To show that this table of possible speed is a reasonable statement of the facts, Table II is offered, showing the speed attainable with the 30 horse power Simplex touring car under the same conditions of weight, and, it is believed, with the same allowance of power per pound of gross weight. Table II shows a maximum speed of 54 miles per hour on a level, hard road in still air, with the car in thoroughly good working order, which speed is substantially the same as that shown by Table I for the Mercedes 35 horse power car. It would be unfair to make this comparison if one omitted to state that the so-called 30 horse power motor in the Simplex car is in reality capable of 35 horse power at the higher speed at which the motor of the Mercedes car would have to run to furnish power enough to drive the Mercedes car at the maximum speed fixed in Table I.

It is believed this article will be found of value mainly for the reason that it affords information in relation to the effect of gradients on the speed of cars. This effect is very marked indeed, as any one will know who ever noticed a freight train negotiate a 3 per cent. grade at a snail's pace, notwithstanding the effort of a 2,000 horse power locomotive. As Table II shows, the 30 horse power motor, working at between 32 and 34 horse power, when making 54 miles per hour of the car on a level, slows down to 13 miles per hour on a 19.5 per cent. grade. Checking this with the figures in Table I, it will be noted that with 54 miles per hour on a level, 12.7 miles per hour results on a 19.6 per cent. grade, although there is a difference at 30 miles per hour, at which speed the Mercedes car is

TABLE NO. 1.

Speed Table—35 Horse Power Mercedes, 1906.

Revolutions of the Motor—1,100 Per Minute.

No. of teeth of sprocket wheel.	17		18		19		20		21		22	
Speed.	M. P. H.	% Grade.	M. P. H.	% Grade.	M. P. H	% Grade.	M. P. H.	% Grade.	M. P. H.	% Grade.	M. P. H.	% Grade.
One	11.14	22.5	12.1	21	12.7	19.6	13.4	18.6	14	17.7	14.6	17
Two	24.6	8.3	26.1	7.5	27.4	6.9	28.9	6.3	30.5	5.7	31.7	5
Three	32	5.2	34	4.5	35.8	3.8	37.6	3.25	39.5	2.9	41.4	2.5
Four	41.6	2.6	44.1	1.76	46.6	1.4	49.1	1	51.6	0.3	54.1	..
Revolutions of the Motor—1,200 Per Minute.												
One	12.4	22.5	13.2	21	13.9	19.6	14.6	18.6	15.3	17.7	16	17
Two	26.8	8.3	28.3	21	29.9	6.9	31.4	6.2	15.3	5.6	34.5	4.9
Three	34.9	5	37	7.5	39.9	3.6	41	3.1	33	2.7	45.1	2.3
Four	45.4	2	48.1	4.3	51	1	53.5	0.5	42.9	..	..	..

In the calculations of this table the air resistance for the complete car, with touring coach work and four passengers, is taken into account, the total weight being 3,760 pounds. For cars with a heavy body or a canopy top the speeds are smaller, corresponding with the greater weight. The cars are usually furnished with sprocket wheels of 18, 20 and 22 teeth. Sprocket wheels of 17, 19 and 21 teeth are furnished instead of the standard wheels, if so desired.

TABLE NO. 2.

Simplex 30 Horse Power Touring Car.

Mileage Table.

No. of teeth in driving sprocket.	23		25		27		29	
Speed.	M. P. H.	% Grade.	M. P. H.	% Grade.	M. P. H.	% Grade.	M. P. H.	% Grade.
One	10	25.9	11.5	22.6	13.45	18.5	15.94	15.18
Two	13	19.5	18.5	12.65	22.10	9.8	26.25	7.35
Three	21	10.5	26	7.4	34.425	4.4	41.31	2.52
Four	37	3.65	41	2.62	47.18	1.25	54	Level
Reverse	8	29.6	8.7	29.1	9.39	27.1	11.25	22.3

This table of speeds and gradient is based upon the conditions of a maximum weight of the car and its burden of 3,760 pounds, a level, hard d, no wind, and the car in good working order.

able to mount a 4.5 per cent. grade, which difference, however, may be due to carburation, for it does not hold regularly throughout the scale of speeds for grades. At 26 miles per hour, for instance, both cars exhibit the same ability, viz., climbing a grade of 7½ per cent.

These tabulations, in addition to showing the hill climbing ability of the cars in question and motor cars in general, also show the advantage of having four speeds and reverse in the transmission, as a perusal of the tables will show at a glance that it is in some cases possible to go up hill on a low gear with greater speed than can be attained with a higher gear.

In Table II one may note that the low gear will permit the mounting of a 15.18 per cent. grade at 15.96 miles per hour; whereas the second gear would probably not do as well, as only 13 miles per hour results on a 19.5 per cent. grade; in any case, the difference would favor the low gear, since stalling the motor would be avoided. In judging the hill climbing performances recorded in the tables, regard must be had to the heavy load these motors were tied up to, as with lighter loads the speed on any particular grade would, of course, be greater.

Just what constitutes a safe and proper speed for a touring car is a matter not easily settled, for much depends upon the car. With a car devoid of effective and reliable braking means almost any speed is too high. There is no rule, then, for determining the speed of a poorly constructed car, but talking about properly constructed cars provided with adequate safety devices and methods of control, it may be possible to lay down a few facts of moment.

The writer does not believe that severe police measures will solve the problem of fast driving nor appreciably modify the trend in this respect. Fortunately, cars cannot readily be built to develop speed in excess of the safe limit if the weight of the car bears a proper relation to the power of the motor. Moreover, a proper limit put upon the allowable size of the motor in view of the gross weight of the car would confine the speed well within the proper limits and eliminate all unreasonable speed laws once for all.

Just what the weight ought to be per horse power of the motor is a question that would have to be settled, but it is certain that the allowable speed should be greater than that fixed by the speed laws in general. It is possible that the following formula would give a weight of the car, considering the motor, that would guarantee reasonable safety:

$$W = \left(\frac{b^2 \times l^2 \times n \times s}{10^9}\right) \times 500$$

in which

W = weight of car in pounds.

b^2 = square of bore in millimeters.

l^2 = square of stroke in millimeters.

n = number of cylinders.

s = two thirds of the maximum attainable speed of the motor running free.

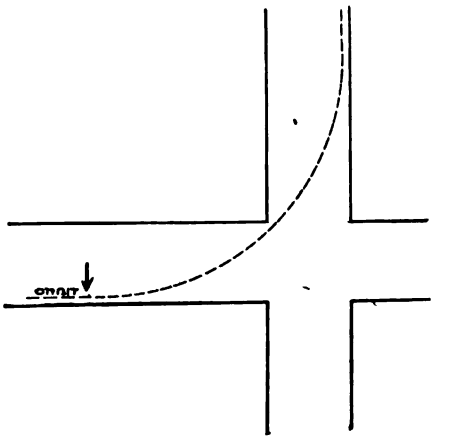


FIG. 1.

This formula eliminates all uncertainties of measuring and fixes very closely the possible speed of a car, provided the weight is adjusted to satisfy the formula. It is possible that the value of the constant 500 would be different for different types of cars. For a touring car of the conventional four cylinder type the value 500 would fix the maximum speed at something like 40 miles per hour, which is about a fair settlement of the speed question, although this allowance is double the present speed allowances.

A touring car weighing as much as the formula would dictate, with the size of motor fixed as well, if fitted with efficient brakes, would be safe enough to go to sleep in under almost any conceivable road conditions, assuming the car to be under the direction of a motorist of horse sense and moderate skill. The safety of a car in case of an emergency depends upon a single factor, viz., the distance in which the car can be effectively brought to a standstill from the speed at which it is running. The motorist who thinks he can stop a car in any distance agreeable to his notion of the moment generally wraps his car around a telegraph pole. Moreover, it must not be inferred that an overzealous application of the brakes will influence the situation for good. Allowing an insufficient distance in which to arrest the motion of a car is, however, not the only cause of the rather too frequent accidents; there is also the fact that a car in turning tends to go

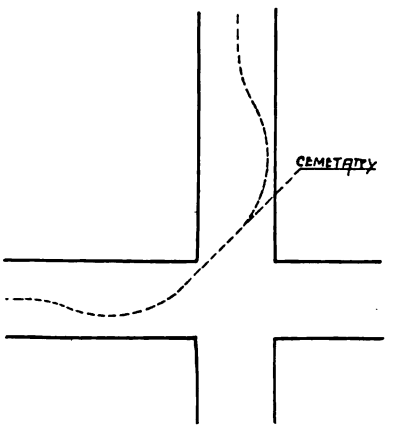


FIG. 2.

off on a tangent, and only remains in the prescribed orbit because of the resistance of the ground contact. When the tangential force exceeds the adhesion to the ground the car diverges from its orbit.

Under ordinary circumstances it is easy enough to fix upon a safe radius of the orbit for a given speed of the car, but on a wet asphaltum roadbed all laws, as they are generally understood, are set at naught and calculations fail to serve a useful purpose. In such cases skill becomes the condition of safety. Reducing these matters to rule, we may say a car traveling in a straight line can be stopped by brake action in a distance

$$F = \frac{W M^2 \times C.0334}{C P} \text{ feet,}$$

if the pressure applied to the brake bands is just within the pressure that would produce skidding. In this equation P = the weight in pounds actually affording traction on the driving wheels, to which the resisting effort of the brakes is applied; M^2 = the square of the velocity of the car in miles per hour; C = the coefficient of friction of contact with the ground of the driving wheels; W = the gross weight of the car in pounds; .0334 = a constant suggested by Beaumont in his formula for the braking distance. This constant modifies the formula $\frac{WV^2}{2g}$ to suit it for speeds expressed in miles per hour instead of feet per second. The value of C affords room for speculation, for while the friction coefficient might be a constant as between rubber tires and, say, a dry, packed and level macadam roadbed, the fact remains that in a day's run numerous kinds and conditions of roads are encountered. Under such conditions to conceive of a stable coefficient of friction is out of the question. However, without knowing the exact coefficient of friction, we may know the law and the danger that besets its violation.

FIRST CASE.

Assume a car as follows: W = 3750 pounds; P = 2250.0 pounds; M = 30 miles per hour; C = 0.50. Then,

$$F = \frac{3750 \times 30^2 \times 0.0334}{0.50 \times 2250} = 100 \text{ feet.}$$

SECOND CASE.

Assume W = 3750 pounds; P = 2250 pounds; M = 60 miles per hour; C = 0.50. Then,

$$\frac{3750 \times 60^2 \times 0.0334}{0.50 \times 2250} = 400 \text{ feet.}$$

The danger of high speed must be quite plain to anyone who will give the matter a thought, because, as the speed is doubled four times the space must be allowed in which to stop the car.

The distribution of the weight of a car also has to do with the distance in which motion may be arrested.

THIRD CASE.

In a particular car, W = 1875 pounds; P = 937.5 pounds; M = 30 miles per hour, and C = 0.50; therefore,

$$F = \frac{1875 \times 30^2 \times 0.0334}{0.50 \times 937.5} = 120 \text{ feet.}$$

By comparing cases 1 and 3 it will be seen that the car with the greater proportion of weight on its driving wheels can be stopped in a shorter distance.

In swinging through an orbit the motion of a car must be considered as mainly influenced by two factors, except if an attempt is made to arrest the motion of the car while traveling in the curve. In the latter event, trouble must almost of necessity follow, for the tractive adhesion of the car may be monopolized by the braking effort, leaving no margin to resist the tangential effort due to centrifugal force. Again, in arresting motion as well as in accelerating, the full weight on the traction wheels is effective, but in doing a curve the tangential effect may disturb the distribution of weight and the centre of gravity of the car.

In any case, it is proper to negotiate a curve as nearly as possible in a true circle, of as large a radius as possible (see Fig. 1). Cutting corners only to fly into a circle of a short radius is not so good (see Fig. 2).

The exact ability of a car to turn a curve without jumping its orbit depends upon the weight distribution of the car and the traction resistance of rubber tires. The question of weight distribution is a question of design, but the traction resistance is a variable, depending upon a lot of things. The normal traction resistance is about as follows:

TRACTION OF TIRES.

Pneumatic tires—

Diameter in Inches.	Sectional Diameter In Inches.	Traction in Pounds Per Ton.
28	2½	40
30	3	47
32	3½	55
34	4	65
36	4½	70

But the adhesion of tires is affected by many variable factors, as follows: (a) it decreases with an increase in the air pressure; (b), it increases as the tire deflates; (c), it is a maximum on a well packed, level, small grain, properly ballasted road, preferably of broken stone; (d) it is nearly a maximum on dry asphaltum; (e) it is high on dry granite block; (f) it is very high on dry cedar block pavement; (g), it is low on broken stone of the large sizes not packed down; (h), it is very low in soft sand; (i) it is low in gravel; (j), it is very low in ooze; (k), it is fairly good on well beaten country roads.

Solid rubber tires have about 80 per cent. the adhesion as highly inflated pneumatic tires, size for size, but the greater the adhesion of the tires, the more power of the motor can be utilized. Moreover, the writer found in experiments conducted on electric cabs that the efficiency of the transmission depends upon the traction.

It was at first thought that the larger tires were insufficient, because they utilized more power, but later on it was discovered that while more power was absorbed, more speed was attained. The reason we were at first deceived was because the increase in speed was not proportional, but further investigations showed that we were not justified in expecting proportional increase in speed for increased power absorption.

This problem is not unlike the gasoline problem in which the motor that uses the most gasoline is the most powerful motor, provided the gasoline is actually used.

There is one other point in relation to the coefficient of the friction of tire contact, namely, that the coefficient decreases in value with an increase in the speed of the car, thus making it vastly more difficult to stop a car quickly if it is moving at a high rate of speed. The variations of the coefficient of friction as a result of increase of speed are not definitely fixed, but they are somewhat as follows:

CAR STANDING STILL, MAXIMUM.

	Per Cent. of Maximum.
At 10 miles per hour	75
At 20 miles per hour	60
At 30 miles per hour	50
At 40 miles per hour	40
At 50 miles per hour	33
At 60 miles per hour	26

Air Resistance.

BY ALBERT L. CLOUGH.

The resistance offered by the air to a rapidly moving motor car is a subject concerning which very slight interest seems to be taken, and about which not much is published. Very little, if any, direct experimentation with automobiles, to determine the amount of such retardation, appears to have been undertaken, and undoubtedly any such tests would be attended with many serious difficulties. It is an undoubted fact that the engine power required to overcome air resistance, both that due to vehicle speed and to head wind velocity, represents under certain conditions a very considerable proportion of the total useful energy delivered by the motor. In track racing or in speed contests upon beaches the course is usually very smooth and "fast," that is, the resistance to traction is very slight, and at the same time the course is almost perfectly level, so that there is no work to be done against gravity. At the high speeds attained under such conditions a very large proportion of the net energy delivered to the driving wheels is absorbed in overcoming air resistance, and, in fact, air resistance is, more than anything else, the limiting factor which

DETERMINES THE MAXIMUM SPEED.

It is only by installing an enormous horse power upon a vehicle offering a resisting surface which has been reduced to the very lowest proportions that these high track speeds can be attained. A similar problem is met with by the designer of speed craft for marine use. He must increase his engine power and reduce his displacement and exposed areas to the very limit, if he is to secure the desired results.

For vehicles traveling at speeds not exceeding 20 or 25 miles per hour the expenditure of energy in overcoming air resistance due to the car's motion is not of especially vital moment, although speeds of this magnitude when attained against head winds or high winds having a head-on component may render the total atmospheric retardation very considerable. Modern touring cars are now generally credited with a maximum speed ranging from 45 to 50 miles per hour, and certain of the high powered ones are guaranteed to possess speeds of 60 or 70 miles per hour. Cars which can show speeds such as these, especially when equipped with tops and wind shields, dissipate a very large amount of energy upon the air when traveling at top speed. Air resistance begins to increase very rapidly at speeds above 20 or 25 miles per hour, and the rate of increase continues to augment with every successive increase of car velocity.

The law of increase of atmospheric resistance is generally regarded as best expressed as a quadratic function of the velocity of the moving body, although other relations have been proposed. On the whole, it appears that the specific air resistance encountered by a nearly flat surface moving in a direction perpendicular to its plane is best expressed as a function of the square of the velocity of its motion. A number of researches relative to air resistance have been conducted with an apparatus consisting of thin revolving vanes, and it is somewhat questionable whether results obtained in this manner are applicable to massive bodies in rectilinear motion. In 1903 the engineers of the high speed Berlin-Zossen electric railway, in Germany, made some very careful experiments upon the head resistance encountered by a single car traveling at speeds as high as 100 miles per hour. There is no obvious reason why these results should not be applicable to automobiles. The Berlin-Zossen experiments dealt solely with the resistance encountered by the nearly flat front of a car of ordinary size, and took no account of the "skin resistance" acting upon the car's sides. The following formula was deduced from these experiments:

$$r = .00265\ A\ v^2$$

where

r = the total air resistance in pounds.

A = the projected area of the moving car in square feet,

v = the speed in miles per hour.

Another formula, derived from the classic experiments of Hutton, which is recommended as giving results "on the safe side" by Worby-Beaumont in his work, "Motor Vehicles and Motors," is as follows—the symbols used being the same:

$$r = .00366\ A\ v^2.$$

This latter formula gives higher ... than the former, owing to the co... being larger. The probabilities ar... the Berlin-Zossen formula is more

accurate than that of Hutton, and that it could be employed with safety in automobile work if the exposed area be figured liberally. The projected area of a motor car, as viewed from the front, probably does not include all the resisting surfaces as there is a closing of the air upon such portions of the car as the rear seat back and rear fenders which would not be included in the projected area. In the case of an electric rail car there is practically no effect of this kind.

The formula $r = .003\ A\ v^2$ might be found a fair compromise between the two formulæ above given. It is of no use to employ but one significant figure in the constant—the nature of the other terms of the equation not warranting such a show of precision.

In Fig. 1 there are shown two curves, A and B, plotted respectively according to the Berlin-Zossen and the Hutton formulæ. The ordinate scale at the extreme left gives the pressures in pounds per square inch due to air resistance, and the abscissæ denote speeds in miles per hour. The projected area of a good sized touring car without top is found to be, on the average approximately 20 square feet, and the pressure due to air resistance upon a car presenting this surface is shown by the other ordinate scale.

The very rapid increase of air resistance with augmented speed is well illustrated by these curves, and the discrepancy between the two formulæ is clearly shown At a speed of 60 miles per hour, according to the Berlin-Zossen formula, the motion of an ordinary touring car is resisted by an air pressure of about 190 pounds total, or perhaps one-tenth of the car's weight If the car were running at 40 miles per hour against a head wind, blowing on the average at 20 miles per hour, the resistance would be the same. The air pressure per square foot in these cases is about 9.5 pounds.

Certain racing cars have recently attained a speed of about 120 miles per hour, and, as the Berlin-Zossen formula is based upon test runs at speeds as high as 100 miles per hour, it may not be entirely fanciful to figure from it the air resistance encountered by a car under these conditions. Assuming 10 square feet of exposed area for such a car (which may be rather wide of the mark), the formula gives an air resistance of about 380 pounds.

The horse power absorbed by air resistance, per square foot of projected area, at various speeds, is given by the simple relation,

$$\text{H. P.} = .00266\ vr,$$

the symbols having their former significance.

In Fig. 2 curves have been plotted showing the energy in horse power dissipated per square foot of exposed area at various car speeds, the left hand ordinate scale gives the horse power per square foot, and the right hand ordinate scale the horse power expended upon an assumed projected area of 20 square feet.

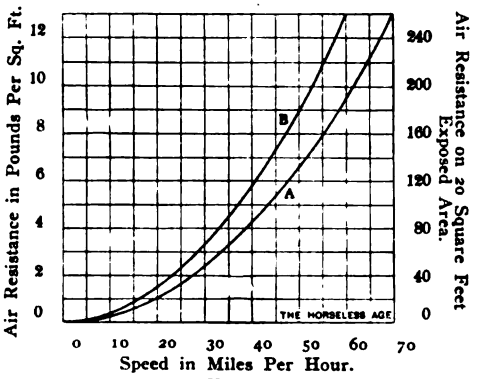


FIG. 1.

Curve A is based upon the Berlin-Zossen formula, and curve B upon the Hutton formula. At 60 miles per hour the former curve shows an expenditure of 1.5 horse power per square foot of projected area, and of about 30 horse power for a car presenting 20 square feet of resisting surface. The same car moving at 70 miles per hour would require about 48 horse power to overcome its air resistance.

At 120 miles per hour a racer presenting 10 square feet of surface would meet with an air resistance calling for about 120 horse power.

The above figures, crude and approximate though they admittedly are, cannot fail to impress one with a realization of the enormous cost in energy which attends the realization of excessively high speeds, and it must be remembered that there must be developed by the motor at least 1.25 as many horse power as are actually dissipated upon the air, owing to losses in transmission.

AIR RESISTANCE AND GRADE.

It may be interesting to compare the energy lost in air resistance with that required to overcome gradients at the same speeds.

The grade in per cent. up which a certain amount of horse power will carry a car of the assumed weight of 2,000 pounds at a speed of v miles per hour is given by the expression,

$$\text{Per cent. grade} = \frac{\text{H. P.}}{5.32\ v}$$

Applying this formula, it may readily be found that the energy expended in overcoming air resistance by a touring car of 20 square feet surface, at 30 miles per hour, is approximately equal to the energy expended by its motor in overcoming a 2½ per cent. grade at the same speed.

At 40 m. p. h. the grade equivalent is 4.24 per cent.

At 50 m. p. h. the grade equivalent is 6.62 per cent.

At 60 m. p. h. the grade equivalent is 9.54 per cent.

At 70 m. p. h. the grade equivalent is 18.98 per cent.

The horse powers from curve A are here employed.

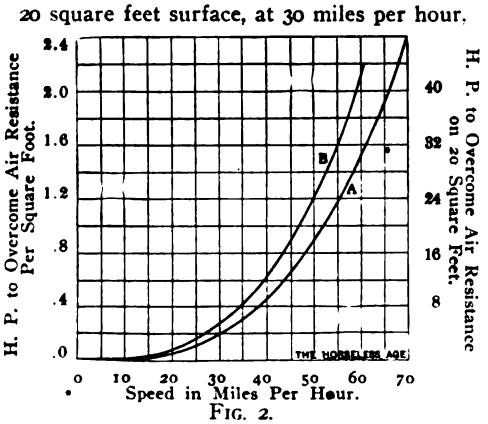


FIG. 2.

Automobiles in Egypt.

The journal of the French Chamber of Commerce discusses the future of the automobile in Egypt. Compared with other countries, it says, automobilism has made very little progress in Egypt. The first motor to enter the country was a small Dion-Bouton, which was purchased by Prince Aziz Hassan some fifteen years ago. There are now 170 cars in Egypt, 56 in Alexandria and 110 in Cairo. These figures would be much higher were there more facilities for automobilists. There is a great want of good roads in the country. In fact, beyond the Ramleh road in Alexandria and the Pyramids road in Cairo, measuring together less than 30 kilometres, there are nothing but agricultural roads, which are all very well for carts and traction engines, but impossible for automobiles. The creation of a road which would join Cairo to Alexandria is favored, and the Government is to be approached in the matter. If such a road were made it would not only facilitate communications between the different parts of Egypt, but would greatly increase the number of automobiles to be seen in the country. Tourists would then be able to use their big cars on runs between Cairo and Alexandria, and amateurs here, having at least a decent road, would become much more numerous, while the importation of automobiles would then assume far greater proportions. French makes of cars are evidently most favored. Companies have on more than one occasion applied for permission to establish a service of motor buses in both Cairo and Alexandria, but the authorities have always found the excuse that the streets were not suited to such a service. The Société des Omnibus du Caire, however, seems to have taken the initiative and has imported two types of omnibus of the Dietrich make with which trial runs are at present being made. Should these trials prove satisfactory, more cars will be ordered, and we may soon see the motor bus a familiar vehicle in our streets.

A wise regulation has just been decided upon by the Government of Holland in consequence of the numerous complaints they have received of the abuse of the motor horn. The use of the signal horn is forbidden to cyclists from February 1 this year, it being intended to limit the use of this signaling device to automobiles.

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Devoted to Motor Interests

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The Other Side of the Legislative Question.

There are proverbially two sides to every question, and applying this truth to the present automobile legislative situation it would be a bad mistake to assume that the attempts to force more restrictive and objectionable legislation on automobilists are simply an outbreak of "rural fanaticism." The introduction of these various bills is undoubtedly prompted by the wishes of the country populations, and the bills are certain to have the support of legislators with large rural constituencies, but there is a well founded reason for the anti-automobile sentiments of country folk which are referred to in a communication and in some quotations from widely read agricultural journals found in our present issue.

As a matter of fact, there is a great deal of unlawful and unjustifiable speeding constantly going on on the public highways, and yet the automobile clubs which have passed so many resolutions declaring themselves opposed to fast and reckless driving, which resolutions in some cases have been used to influence legislation, have done absolutely nothing to give practical effect to them. As long as the law is not enforced, or no more objectionable measures are threatened, the subject of illegal and reckless speeding is taken lightly by the so called conservative motorists, and at the clubs it is mostly discussed in a jocose manner. The moment a new bill is introduced, however, both classes of drivers—the conservative and the reckless—stand shoulder to shoulder, so to speak, in opposing it, solemnly pass resolutions condemning reckless driving and assume a very innocent and injured mien. The farmers, however, do not base their opinion of motorists upon club resolutions, but upon what they see on the road. Those who live on well maintained roads near the big cities have occasion to see the laws boldly defied numbers of times daily during the seasons. It is no uncommon sight to see racing machines stripped for action reeling off the miles at breakneck speed on the most frequented turnpikes and high powered touring cars emulating these more reckless racers to the limit of their ability, while the pedestrian and the average user of the road run to cover and wonder whether they will always be lucky enough to escape with their lives. The law requires slowing down at corners and in meeting traffic, but many drivers neglect this, to their own danger as well as that of other road users, and it is particularly this taking of corners at full speed which is most dangerous to all users of the road.

All infractions of the law are bound to react on the whole automobile using public, and if the conservative, cautious drivers, whom we have reason to believe are in the majority, wish to escape penalties for the transgressions of the other class they must ostracize the habitual scorcher by expelling him from the clubs, by bringing particularly flagrant violations to the notice of the police, by preventing matches or record runs on the public roads when they are announced beforehand, etc. In brief, the clubs should make some active effort to insure respect for the law and to promote common decency among auto drivers. In most court cases for speed violations it would be more appropriate for the automobile clubs to request an imposition of the maximum penalty than an acquittal. This may not be a pleasant task, but such action will soon be absolutely necessary in order to protect the good name of the automobile movement and insure the road rights of the automobile. In no way could the automobile clubs prove themselves more deserving of the respect and gratitude of the whole automobile movement, and of the industry as a whole, than by taking an energetic course on this burning question of the suppression of unlawful speeding.

The French Method of Developing an Industry.

By an incident in connection with the late Paris Show the French have been brought to a rather unpleasant realization of one result of their spectacular method of quickly developing an industry relating to new means of locomotion. It appears that the Government some time during the past year set aside a certain sum of money for the purchase of a number of guard boats for the French high sea fisheries. The Minister of the Navy, M. Thomson, whose duty it was to purchase these craft, selected at the Paris Show two, one of which was of German construction. This has led to a storm of disapproval on the part of the public, and the opposition is trying to make political capital out of the incident. A certain deputy from an inland department, whose constituency can hardly have any extensive boat building interests, has announced his intention of interpellating the Government regarding the reasons which actuated M. Thomson to purchase this foreign boat.

It may be explained here that the motor boat industry is regarded in France as an outgrowth of the automobile industry, and that the French lay public consider their country to be the leader in this industry, as well as in the automobile industry, this opinion being based upon the achievements of French built boats in the speed contests of the past few years. These speed contests have not only molded public opinion with respect to the superiority of the French motor boat, but have guided French motor boat builders in the direction which they have followed. The result was that the exhibits of motor boats at the Salon consisted mostly of racing boats or high speed pleasure craft, all entirely too frail for use in open waters. The Minister of Marine could find only three among the numerous boats exhibited which were at all suitable for the purpose of guard boats for the fisheries, and of these one could not be considered because it had too light a hull; the other two were acquired from their owners.

It can readily be understood that it was rather a shock to the French public to see their Government go abroad for motor boats, when they considered themselves pre-eminent in this industry. In the discussion which is about to come up in the Chamber of Deputies, the Minister of the Navy will undoubtedly be reminded of the glorious achievements of French motor boats in competition with others; but he ought to find full justification for his action in pointing to the results of the ill-conceived race across the Mediterranean last summer, in which every boat that started was lost. What he needs for his purpose is not a boat that can outdistance all others on a smooth inland water or in a coast trip on a calm day, but a boat that can brave any stress of weather on the high seas. Undoubtedly the French motor boat concerns could also build such craft if they tried, but they have up to now been so deeply engrossed in constructing speed boats that they have had no time for this more prosaic task.

Loss of Storage Battery Capacity at Low Temperatures.

It appears to be generally assumed that the motive power of the electric automobile is not affected by cold weather, and that on this account the electric motor car is independent of climatic changes so far as the utilization of its stored energy is concerned. While it is a fact that the electrolyte used in accumulators does not congeal at temperatures realized during the cold season, and that a lead battery will continue to deliver energy during the coldest day of the winter, its efficiency is very considerably decreased by the reduced temperature. A lead battery when discharged at about the freezing point is understood to suffer a loss of from 40 to 50 per cent. as compared with its output at 70 degrees F. or thereabouts. The operation of electric vehicles during cold weather is thus at an added expense for charging current, and a reduced radius of action must be submitted to.

According to published figures upon the subject, the Edison iron-nickel accumulator is even more prejudicially affected by low temperatures than is the lead battery. In a very elaborate treatment of this interesting form of storage cell, recently published by M. U. Schoop in the *Scientific American Supplement*, tests are described in which the Edison cells were jacketed with ice water in order to determine the effect of a freezing temperature upon the effective discharge. It was found that the Edison cell practically fails as a source of electrical energy at this temperature. The tests were conducted at a discharge rate of 50 amperes, and the effective output of energy was considered to have terminated when the voltage became reduced to one volt per cell. An Edison cell, when discharged at ordinary room temperature (70° F.) showed a discharge output of 144 ampere hours, the temperature of the electrolyte meanwhile rising to about 90° F. (The liquid of the Edison cell increases in temperature during discharge, while that of the lead cell decreases.) The same cell when discharged with its electrolyte maintained at 41° F. by a cold water bath, all other conditions being identical, showed an output of but 12 ampere hours before the voltage fell to the minimum useful point. Upon a further continuation of the discharge the voltage fell to a very low figure. The useful discharge at the low temperature was but about 8 per cent. of that at ordinary temperatures. Smaller rates of discharge showed, however, a less serious falling off in the output.

It would seem, from these experiments, that the employment of the iron-nickel cell in electric vehicles, intended for service where the outside temperature frequently falls to below 0° F., may be attended with very serious, if not fatal, drawbacks, unless means can be devised to insure the maintenance of a sufficiently high electrolyte temperature, either by the conservation of the inherent heat of the reaction or otherwise.

The research referred to confirms statements which have previously been given out as to the low efficiency of the iron-nickel cell as compared with the lead type, but comments most favorably upon its ability to withstand a vast amount of abuse, upon its satisfactory weight efficiency and some other points of excellence. Its author, however, seems far from unqualifiedly enthusiastic as to its commercial future.

Although the present British automobile law expires at the end of the present year, the Registration Department, on the advice of the Local Government Board, continues to issue license certificates for a whole year, which tends to indicate that the licensing system will not be abolished when the present law expires.

Calendar of Automobile Dates and Events.

February 3-10.—Chicago Show, Coliseum Building.
February 5-10—Washington Automobile Show.
February 12-17.—Detroit Automobile and Sporting Goods Show.
February 19-24—Cleveland Show.
February 24-March 3.—Philadelphia Show.
February 26-March 3.—Portland, Me., Show.
March 5-10.—Buffalo Show.
March 10-17.—Boston Show.

ew Vehicles and Parts.

1906 Cadillac Cars.

The Cadillac Motor Car Company, of troit, Mich., will build the following dels for the 1906 market: Models K and which are continuations of last year's about and small touring car respectively, delivery car Model M on the same sin- cylinder chassis, and two large cars, dels H and I.

The specifications of the new four cyl- er cars are as follows: Model H, four inder engine, 4⅜x5 inch stroke, rated 30 horse power; wheel base, 104 inches; ige, 56 inches; wheels, 32x4 inches; ee speeds forward and one reverse, netary transmission; seats five. Model four cylinder engine, 5x5 inch stroke, ed 40 horse power; wheel base, 110 hes; gauge, 56 inches; wheels, 36 inches, h 4½ inch rear and 4 inch front tires; nsmission same as on Model H. This is fitted with platform springs at the r, but in other respects the two cars are ilar.

RUNABOUT IMPROVEMENTS.

Before describing in detail the large car changes in the single cylinder car will mentioned. The touring car body has n entirely changed, and is now of the p pattern, the curves being very grace- and pleasing. The fenders and dash are curved to harmonize with the body. ictically no changes have been made on engine in the last three years. It is ; inches, rated at 10 horse power, and ated as before, under the body. The nt cross spring, instead of being fas- ed rigidly, as last year, to the spring ch, is now pivoted to it so that the ly has a three point suspension. The rk lever has been changed from beside the driver's seat to a position beside the throttle lever just under the steering wheel. The foot pedal for the low speed, and the side lever for the high and reverse remain unchanged. The safety device which prevents inserting the starting crank until the spark lever is retarded has been retained. The gasoline tank now has a small reserve tank of one gallon capacity within it. This may be used as part of the regular tank or kept in reserve by turning a small handle back of the heel board. No rods of any kind are now passed through the tank, and the screw cap has a small chain on it to prevent its being lost. The oiling is from a McCord force sight feed oiler, run by an eccentric from the hub of the flywheel. The sight feed glasses are just back of the heel boards, where they can easily be seen for adjusting or testing. The oil is delivered through a tube passing through the wall of the crank case into a saucer shaped washer around the crank pin and against the crank web. The edge of this washer is curled over so that the centrifugal force throws the oil into this rim, from which a hole leads through the crank pin to its surface. Two other leads supply the main bearings, which are babbitted bronze shells that may be taken out and renewed without removing the engine shaft. The cam shaft is situated transversely at the under side, and the large two to one gear dips down into a trough and throws oil all over the inside of the case. The fourth tube leads to the top side of the horizontal piston.

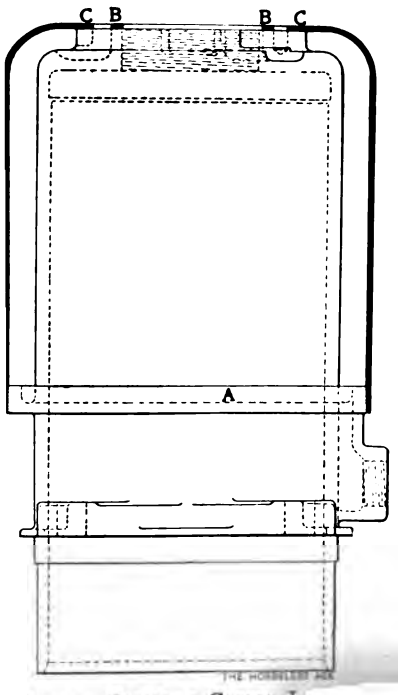


FIG. 1.—CADILLAC COPPER JACKETED CYLINDER.

The circulating pump is now flexibly driven by an arm and pin on the engine shaft pushing against a flat curved spring projecting at right angles from the pump shaft. In case the pump should freeze, this flat spring will bend sufficiently to allow the driving pin to slip off of it, thus preventing damage to the pump. A horizontal tube radiator is used, with a filling cap on top which really leads to a small tank just back of the radiator, but which gives the car the appearance of having a cooler and tank combined. The mixing valve type of carburetor, which has the advantage that it can be taken to pieces and cleaned without loosing the adjustment, remains unchanged from last year. The jump spark system using the Cadillac double plug, which does away with grounding the secondary on the engine, is still used. The cover of the battery box under the footboards is no longer screwed down, but held by two snap springs, and the hinged joint is protected by a strip of rubber to prevent water leaking in.

The following description will cover both of the new Models H and L:

MOTOR.

The 30 horse power is of 4⅜ inch bore by 5 inch stroke, and the 40 horse power of 5 inch bore by 5 inch stroke. The cylinders are cast separately from a special grade of iron, the formula for which is result of many experiments. It is d for this iron that, although it con-

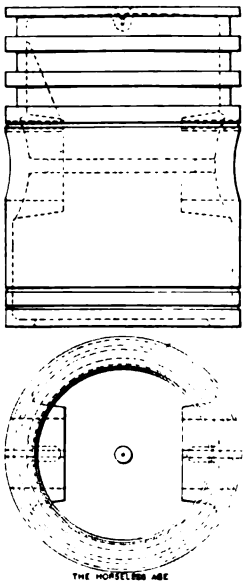


FIG. 1A.—CADILLAC PISTON.

tains much less phosphorus than the French castings, it flows freely, is not springy, machines very readily and shows by tests the remarkable average tensile strength of over 32,000 pounds per square inch, and often runs well over 35,000 pounds. The cylinder heads are cast separately from the rest of the cylinders, with the water jackets cast integral. The water jacket on the cylinder is copper, as shown in Fig. 1. This jacket fits tightly over the slightly roughened and tapered flange A cast integrally with the cylinder. Around the outside of this is pressed downward a steel ring about two-thousandth inch small, which makes a tight fit and allows the jacket to be quickly removed.

The cylinder and its head are held together by a right and left screw nipple. The under side of the head is provided with two V-shaped circular ridges which press downward at B and C on each side of the water jacket, opening up into the jacket of the head and thus making a tight joint. The copper jacket being the only jacket used, in case of a freeze up this jacket will expand considerably, thus relieving the pressure on the cylinder walls, but in case the cylinder should be cracked all that need be replaced is the individual piece.

Three wide, eccentric, diagonally cut rings are used at the top of the piston. The casting for these rings is of different iron than the cylinders; the material contains more sulphur, is more springy, and necessarily more brittle. The rings are turned on a special automatic machine, which takes the casting, and when the turning operation is completed twelve unsplit rings, which are exact duplicates, are found hanging on its arbor. These are then split and separately clamped and ground on another machine until they are of the exact thickness and diameter. The piston is flat on top and three oil grooves are turned into it, one above the wrist pin and two near the bottom, which latter is flanged in-

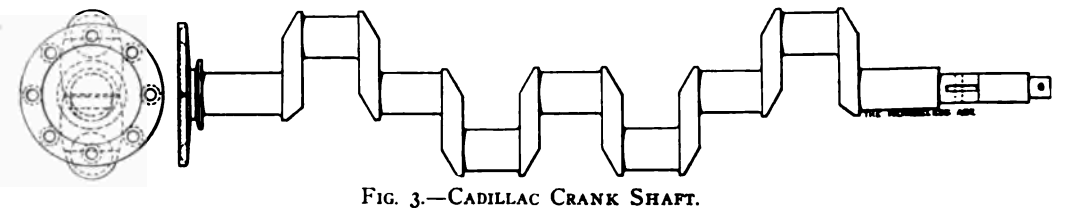


FIG. 3.—CADILLAC CRANK SHAFT.

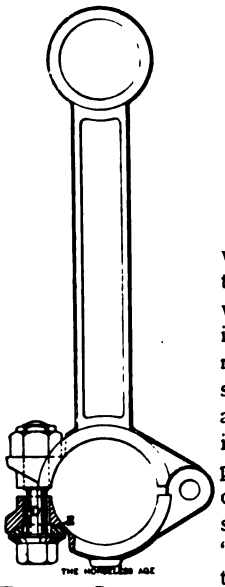


FIG. 2.—CONNECTING ROD.

ward to give additional strength. The wrist pin is very large in diameter, and made of heavy Shelby steel tubing, hardened and ground. One end is a forced fit into the piston boss, while the other end is split at several places like a "drawing-in chuck," the inside threaded and a taper plug screwed into it to spread it. The manufacturers claim for this construction a record of never having had to replace a cylinder owing to scoring by the pin.

The connecting rod is a steel drop forging of H section. The wrist pin end has a bronze bushing with helical oil grooves cut in it. The crank pin end has a hinged cap, as shown in Fig. 2. This cap is held by the bolt D, with a Columbia lock nut at one end, and a curved washer E fitting into a cup shaped depression, which allows the cap to adjust itself and relieves any binding action.

The crank shaft is a steel drop forging with the flywheel flange forged integral with it. It is specially treated for toughening and hardening, and all the bearing surfaces are finished by grinding. The shaft runs in five liberal bearings. These bearings are split babbitted bronze shells which may be removed without taking out the shaft. The two to one gear is a forced fit over a diameter two-thousandths large, and is held by a Woodruff key. Fig. 3 shows the crank proportions.

LUBRICATION SYSTEM.

The crank case is a very light, two piece aluminum casting divided horizontally into upper and lower portions. The lower part is divided by thin partitions into four compartments, and supports the bearings. Its sides are formed with six arms, which support the engine upon a sub-frame composed of two heavy, steel tubes supported upon pressed steel cross members. At the front of this case is an oil compartment with a tube which carries the surplus oil when the level gets too high back to the rear crank pit. The force feed oiler is located on the right side of the engine, and driven by an arm from one of the valve lifting rods. The oil flows through a sight feed on the dash, and then enters the rear crank case compartment. By splash it is thrown into a sloping trough on the side wall, and drains into the next forward compartment, where it again goes through the same performance, and so on until it drains into the oil compartment at the front, and, as stated, the surplus flows back to the rear and is again used. The end bearings of the shaft are provided with oil catching recesses from which the oil flows through channels back into the case, thus disposing of the oil which would otherwise leak or drip out at the ends. The upper part of the case is provided with four large hand holes which practically make one side

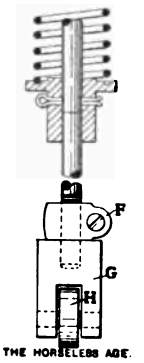


FIG. 4.—VALVE ADJUSTMENT.

open. The webbing is very carefully planned to provide a maximum of strength. This is held to the under half by steel studs which are made more secure by steel washers and Columbia lock nuts on their lower ends. The cylinders are held to the crank case by a similar arrangement.

THE VALVES.

As the mechanically operated interchangeable valves are all on one side, a single cam shaft is used. This has hardened steel cams pinned and brazed to it, and runs in five bronze bushings. The cam shaft does not move lengthwise as in last year's model. The valve stems are hardened steel, and the heads are of cast iron, forced on, riveted and ground. The valve lifting rod is hardened steel, arranged as shown in Fig. 4. The split nut F is arranged to clamp at the desired height on the rod to adjust its length. The square block G, carrying the hardened steel wheel H, moves in cast iron guides held to the case by six studs. The usual form of spring, held as shown, is used. Over the valves are brass screw plugs, the one over the exhaust containing the compression relief cock and kerosene cup.

A gear pump having hardened steel gears and a cast iron case on the front of the crank case is driven by an incased gear from the engine shaft gear. The water is drawn from the bottom of the radiator and forced into the bottom of the jackets, on the valve side, through brass pipes fitted with brass unions. From top it flows through brass pipes to radiators. Around the pump is a minum pipe bypass with a shut-off This may be opened in case anything pens to the pump, and a thermo-siphon culation will then be set up.

The exhaust pipe is a steel tube be brass fittings and clamped to the e by yokes held by four studs and These yokes also hold the one branched, cast aluminum intake pipe. method of fastening makes removal piping very easy.

THE CLUTCH.

The flywheel is of cast iron, turned hollow and contains a clutch. As this car is driven through a three and reverse planetary transmission could be operated without a main one has been provided for the reason it is often desirable to run the engine the transmission entirely idle. In Fig is the flywheel bolted to the flange the crank shaft, and supporting the Bright ball bearing N. L is a large washer or ring set into a groove in a ilar manner to the retaining ring of bearing. It is forced outward into groove by having a taper screw pin serted at the place where it is split. combination is now equivalent to a flywheel. In this hollow is the composed of two circular leather discs O and P, which are forced apart from each other and against the inner face of the flywheel in one side and ring L on the other, by eight short springs between the discs. In assem-

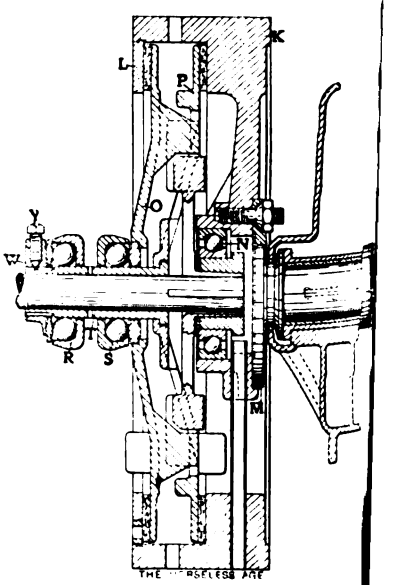


FIG. 5.—CADILLAC CLUTCH

: pressure put upon each of these coil rings is about 100 pounds, making a total essure of about 800 pounds, forcing the ates apart. This clutch is released by inging the plates O and P together by ans of two ball bearing collars R and S. the back of these collars, where they ar against each other, are wedge shaped rfaces so that by rotating them in oppo- e directions they are forced apart, and R is fast to the sleeve T, which in turn fast to plate P, such separation of the lars brings P and O together. The ten- n of the springs and the limit of their ion are adjusted by the screw collar W d to the sleeve T by the set screw and k nut Y. Vertical rods connected to a ort crossarm on the cross shaft c ich the clutch foot pedal is mounte- ate the collars R and S in opposite di tions.

The planetary transmission, which is ex- tional because of having three forward eds, is practically the same as last year l is operated by a single side lever. It mounted on a Hess-Bright bearing at rear end, and runs in oil. All the rs are made of steel drop forgings hard- d, and are bronze bushed. It is divided three drums, with the usual contract- leather faced steel bands for the two ward and the reverse speeds, and with a speed disc faced with leather and ro- d by the engine shaft, by means of a sarm with lugs at its ends which fit notches or slots in the back of the . The leather is put on in each of the quadrants separately, and held by r pressed steel backers which can easily removed. This high speed disc, when ed against the outside of the transmis- driven by a mechanism similar to the ch. clamps the entire transmission to clutch shaft, in which case it simply s its weight to the flywheel, and all s turn together with the shaft, the s inside being stationary on their studs rotating with the studs around the

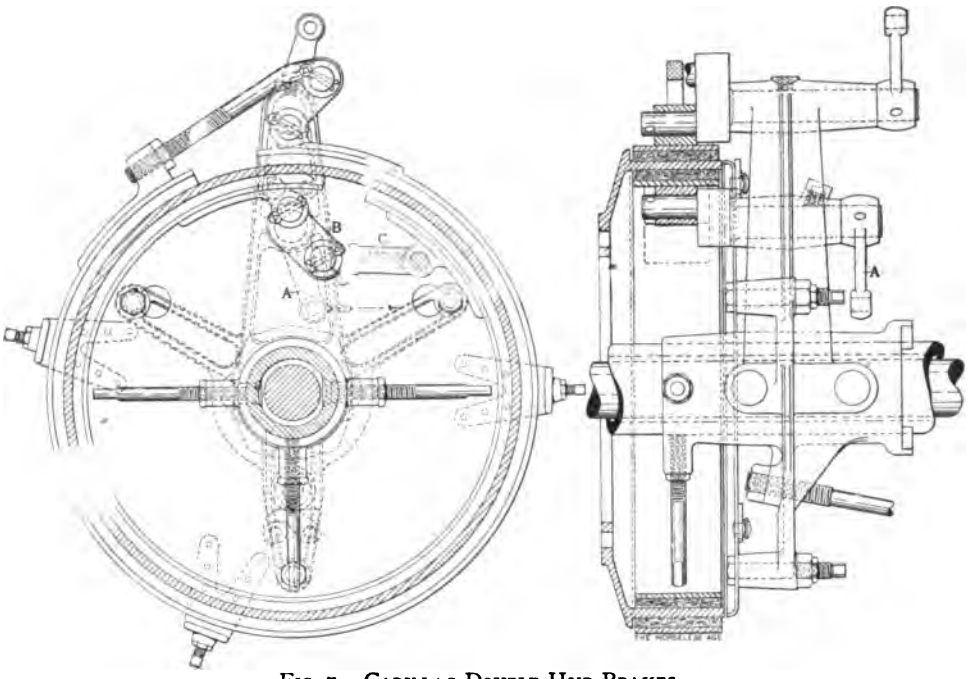


FIG. 7.—CADILLAC DOUBLE HUB BRAKES.

shaft. This gives a direct drive on the high speed. The drive is then by naked shaft, two oil retaining, dust-proof universal joints of the Cadillac Company's own design, and bevel pinion and gear.

REAR AXLE CONSTRUCTION.

In Fig. 6 is shown the rear axle construction. The drive shaft and bevel pinion, it will be noticed, are well supported on Hess-Bright bearings. The bevel gear differential housing is of aluminum, with very large webs. The floating live axle is encased in a steel tube, the outer ends of which, as shown at A, support the large Hess-Bright bearings on which the rear wheels run. These bearings are directly in line with the spokes to receive the weight direct. The wheel hub is fitted to a taper on the end of the axle and keyed. This axle does not carry the weight, but simply transmits rotation from the bevel gears at the inner ends to the wheels at the outer ends. The differential, as usual, runs in an oil bath.

There are two brakes, both acting on the rear wheel drums, instead of one on the rear of the transmission, as in last year's four cylinder car. These brakes, which are both of the band type and faced with a special belting material, are shown in Fig. 7. Both brakes are double acting. The contracting band is operated by the ratchet lever at the outside of the car by pulling toward the driver. This is the emergency brake which also disengages the clutch. The inside expanding band brake is operated by the right foot lever, which also disengages the clutch. A forward pull on lever A by the steel brake rod carries arm B upward with it, tending to bring B and C in line. This gives a powerful toggle joint action, just as though applied

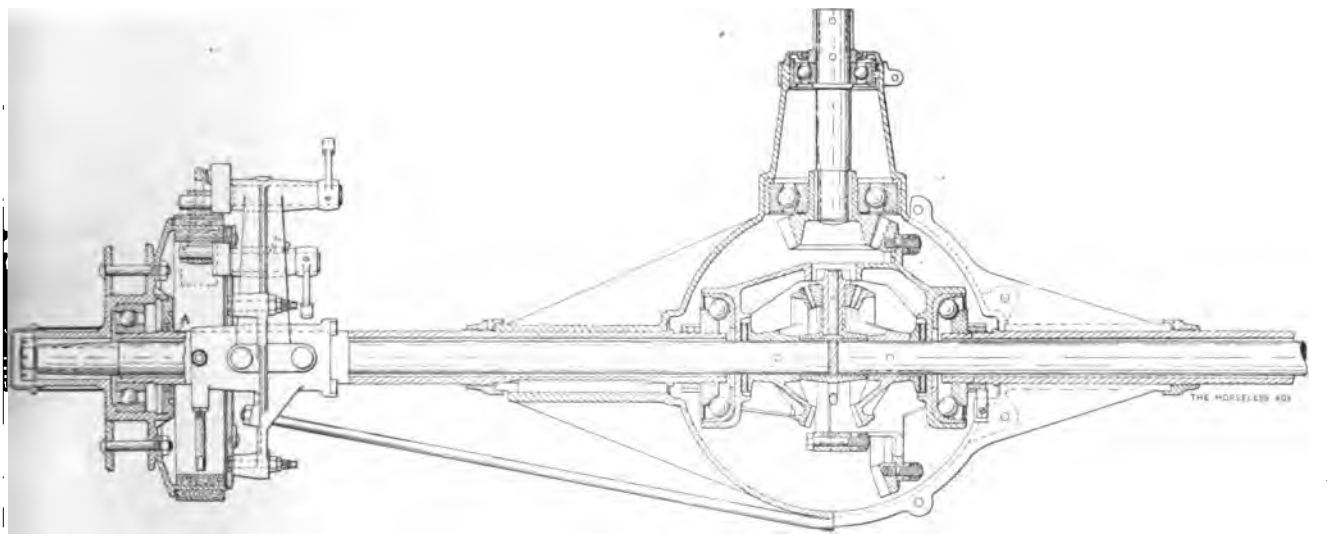


FIG. 6.—CADILLAC REAR AXLE AND DRIVING GEAR CONSTRUCTION.

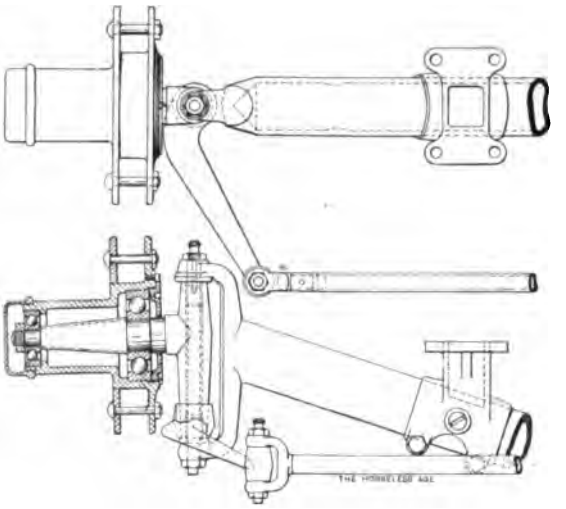


FIG. 8.—CADILLAC FRONT AXLE END.

at D; arm C is adjustable in length, and can be so set that when the brake is hard on the arms, B and C are almost in line, in which position the action is the most powerful. A shield protects this inside brake from dust and dirt.

The front axle is of steel tubing of the form shown in Fig. 8, which figure also shows the steering knuckles and the front wheel hubs, which latter run on Hess-Bright bearings, the large balls being, as in the rear wheels, directly in line with the spokes. The cross link connecting the wheels is protected by being placed behind the axle.

CONTROL LEVERS.

The spark and throttle control levers are located on a stationary notched arc on the steering wheel, as shown in Fig. 9. They are connected to a tube and rod, the ends of which at A and B each carry a small bevel gear, which mesh with partial gears on the end of an upright shaft and sleeve carrying the arms which pull the rods to the throttle and timer. As shown, the steering mechanism is of the screw and nut type, and is provided with ball thrust washers at each end. The nut is split at right angles to its length and by means of the claw shaped piece pivoted at C, by separating the ends D and E by the set screw, the other ends F and G are made to press the two parts of the nut together on the thread, which effectively prevents any back lash.

GOVERNOR.

A feature of these cars which is new is the application of the ring type of marine governor to an automobile. This new device has proved even more satisfactory than was anticipated. Fig. 10 shows a drawing of the governor, with one side of the aluminum housing removed and the lower portion in section, showing how the vertical

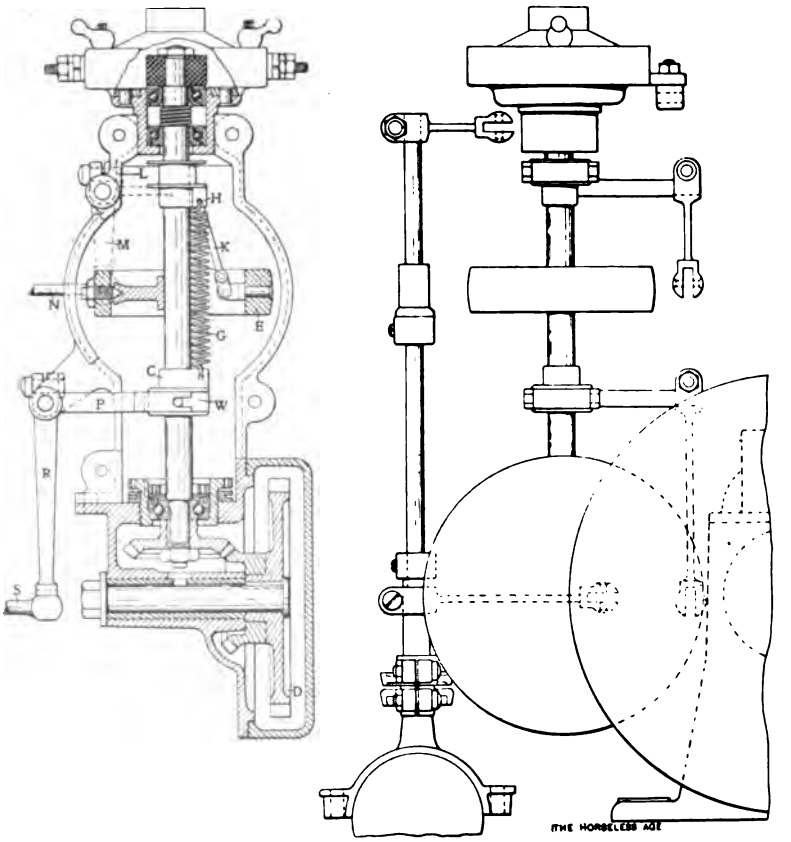


FIG. 9.—CADILLAC GOVERNOR.

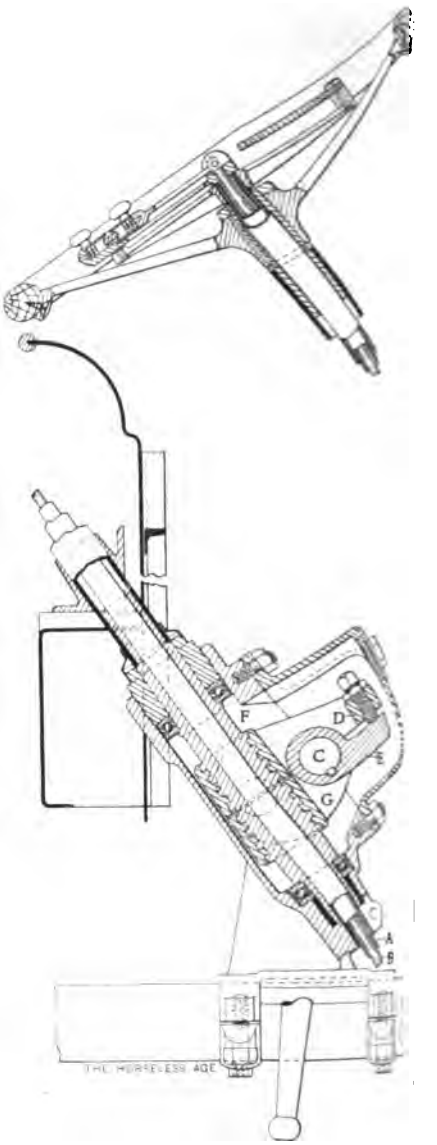


FIG. 10.—CADILLAC STEERING GEAR.

shaft C is gear driven from a small gear on the cam shaft, which meshes with gear I. This vertical shaft runs in ball bearings and carries at its upper end, below the ring E, the Lacoste timer. The latter is supported on one side and normally rests in an oblique plane, but when the engine speeds up it tends to assume a position in a horizontal plane.

This action is opposed by the spring G fastened to the collar H, which the ring moves upward by the connecting link K. As the collar H moves upward it carries with it the bell crank lever L M, which in turn pulls the rod N and closes the throttle lever on the wheel, and when that lever is set for open throttle it pulls the rod S which in turn operates the bell crank lever P R to lower the collar M and increase the tension on the spring G, which means that a greater engine speed is necessary to make the ring overcome this increased tension. By this arrangement it is possible to set the throttle lever so that the engine will maintain, within the limits of its power, practically the same speed up hill or down. If it is desired to suddenly speed up, an ac-

:elerator button just to the left of the clutch ›edal can be depressed; this opens the :hrottle wide and to a certain extent pulls :od N to depress the governor ring, but when the button is released the engine im-nediately resumes the speed indicated by :he throttle lever on the wheel.

A double muffler is used, which has neither baffle plates nor sieve pipes in it. There are two hollow cylinders, the exhaust enters the first and must pass out again practically at the same place it entered; it then passes over into the second cylinder and repeats the same performance, thus muffling by the opposed gas currents. This muffler is very quiet.

The frame is of three-sixteenth inch pressed steed, with cross members of the same material. It is braced diagonally on top by two steel strips crossing at the middle and riveted at the ends and to the cross members. The dash is also of pressed steel and edged with a brass bead, and carries a quadruple vibrating coil for the jump spark. The current is supplied by storage batteries and the plugs are located over the inlet valves.

The front springs of both cars are semi-elliptic, and the axles are set slightly forward of the centre of the springs. The rear springs of the 30 horse power car are three-quarter elliptic, and on the 40 horse power car they are of the platform type. The gasoline tank is under the front seat, but fastened rigidly to the frame; however, arrangements have been made for placing it under the rear, and using a pressure feed from the exhaust if this location is desired by the purchaser.

The bodies are of wood in curved designs, with large side entrance tonneau, but almost any style of body, including the largest limousines, can be readily mounted on either chassis.

The Cleveland 30-35 Horse Power Car.

Two models are offered for 1906 by the Cleveland Motor Car Company, one a continuation of last year's 20 horse power car and a new 30-35 horse power car known as Model F. The specifications and dimensions of the latter car are as follows:

Motor, four cylinders, 4½x5 inches, rated at 30-35 horse power; make and break ignition by Simms-Bosch low tension magneto; bevel gear shaft drive; sliding gear transmission, with three speeds forward and one reverse; wheels, 34 inches; tires, front and rear, 4 inches; wheel base, 104 inches; gauge, 56 inches; weight, fully equipped, 2,400 pounds; seating capacity, five passengers; body, choice of double phaeton, tulip or victoria.

A live rear axle is used and runs in a casing made of heavy steel tubing, which carries at its ends the wheel bearings and supports the weight of the car, leaving nothing for the live axle to do but drive the wheel hubs through a dog clutch mounted on its squared ends. The axle casing is strongly trussed and connected to a cross member of the frame by a tubular torsion rod. By removing the caps over the wheel hubs the driving shafts may be entirely removed and the rest of the vehicle remains intact. The differential is of the bevel gear type and runs on ball bearings. The driving gear case is divided horizontally near the top and the upper portion can be removed for inspecting the gears. This case is oil tight and may be packed for a season's running.

The front and rear wheels are each 34 inches in diameter, mounted on ball bearings, and are made of second growth hickory. The front axle is a nickel steel forging of I section, with the spring supports made integral. The steering knuckles, pivots and links of the steering gear are all drop forgings of carbon steel, oil hardened, and the bearing surfaces are all ground. The steering gear is of the irreversible nut and screw type, encased in a malleable iron casting.

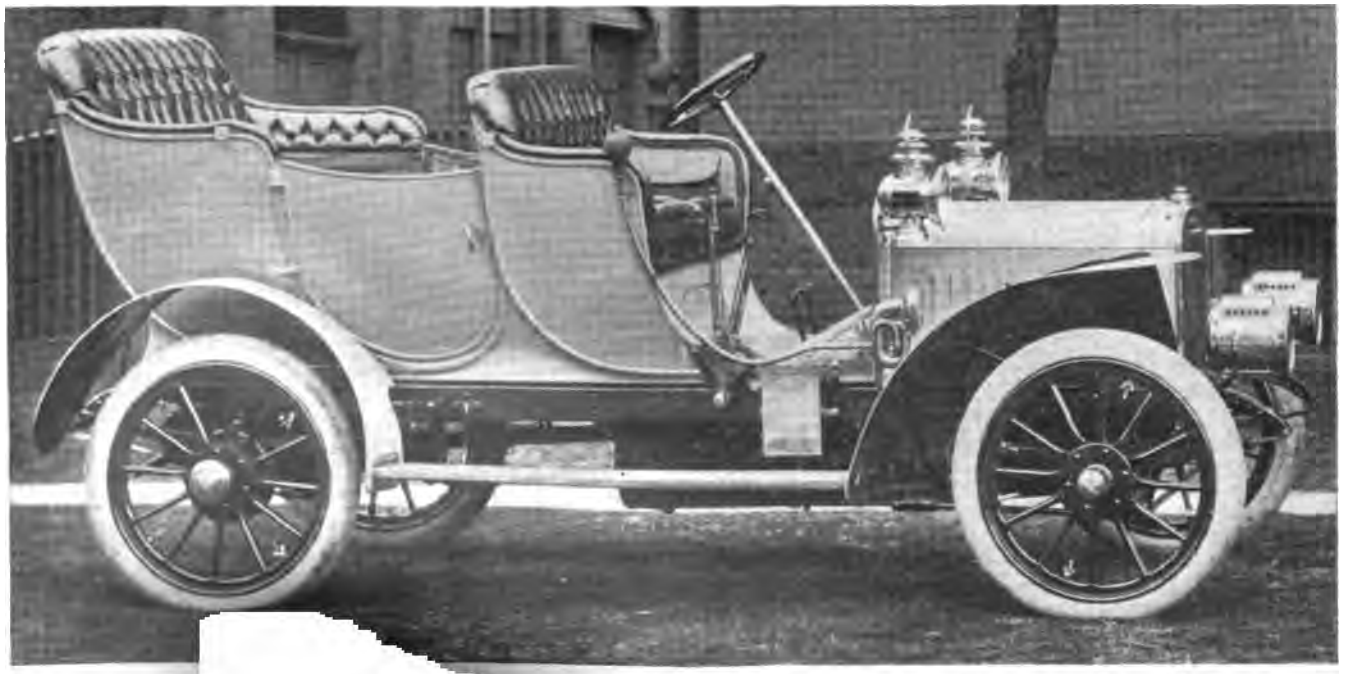
FRAME AND SPRINGS.

The frame is made from cold rolled pressed steel of 3-16 inch thickness, without narrowing the side rails at the front. The cross members and subframe are also of channel section pressed steel and strongly braced by the use of gusset plates. The springs are long, semi-elliptic, and shackled at their rear ends. The front springs are under the frame and the rear ones are on the outside.

THE MOTOR.

The 30-35 horse power, four cylinder vertical tandem engine has a bore of 4½ inches and stroke of 5 inches. The cylinders are cast in pairs, with water jackets integral and the valve chambers on opposite sides. Each pair of cylinders has a drain cock at the bottom of the jacket. The cylinders are finished by grinding. The pistons are soft gray iron castings, rather long and with slightly domed heads. Four oil grooves are turned in the piston below the pin. Four eccentric lap jointed, unpinned rings are used, placed above the wrist pin. The rings are also finished by grinding. The wrist pins are hollow, of hardened steel and ground; they bear against a hardened and ground steel bushing in the connecting rod. These rods are nickel steel drop forgings of I section. The cap at the crank pin end is held by a special bolt lock nut and cotter pin. A split bronze bushing, with diagonal oil grooves cut in it, supplies the wearing surface.

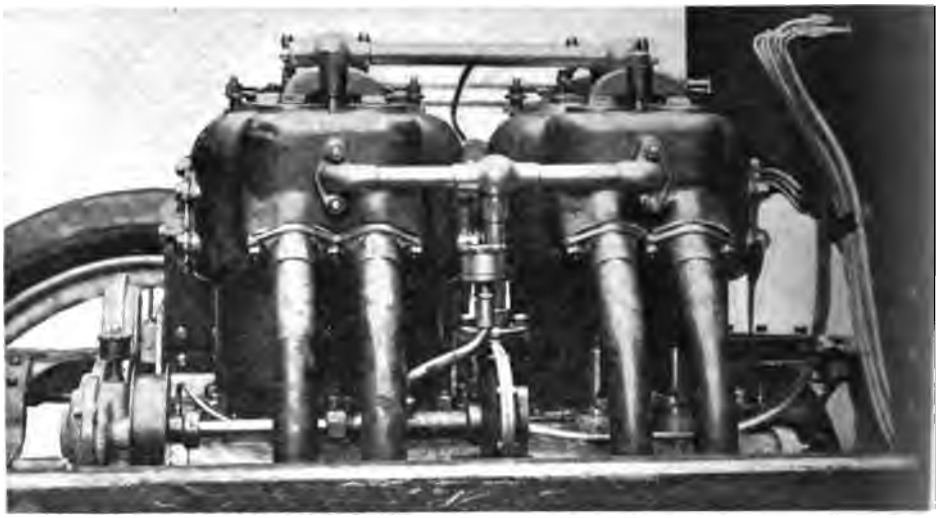
The crank shaft is a special high carbon, steel drop forging, with the flywheel flange



CAR, WITH VICTORIA TYPE SIDE ENTRANCE BODY.

integral. It is supported in three long phosphor bronze bushings. Specially shaped bronze oil retainers are pinned to the crank webs and receive the overflow oil from the main bearings. Through oil ducts from here centrifugal force carries the oil to the surface of the crank pins.

The valves are all made of nickel steel, with their heads and stems integral, and are interchangeable. The valve lifting rods are of steel, with hardened rollers running on the cams. The valve lifting rod guides are held in position in pairs by a steel yoke retained by one nut. The cam shafts and cams are forged in one piece from nickel steel stock, and the cams are hardened and ground. These cam shafts run in bronze bushings. The 2 to 1 gears are of bronze and encased in a dust and oil tight aluminum case, which also encloses the gears which drive the magneto and pump. The upper portion of the two piece aluminum crank case carries the engine supporting arms and also the main bearings, so that the lower half of the case is simply an oil retaining pan. Brackets cast integrally with the case support on the left side a bronze centrifugal pump and on the right side the magneto. These features are clearly shown in the accompanying photos. The pump shaft is driven by a gear meshing with the cam shaft gear and the radiator fan which is supported on the front of the forward cylinder is driven by a flat belt from a pulley on the pump shaft. This disposition of the fan support reduces the vibration and tends to prevent leaking of the radiator. The exhaust pipes are made of steel tubing, each pair held by three studs. As shown in the photo, they run downward to a single piece iron casting, from which a pipe runs to the rear and connects with the muffler, which is suspended crosswise. Two outlets are arranged with flattened ends to blow down the dust, which would otherwise rise from the rear wheels.



EXHAUST SIDE OF CLEVELAND MOTOR.



MAKE AND BREAK IGNITION BLOCKS OF CLEVELAND CAR.

COOLING.

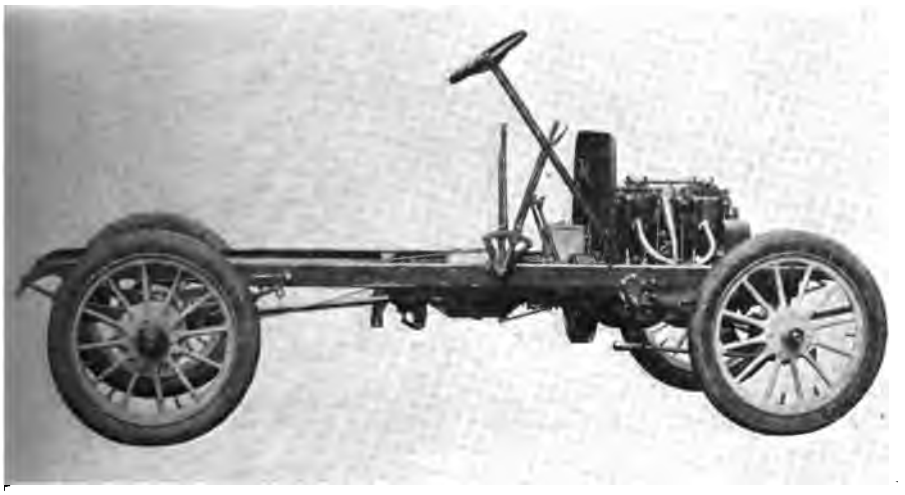
The motor circulation is from the bottom of the cellular cooler through a copper pipe to the pump, upward to a T and then to the jackets between the exhaust valves and out from the top of the jackets through a brass pipe to the radiator.

IGNITION.

The jump spark system has been discarded in favor of the low tension make and break system. A Simms-Bosch magneto is mounted on a bracket at the right of the engine and held in position by a yoke and two nuts, so that it may be quickly removed. The magneto is grounded on the engine, one wire leads to a plug cut-out on the dash and one to the metal bus bar, which is supported by special brackets which form a part of the water pipe on top of the engine. A cut-out switch is provided for each cylinder. The igniter terminals are mounted in plugs which are a ground fit into the cylinder over the inlet valves. The adjacent plugs are held in position by a yoke and single nut, as shown in the sketch. A vertical shaft A for each cylinder, rotated by small steel bevel gears from the inlet cam shaft, operates the igniter mechanism. Upon the upper end of each of these vertical shafts is mounted an eccentric B, the hub of which is clamped to the shaft. This eccentric moves a push rod C, which is held in contact with another eccentric D by a coiled spring, as shown. The end of the rod C pushes the contact arm E, which controls on the inside of the cylinder the hammer which makes the contact with the anvil or plug. Rod C, owing to the eccentric motion of its end and its bearing against arm D, first pushes arm E until the contact parts in the cylinder touch and then trips or slips off, allowing the points inside to separate suddenly under the action of spring G. The time at which this tripping action takes place may be retarded by changing the position of the cam D by means of the linkage operated by the spark



INLET SIDE OF CLEVELAND MOTOR.



ELEVATION OF CLEVELAND CHASSIS.

ver on the wheel. The advance of the ark is automatically taken care of by the riation in the current due to the speed, d this spark lever is provided only for tarding the spark when starting.

Adjusting the mechanism so that the ark will take place at the proper time s been made simple by placing at the rear the engine a stationary pointer and graving reference marks on the flywheel n which indicate the exact position at ich the contact points should separate. l that is necessary is to move the fly- eel until the reference mark for the par- ular cylinder to be timed is opposite the ints. Then loosen the sleeve by which centric B is fastened to the vertical aft and turn it until arm C just trips the ce E, then lock the sleeve by the clamp ew and the timing will be correct.

OILING.

A Hill precision oiler, with sight feeds the dash, is located under the footboards t back of the dash. The oiler is oper- d by an eccentric and a rod from the r end of the cam shaft, the rod connect- to a rocker arm, which operates the in- idual plungers of each feed. The sup- to each pipe is adjustable. Tubes lead each of the engine bearings and the over- w is caught in specially designed cup ped bronze rings around the shaft and de fast to the crank webs. By centrifu- force the oil flows from here through a e to the crank pin. There are also two es to the transmission main bearings l a third to the differential.

The clutch is made of aluminum and is the usual leather faced cone type, ar- ged to give no thrust on the engine rings. The forked arms which engage slotted spool or collar on the shaft for engaging the clutch are provided with dened steel rollers, which come in con- t with the spool. The usual coiled spring ps the clutch in contact.

CARBURETOR.

The carburetor is of the float feed type. e nozzle is eccentric with the float, so t tipping of the car does not cause flood- . The admission to the float chamber is at the bottom and governed by a weight- ed needle. A drain cup is provided, through which all gasoline which passes into the carburetor must pass, thus pre- venting any dust or dirt from obstructing the flow. A balanced rotary throttle valve is used, which is operated from the throttle lever on the stationary sector on the steer- ing wheel. The gasoline is carried in a 15 gallon copper tank under the front seat and flows by gravity to the carburetor. This tank is provided with a 2 gallon reserve tank.

TRANSMISSION.

A full universal joint connects the clutch to the three speed and reverse sliding change speed gear. The gears are all of 50 point carbon steel, hardened, and run in an oil bath. The sliding gear pair is turned from one piece of metal and runs on a squared shaft. The other gears are bolted to flanges made integral with the shaft, which are oil tempered, hardened and ground, and all nuts, not only in the trans- mission, but on the whole chassis, are cas- tellated and retained by split pins.

The drive is direct on the high gear. The entire top of the aluminum case forms a hand hole for inspection and packing, and the ends forming the bearing supports are provided with an oil groove or cup to prevent the oil from dripping out of the ends. The engine and transmission are both supported on a subframe of pressed steel and protected from mud and dirt by a large aluminum pan or shield, held by straps in such a way that it can be instantly dropped down.

The power is transmitted to the rear axle by the use of two hardened and ground uni- versal joints of special construction and an oil tempered steel shaft. The front joint is covered by a brass dust shield and the rear joint is provided with a squared tube and shaft to allow for the action of the springs.

BRAKES AND CONTROL.

There are two foot pedals with rough- ened heads and the edges turned up to pre- vent the foot from slipping. The left oper- ates the clutch. The right controls the double acting transmission brake, which has phosphor bronze shoes acting against a steel drum. On the outside of the seat, moving on a suitably notched bracket, are the change speed lever and the emergency brake lever, which also releases the clutch. These brakes are on the rear wheel drums and are of the expanding type. They are well protected from the mud. The change speed lever works on the progressive prin- ciple and is provided with a thumb button release.

The Walker Runabout.

The accompanying photograph shows the Walker runabout, manufactured by the Walker Motor Car Company, of Detroit, Mich. The car is driven by a double op- posed engine under a bonnet in front of the dash. The crank case and change gear case are cast integral. The planetary change gear gives two speeds and reverse, and from it the drive is transmitted to the rear axle by propeller shaft and bevel gears. Full elliptic springs are fitted front and rear.

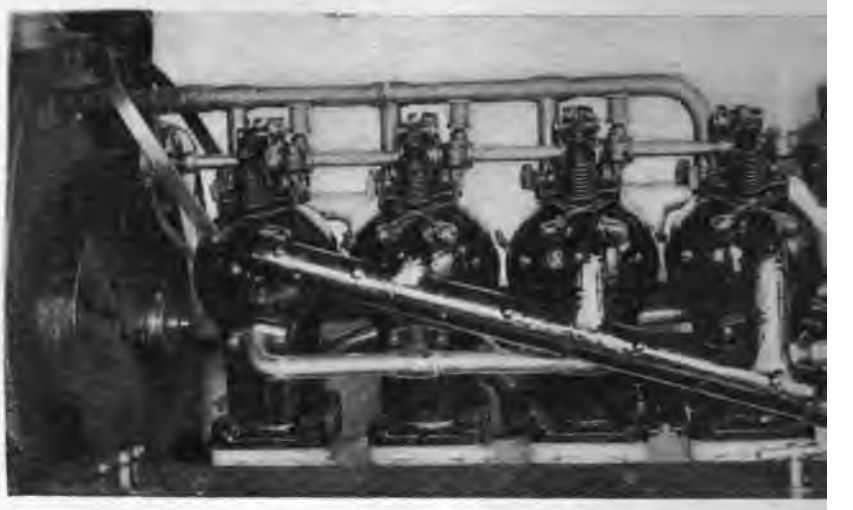


THE WALKER RUNABOUT.

The Ariel Four Cylinder Car.

A new four cylinder car built in Boston has just made its appearance in New York city. We refer to the Ariel, which is the product of the Ariel Motor Car Company, of Boston, and is handled in the metropolis by Cowell & Crosby Motor Car Company, 1621 Broadway. The car shows simple lines throughout and is rather lighter than usual for the size of engine with which it is fitted. Its distinguishing features are an oval radiator and corresponding hood, and spherical cylinder jackets. The motor is of 4½ inches bore by 4 inches stroke and rated at 28-30 horse power.

The cylinders are cast individually, with integral heads and the spherical water jackets. The valves are of the caged type and set into the head at an angle of 30 degrees with the vertical. Both sets of valves are mechanically operated and are interchangeable. The valve cages are secured in place by means of cast-on flanges and two studs. The valves are operated from a single cam shaft running centrally across the tops of the cylinders, and mounted in four split bronze boxes bolted to the cylinder heads, each of which boxes is provided with an oil cup. The cam shaft is driven from the engine crank shaft through a vertical shaft at the rear of the engine, with bevel gears at top and bottom. The upper set of gears is enclosed in a two-part brass housing, while the lower pair is exposed. The vertical shaft is geared up from the crank shaft in the ratio of 1 to 1½, the reason being that the shaft carries the circulating pump, which it is desirable to drive at a fairly high speed. The pair of bevel gears at the top end of the vertical shaft gives a reduction of 3 to 1, so that the ratio of transmission from the crank shaft to the cam shaft is the usual 2 to 1.



EXHAUST SIDE OF ARIEL MOTOR.

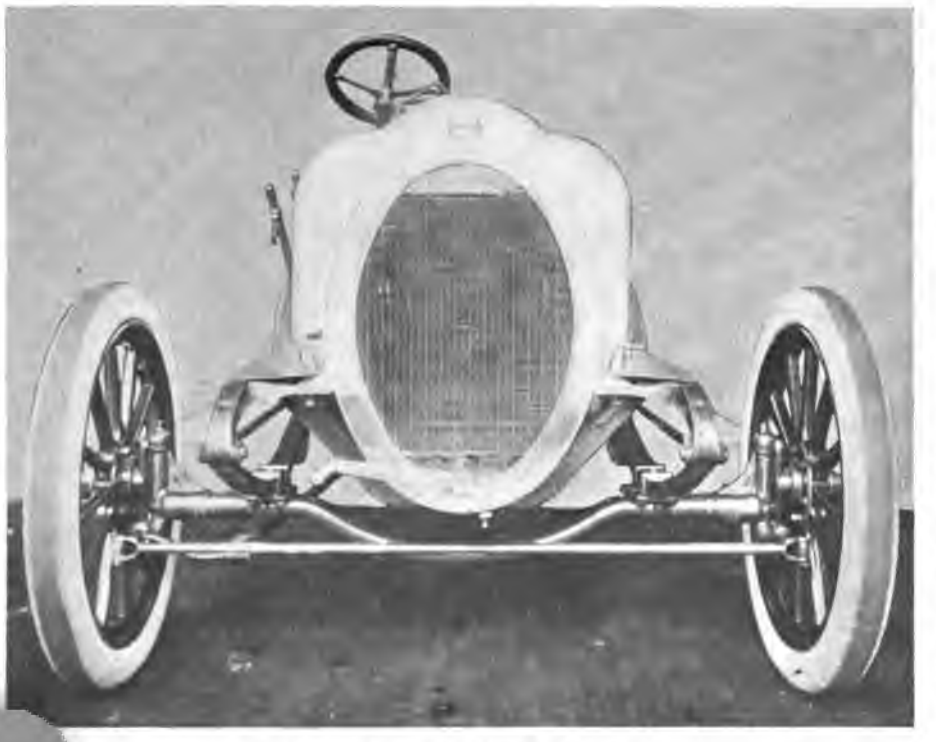
The crank chamber consists of two aluminum castings, with a joint in a horizontal plane, the five bronze boxes for the crank shaft being carried between the two halves. As there are no cam shaft and cam gearing to enclose and provide bearings for, the crank chamber is of extremely compact and simple form, substantially cylindrical, with dome shaped ends. The lower half is cast with partitions dividing it into four compartments, so as to insure uniform lubrication on hills. The upper half is also cast with stiffening webs, but these have openings in them to eliminate all unnecessary weight. The lower half is cast with four small feet, by which the engine is supported on drop frames forming cross members of the main frame. This elimi-

nates the necessity for long, heav
arms on the crank housing to
engine on the side frames, and u
effects a considerable saving in w
removing the exhaust and wate
tions and the bolts by which the
of the crank case are fastened
the entire engine, minus the low
the crank case, can be removed
car. In connection with the valv
it remains to be mentioned that
are operated from the cam shaf
the intermediary of rock levers
on brackets cast on the valve
rock levers being provided with
hardened cam rollers, and with
adjustment for regulating the l
valves. There is a circular han
the lower half of the crank cha
derneath each cylinder which c
moved when it is desired to adjus
necting rod bearings.

The pistons are of conventional
tion and fitted with three compres
at the top end, the rings being
lap jointed and free to move
grooves. The connecting rod i
forging, bronze bushed at the
and provided with a bronze c
crank end. To the rear end of
shaft, on a tapered section of th
keyed a flywheel of considerable

The exhaust manifold is a s
casting, so inclined that the pi
from it to the muffler does n
any bends. The muffler construct
somewhat out of the ordinary.
fler is of cylindrical form and
gases from the engine enter it c
one end, but are immediately di
baffle plates to an outer annular
where they expand and have a
cool off, owing to the large exp
face of this chamber. From
chamber the gases pass into an
through perforations in the part
and from that to a central cham
which they leave at the centre o
head of the muffler.

The engine is supplied with c
mixture by a Holley carburetor



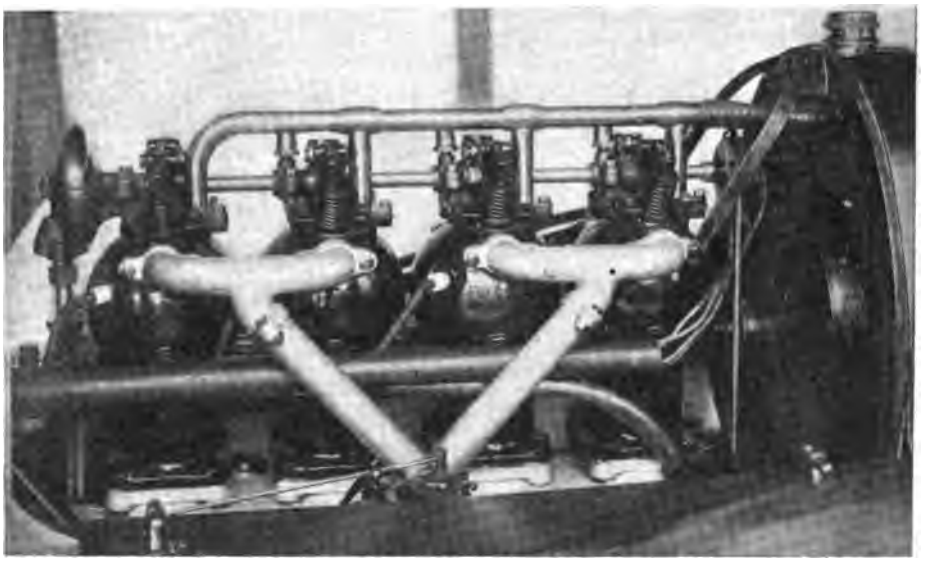
FRONT VIEW OF ARIEL CHASSIS.

low position at the right hand side of : engine and connecting by a cast alumi- m manifold in three parts to the four et valves. A twenty gallon gasoline tank galvanized iron, partitioned off to pre- nt undue splashing on rough roads, is ranged in the front seat and feeds to the rburetor by gravity. The source of cur- nt for the ignition is a four cell, eight lt storage battery carried in a box on e right hand running board. The Ariel mpany are considering to use a three l battery in the future, this being recom- ended by the coil makers, but they have t had any trouble from coils being dam- ed by the unusually high voltage. A mmutator of the internal roller type, th an annular contact sector ring of red re, is carried upon the forward end of e cam shaft, and a quadruple vibrator il with switch is mounted on the dash- ard. The spark plugs screw into the linder walls at an angle, extending up- ardly and rearwardly on the right hand de. The high tension and low tension bles are carried through a fibre tube on e right hand side of the cylinders, to pro- ct them against possible accidental dam- ge. The time of spark is controlled in e car from which these data were obtained a lever on the steering column under- eath the wheel. This is owing to the use f a type of steering gear with which it impossible to carry rods for the control f the spark and throttle through the steer- g post. In the future it is proposed, how- ver, to mount the spark and throttle levers n a stationary sector on top of and con- ntric with the steering wheel, a different rm of steering gear having been adopted r future use.

The car examined was provided with a at tube radiator, but in future a cellular adiator will be used, the outline remain- g oval as heretofore. Back of the radi- tor is mounted a sheet iron fan with ring, hich is carried on ball bearings and riven by a belt from the forward end of he crank shaft. The water is circulated y the gear pump mounted direct upon the ertical shaft at the rear of the engine, and s this shaft is driven by bevel gears from he crank shaft, the drive of the circulating ump is absolutely positive. The water rom the pump is forced into the jackets t the lowest point through a copper tubular nanifold; it leaves the jacket on top and lows through a similar manifold to the adiator, from the bottom of which it re- urns through a copper tube to the pump. The lubricating system of the engine is based upon the splash principle, but oil is constantly fed to each of the crank chamber compartments by a force feed lubricator on the dashboard, which is driven from the rear end of the cam shaft by means of a spring coupling so designed that it will not transmit any reverse motion, thus protect- ing the lubricator from damage. The lu- bricator has two feeds, both of which pass through the wall of the crank and divide into two bra providing a feed to each of the four compartments.

The friction clutch is a leather faced, aluminum cone, with a taper of 10 degrees. The clutch spring surrounds a projection of the engine shaft and is entirely en- closed. The clutch connects to the change gear box by a claw coupling, which allows both for any disalignment between the bearings of the engine and the gear box, and for the motion of the clutch in en- gaging and disengaging. The gear is a sliding pinion affair, with three forward speeds and one reverse, encased in a two part aluminum housing carried on drop frame members. The bearing sleeves are plain bronze bushings. The high speed for- ward is a direct drive, and is obtained by engaging a square block on the clutch pinion into a corresponding socket on the forward sliding gear. This gives four changes per revolution of engaging the di- rect drive, instead of two, as with the ordinary claw coupling. All the pinions which a pin operated by the clutch shifting mechanism is adapted to engage. When the sector is in any other position than that corresponding to perfect mesh of the gears the pin cannot pass into any of the holes on the sector and the clutch can therefore not engage.

The transmission to the rear axle is by a shaft with two universal joints and by a steel bevel pinion and gear. The shaft of the bevel pinion and the rear axle driv- ing shaft are mounted on 5/8 inch ball bear- ings. The reduction ratio of the bevel gears is 3 3/3 to 1, which is the reduction ratio from the engine to the driving wheels for the high speed; the intermediate speed is lower in the ratio of 1 7/8 to 1, and the low speed about 3½ to 1. A differential of the spur pinion type with three sets of pinions is carried on the rear axle. Differ- ential and driving gears are enclosed in the housing with removable top section, which admits of ready access to all of the gears. The torsion on the rear axle is taken up



INLET SIDE OF ARIEL MOTOR.

and gears are cut with six pitch teeth of 1⅛ inch width of face, and are suitably beveled at the edges to permit of easy and positive shifting. The case has a lid on top, of such size that when it is removed all of the gears inside the box can be conveniently examined. The gear is operated by a single side lever, which, in being moved from its rearmost to its foremost position, gives successively the reverse, neutral, first, second and third forward speed positions. An interlocking device is provided, which prevents the clutch being engaged before the gears are in perfect mesh, thus remov- ing the danger of battering the ends of the teeth. The gear shifting mechanism comprises a rod which passes through the wall of the gear box at the forward end and connects by a big double armed lever and a link to an arm depending from the shaft of the shifting lever. To the double armed lever referred to is secured a flanged or, in the flange of which there are er of holes, one for each speed, into on a tension rod running from the lowest point of the gear casing to a cross member of the frame. A pair of distance rods are also provided between the side members of the frame and the spring blocks which are fitted over the axle tubes. The front axle is of tubular construction, 2 inches in diameter, and has the drop forged axle end pinned and brazed to it. This axle is curved downward in the centre to allow sufficient clearance between it and the en- gine crank case when the springs are com- pressed. The steering knuckles are of the inverted Elliott type, and are connected by a tie rod in front of the axle. The steering mechanism that will be used in the future is of the screw and nut type, and connects to the right hand knuckle by a rod with one ball and socket and one double forked connection.

The frame consists of pressed steel side members of 5-32 inch stock and 4 inches deep at the centre. Besides the pressed steel cross member at the rear, the side

members are connected by four drop frames, two of which carry the engine and two the change gear box. The frame is carried on semi-elliptic springs in front and full elliptics at the rear. The latter are hung underneath the axle and have a swivel connection with the frame. All springs are 38 inches long. The car has a wheel base of 100 inches and is equipped with 32 inch artillery wheels and 3½ inch tires. Its weight complete, without supplies, is about 1,950 pounds.

The vehicle is provided with two independent braking systems. The foot brake, which is interconnected with the clutch, acts on a steel drum directly back of the change gear box; it consists of two bronze sectors pivoted on a stud extending from the gear box and adapted to be contracted on the drum by means of a lever mechanism. The rear, hand operated brakes also consist of bronze sectors, but they are of the expanding type, and are enclosed by sheet metal plates in front of the brake drums. The sectors are expanded by means of double cams, the lever arms on the shaft of these cams outside the brake drum extending upward and connecting by steel cables to downwardly extending arms on the shaft of the brake lever. The hand brake is not interconnected with the clutch.

The car is fitted with a double side entrance tonneau body, seating five, the tonneau doors swinging forward. It also has a cast aluminum dash of distinctive form, continuous running boards, sheet metal fenders and a hood hinged at quarters and in the centre. It is sold with a complete equipment of lamps, etc.



THE AUSTIN MODEL LX.

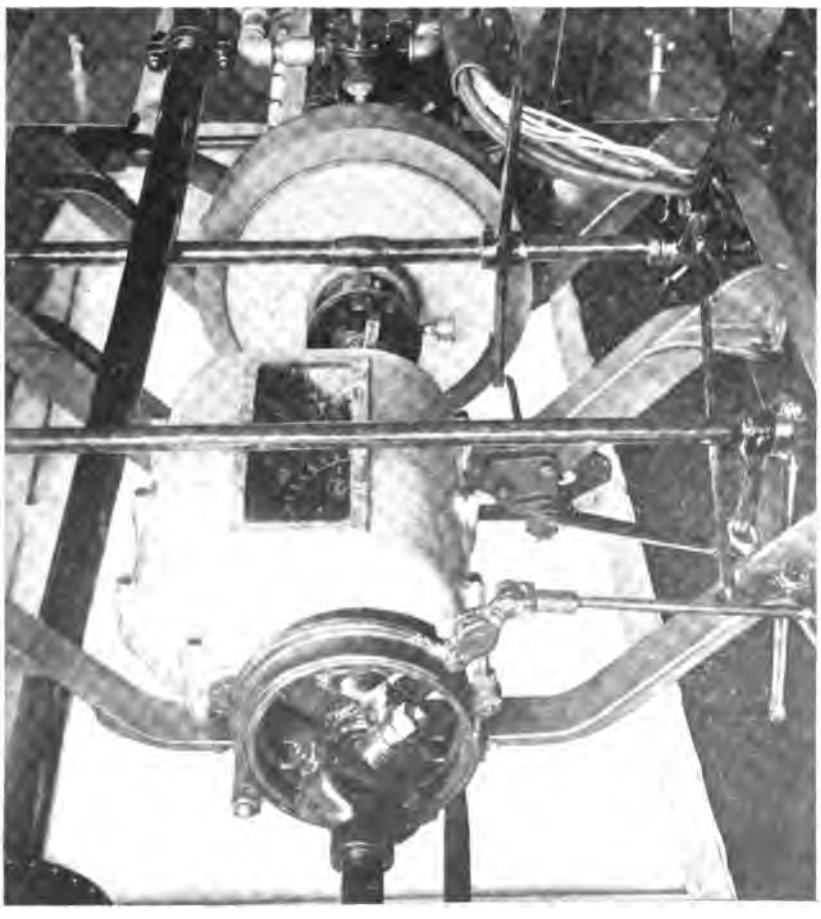
The Austin Model LX.

The 1906 model of the Austin Automobile Company, of Grand Rapids, Mich., is a 60 horse power machine, which is fitted either with a runabout, side entrance tonneau or limousine body. The car is one of the most powerful on the American market, and is substantially constructed. Its distinguishing features are its triple automatic inlet valves, its double ignition system and the provision of tool, ba and curtain boxes underneath the frames and accessible through doors op ing to the outside.

MOTOR CONSTRUCTION.

The cylinder are of 5½ inches bore stroke, respectively, and are cast indivi ly and integral with water jacket, head valve box. The engines uses high comp sion, and the rated power is claimed t obtained at 1,200 r. p. m. The four cy ders are bolted down to the top half o crank chamber, which is an iron cas and is provided with large hand hole the right hand side, which admit of ad ing the connecting rod bearings. This of the crank chamber is substant webbed, as may be seen from the illus tion of the engine. The lower half of crank case is an aluminum casting simply acts as an oil well. The cam ge ing is located in front and is exposed protected from road dust and mud by sheet metal pan between the engine the running gear frame. A steel pin on the engine crank shaft meshes wit brass gear on the cam shaft and with noiseless fibre gear, which in turn mes with a gear on the magneto. The c shaft is of the outside type, small pock being arranged on the crank case, wi form housings for the cams, bearings the cam shaft and guides for the valve p rods. Long levers with rollers on the e are interposed between the cams and valve rods, to reduce side thrust. T three inlet valves, of ⅞ inch diameter ea are arranged in a nest directly over exhaust valves in a boss cast on to the haust valve chamber and closed by a p ished brass cap. These inlet valves be readily removed together, thus giv access to the exhaust valves. The reas for using triple inlet valves is, that if single large diameter valve were used stead, it would be much more liable warp and become leaky, and it wou also be less quick acting in opening a closing.

The crank shaft is made from a crucib steel forging, and is formed with a sol flange, to which the flywheel is bolted. is 1¾ inches in diameter and has five ma



VIEW OF ARIEL CLUTCH, GEAR BOX AND UNIVERSAL JOINT.

arings supported in bronze boxes, the
e on the flywheel end being 4 inches long
d the rest each 3 inches long, making
total bearing length of 16 inches. The
ank pin bearings are 1¾x3 inches, bronze
ished. The engine is hung from cross
embers of the main frame, one at the
ont and one at the rear of the engine,
hich bolt to lugs cast on the upper half
the crank case.

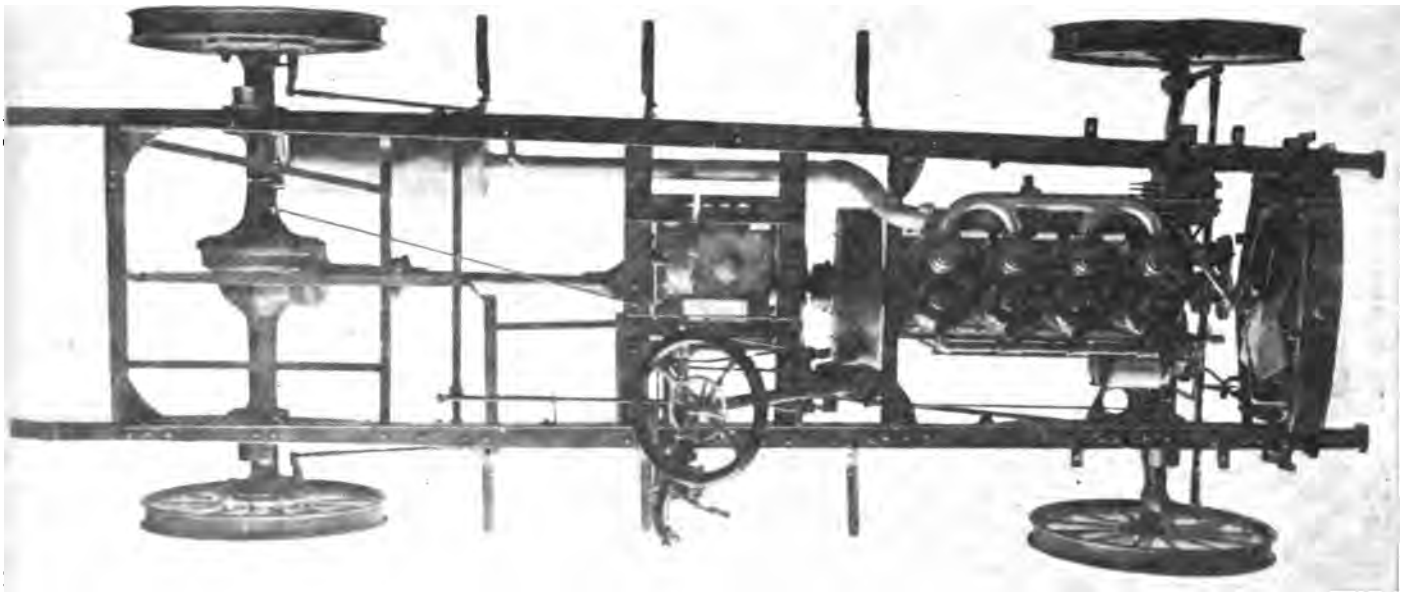
A Schebler carburetor is used, located on
e left hand side of the crank case and fed
ith gasoline from a 20 gallon tank under
e front seat. This tank is provided with
i indicator showing the amount of gaso-
ne in the tank, and in addition a reserve
nk of 2 gallons capacity is placed under
e driver's seat, so that the possibility of
nning out of fuel on the road ought to be
ry remote. The carburetor connects by
vertical brass tube and a nickel plated in-
t manifold to the inlet valves of the four
linders. It combines a throttle valve,
hich is operated by a finger lever moving
i a stationary notched wheel on the steer-
g hand wheel.

ler combined timer and high tension distributer is carried upon the forward end of the cam shaft, and a single vibrator coil with switch is secured to the forward side of the dashboard. The batteries, single coil and combined timer and distributer form together the second ignition system. Besides using each ignition system separately, it is also possible to use the battery with the high tension distributer on the magneto. Two ignition switches are secured to the front of the driver's seat. By operating the outer one of these switches it is possible to use either one or the other of the two batteries, or the two sets in parallel, in connection with the set of plugs specially provided for the batteries. By operating the second switch it is possible to use either the magneto alone or the battery in connection with the magneto distributer and the plugs provided for the magneto. Both systems of ignition can, of course, be used at the same time if it is desired. In ordinary operation it is the custom to use the battery and battery plugs for starting, and as soon as the engine has attained speed to switch on the magneto and turn off the battery. The high tension cables are carried in a brass tube, and in the case of the magneto in a rubber tube.

The engine lubrication system is a combination of splash and positive feed. A six lead Hill precision oiler is carried on the left hand side of the engine, forward, and is driven by means of an eccentric from the forward end of the cam shaft. Four of the feeds lead to the four cylinders respectively, and the other two to the forward and rearward half of the crank chamber respectively. A main oil supply tank of 2 gallons capacity is arranged under the driver's seat.

COOLING SYSTEM.

A Whitlock cellular radiator is carried at the front of the engine space, and has an aluminum blade fan, belt driven from the engine shaft, mounted behind it. The water is circulated through the cooling system by a sliding vane pump on the forward end of the crank shaft. The water from the pump enters the jacket between the inlet and exhaust valves and leaves the jackets on the opposite side of the cylinders, at the highest point. Inlet and outlet connections are, therefore, almost at the same level. The water connections consist of brass pipe fittings, and the usual length of hose pipe at the inlet and outlet to the radiator is not omitted. The exhaust manifold bolts to the valve boxes at an angle of 45 degrees, and connects through a curved and a straight pipe with the muffler located toward the rear of the frame. The starting crank, when not in use, is held in a sheet brass spring clip pivotally supported on a steel bar connecting the side frames in front of the radiator, this steel bar also carrying a bearing hanger for the starting shaft. A sheet metal dust pan is secured to the crank case of the engine on both sides and to the side frames. All of the cylinder compression cocks are connected by a link mechanism, and can be opened simultaneously from the front of the car by means of a rod with looped end underneath the radiator. In starting a large engine like the present one, it is, of course, very desirable to relieve the compression in the cylinders, as otherwise a very considerable effort is required.



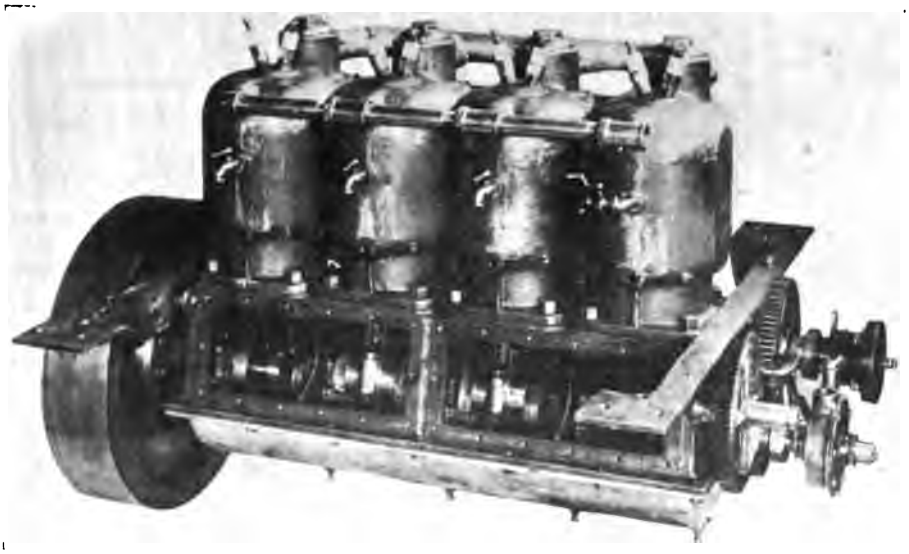
PLAN VIEW OF AUSTIN MODEL LX CHASSIS.

DOUBLE IGNITION SYSTEM.

Ignition is by jump spark, and two entirely independent ignition systems are provided. The two sets of spark plugs are both screwed at an angle into the plugs closing the central openings in the cylinder heads. A Remy high tension magneto is carried on a support bolted to the right hand side frame near the front of the engine and driven from the cam gearing, as already explained. This support forms also an oil can holder. This magneto supplies current to one of the two sets of spark plugs. As an additional source of ignition current, two sets of six dry cells are carried in a box underneath the right hand frame member, either one of which can be used separately or the two simultaneously, connected in parallel. A Mos-

THE METALLIC CLUTCH.

The clutch is of the single metal disc type, and is completely enclosed, as shown by the section view herewith. Referring to the illustration, A is the flywheel which is bolted to a flange on the crank shaft. Mounted upon an H-B ball bearing on the end of the crank shaft is a hub B, to which is bolted the copper disc C. The latter may be clamped between the web of the



THE AUSTIN ENGINE.

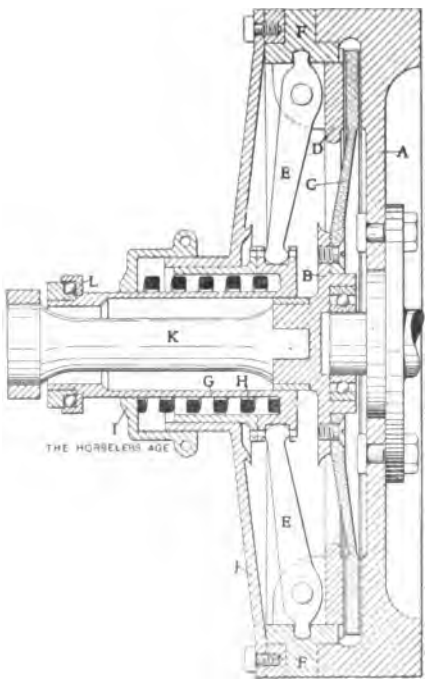
flywheel, which is properly faced off, and the face of a floating ring D, by means of a set of lever arms E E, which are fulcrumed on lugs on the floating ring D, their outer ends engaging in grooves cut in the plugs F F set into the flywheel rim, and their inner ends into a groove cut into the sliding sleeve G, which is urged in the direction of the flywheel by the heavy coiled spring H, which is entirely enclosed and can be adjusted as to its pressure by screwing the cap I more or less over the hub of the clutch cover plate J. The normal pressure of the spring is said to be 400 pounds. The clutch is completely enclosed and runs in oil, and is claimed to be particularly smooth acting. The hub or centre B has a transverse groove cut through it at its rear end, into which engages a tongue on the shaft K, which arrangement prevents straining of the parts in case of slight disalignments between the engine and gear box bearings. The clutch may be disengaged by exerting a rearward pressure against the ball bearing cup L.

SELECTIVE CHANGE GEAR SYSTEM.

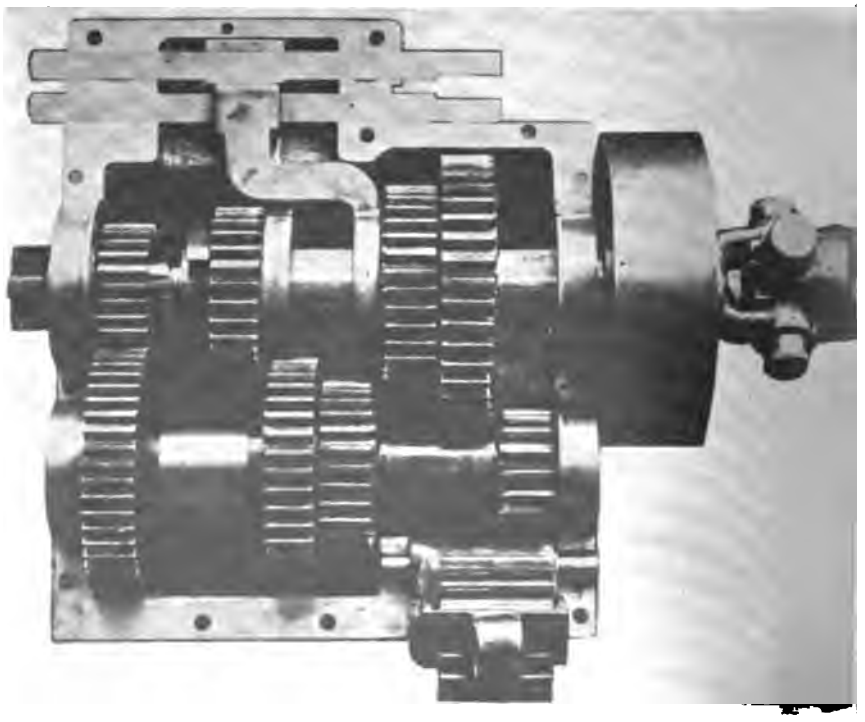
The change speed gear is of the selective sliding pinion type, and provides four forward speeds and one reverse. The gears are enclosed in a very compact aluminum box in two halves, and their shafts are mounted on H-B ball bearings. There is a large lid on top of the gear box which, when removed, gives complete access to all parts. The change gear box is hung by four supporting arms from two longitudinal angle pieces resting on cross members of the frame. The high speed forward is a direct drive. The reversing pinion is carried in a pocket bolted to the top of the gear box. The method of operating the gear differs materially from other selective operating mechanisms. The shifting lever is not moved in the direction of its fulcrum, but has an up and down movement whereby it is fastened to either one or the other of the two concentric shifting shafts which are provided with short lever arms at their outer ends carrying spring plungers for locking them in position when not in use. The shifting mechanism is also so locked with the clutch in a very simple and direct manner. Forwardly extended toothed sectors are secured to the two concentric shifting shafts, into the notches of which is adapted to engage a wedge block under the action of a coiled spring, the wedge being connected to the clutch pedal by a link, so that it is disengaged from the slot whenever the clutch is disengaged. There is one slot in each of the two sectors for every position of the gear. The reverse gear is obtained by means of a special lever moving in a transverse plane in front of the driver's seat. By pushing the main gear lever down and moving it forward, the first speed is obtained; backward, the second speed; pulling it up and moving forward, third speed; back, fourth speed. When it is desired to engage the reverse, the gear shifting lever is first moved to the neutral position.

REAR AXLE CONSTRUCTION.

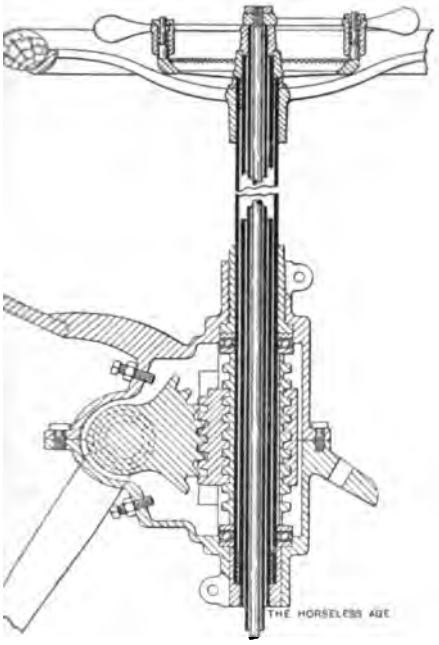
The drive to the rear axle is by a propeller shaft with two universal joints. The differential and bevel driving gears are enclosed in a cast steel housing in two halves joined in a vertical plane. Each half is cast integral with one of the rear axle tubes, the latter being provided with



AUSTIN CLUTCH.



AUSTIN CHANGE SPEED GEAR.



AUSTIN STEERING GEAR.

ur longitudinal ribs and with integral ring saddles and brake carriers. The vel gear is cut from a forged crucible el blank, with sixty-six teeth of 5 ch and 2 inches width of face. The rear le is mounted on roller bearings, which me type of bearing is also used on the ont axle. No torsion brace is used to ke up the reaction of the driving effort the rear axle. The front axle is a solid uare section forging, curved downward the centre, with Lemoine steering heads. he tie rod of the steering knuckles is in ont of the axle, and the right hand steer- g knuckle connects to the irreversible eering gear by a long rod with ball and cket joints.

STEERING GEAR.

The steering gear is of special construc- on, and a sectional view of it is shown rewith. It combines the screw and nut id rack and gear sector principles. The rew is supported by adjustable ball thrust earings at both ends, and the shaft of the ar sector is mounted in eccentric bronze ushings, by which means its mesh can be djusted. The steering mechanism is en- osed in a two-part bronze housing rigidly olted to two cross members of the frame. rom the housing extend three concentric ubes and one rod, the throttle and spark ontrol being arranged concentric with the teering post. The outer tube is the steer- ng column to which the steering hand wheel is secured. The intermediate tube arries the stationary notched wheel on which the spark and throttle levers move nd the inner tube and shaft are for the hrottle and spark timer respectively. It will be noticed that the spark and throttle levers are of unusually substantial con- truction, and are provided with spring lungers, with V shaped ends engaging into he notches on the stationary ring.

The car is fited with in ng service brakes acting rear wheels, and operated by a foot pedal. and with a contracting band clutch at the rear of the change gear box, which is operated by the side lever and is interconnected with the clutch, and self locking. Of the three pedals on the footboard, the outer one is the brake pedal, the intermediate the clutch pedal, and the inner one the muffler cut-out.

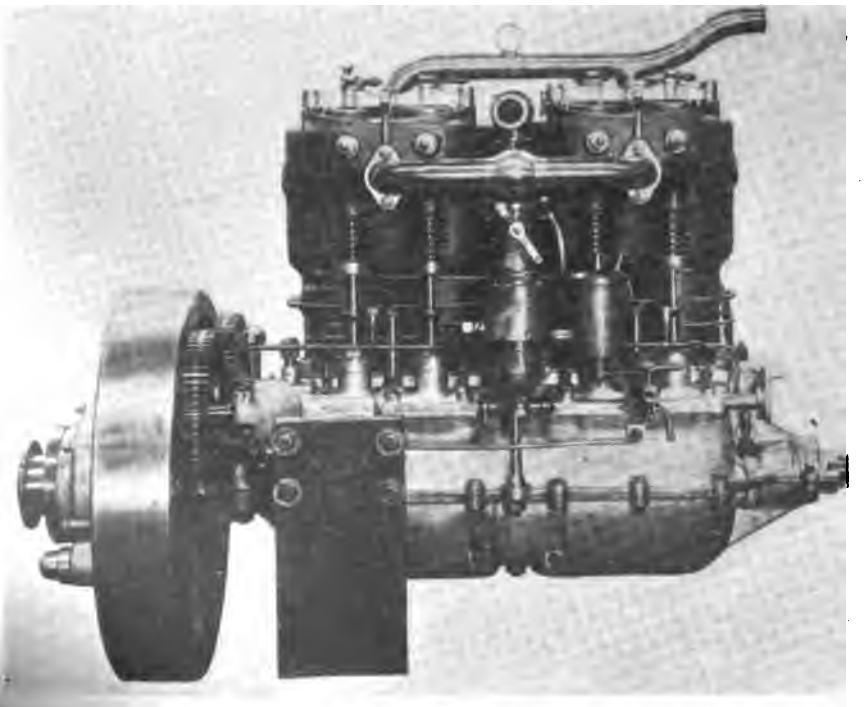
The frame of the car is constructed of angle steel, 3x3½x5-16 inches, the side members being perfectly straight but sloping toward each other toward the front, thus giving a narrow front without the necessity of weakening the frame by bends. The vehicle springs are of substantially three-quarter elliptic form, the usual spring horn being replaced with short leaf springs. The standard car has a wheel base of 109 inches and weighs 2,800 pounds. The car is fitted with the Austin spring controller, which is built on the principle of the single acting band brake and is one of the simplest forms of shock absorber in use.

The regular side entrance tonneau body accommodates five passengers, and is upholstered in brown leather. The dash of the car, which is of wood, with brass tube railing, is perfectly free from all fittings and attachments. The hood is comparatively low and broad, and provided with louvres in the side walls. The space between the continuous running boards and the frame is entirely closed by the boxes already referred to, the two on the left hand side being tool boxes, and those on the right hand side a battery and curtain box respectively. The above information was obtained by a representative of THE HORSELESS AGE at the New York agency for the Austin car, Frank A. Sanford, 1848 Broadway, where one of the cars is on view.

The Bliss 30 Horse Power Car.

The new Bliss touring car, manufactured by the E. W. Bliss Company, of Brooklyn, is designed on French lines, by a French engineer, and is avowedly an attempt to produce the highest grade of car possible at the present stage of the industry. Nickel and nickel-chrome steel are used very extensively in the construction, to the exclusion of carbon steel, but all materials used, with a few exceptions of minor importance, are of American origin. The motor is of the high compression type and fitted with a large flywheel, so that it does neither slow appreciably on any ordinary hills nor balk at changing speed on hills. The chassis is of comparatively simple and clean cut design.

The twin-shaped motor cylinders, of 4½ inches bore and 6 inches stroke, are bolted to the crank case by six bolts for each pair and have the valve chambers for inlet and exhaust on opposite sides. The walls of the cylinders and jackets are very thin, and in order to insure a sufficiently rigid foundation for the bolts holding the valve cap yokes in place, bosses are cast on the jackets where the studs screw into them, and the portion of the jacket around the bosses is stiffened by ribs. The valves are of the poppet type, with 1⅞ inch opening, and are machined from nickel steel forgings. The caps over the valves are held in place by set screws passing through yokes, one yoke for the two like valves of each cylinder pair. These yokes are held down by three studs and nuts each, one stud passing through a hole through the yoke and the other two through slots opening sideways, so that by unscrewing the set screws a turn or so the yokes can be swung around the



INLET SIDE OF BLISS ENGINE.

through the hole, and the valve

case is cast of aluminum in upper and lower, and is supthe frame by a three point susthe upper half being cast with two substantial arms at its rear end, the which rest directly upon the main and the front crank shaft bearing supported from the front cross memof the frame which is back of the ra-The crank shaft has three main which consist of slit bronze boxes clamped between the upper and lower halves of the crank chamber. The cam gearing is located at the rear of the engine and consists of a steel pinion on the crank shaft meshing with composition bronze and fibre gears on the cam shafts. The cam shafts and cams are arranged in compartments formed by troughs cast on the upper half of the crank case and removable top halves of aluminum, these compartments communicating with the interior of the crank chamber through drill holes, so that the cams are lubricated by the splash in the crank chamber, in addition to which a positive feed is provided for the cam shaft bearings in the end walls of these compartments. The cams and cam shafts are made from a single piece forging of nickel steel. At the middle of the exhaust cam shaft there is a train of enclosed gears which drives the magneto and circulating pump. The bottom half of the crank chamber is provided with two large circular hand holes slightly toward the left hand side, by removing which and the readily detachable under pan the connecting rod bearings are made accessible.

The pistons are ground to a taper, and are lapped in a special jig and not in the cylinders. They are provided with four compression rings in separate grooves at the upper end, the rings being ground to size. The wrist pin is hollow, hardened and ground, and is secured in the piston bosses by taper point set screws screwing in from the inside and locked by cotter pins. The connecting rods are nickel steel I section forgings hardened at their upper end bearings and provided with separate caps held by four bolts, and with removable bronze bushings at their lower end. The crank chamber is divided into two entirely separate compartments by the partition wall which carries the central bearing of the cam shaft.

CARBURETOR.

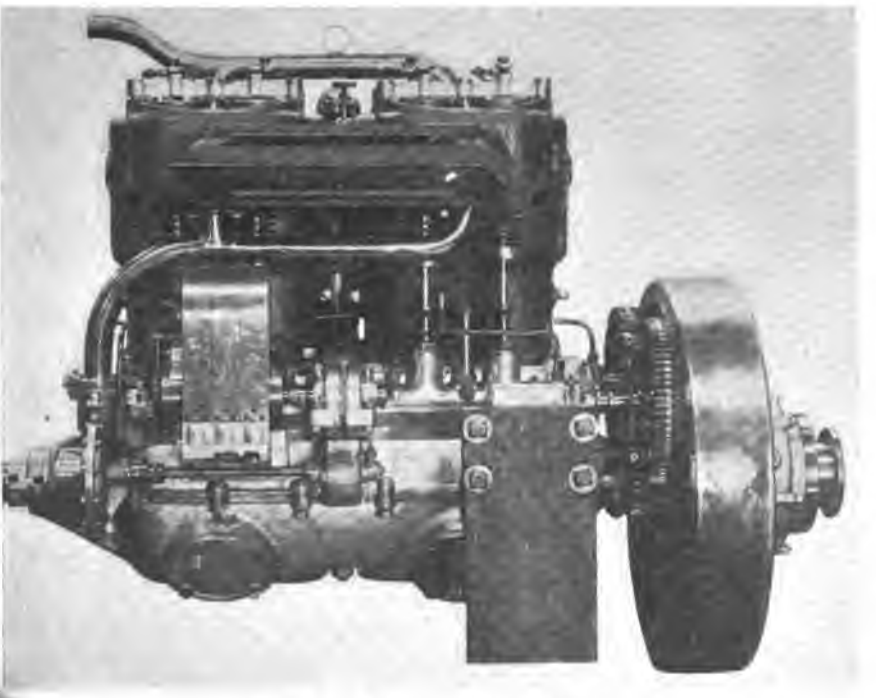
A float feed spraying carburetor is carried on the right hand side of the engine rather higher than usual, the fuel feed from the tank being by exhaust pressure. The air is taken in through a T fitting between the heads of the cylinder pairs, the opening of one branch of the T being covered with a wire gauze, and the opening of the other branch provided with a suction actuated poppet valve, which provides the compensating feature. The fuel supply is carried in a 30 gallon "Mercedes shape" copper tank underneath the frame the rear axle. The tank is two interior partition walls three compartments, addin preventing undue splashing The exhaust pressure for fe taken from the exhaust va the second cylinder from which is screwed the comb pressure regulating valve w for such pressure systems. T leading to the carburetor h it a gasoline filter containi of chamois skin, which pre particles of dirt reaching th the connection above the c cated a butterfly type throt is controlled by a finger lev ing wheel. The inlet pipe copper pipe with a single co pair of inlet valves. The t the control of a centrifuga ried on the exhaust cam sha lever on the steering wheel tor pedal. The carburetor per float which controls th gasoline by a needle valve on the float. The mixing c eted, and a portion of the diverted where it emerges der jackets, carried through jacket and added to the again where it enters the

IGNITION SYST

A double ignition system cept as to the plugs, of whi a single set. One of the so current is a high tension



REAR VIEW BLISS ENGINE, SHOWING FLYWHEEL



EXHAUST SIDE OF BLISS ENGINE

ıer make if desired) magneto carried on bracket on the engine crank case and ven by inclosed gearing, as already de-ibed. These high tension magnetos are f-contained, and the high tension leads ınect directly to the spark plugs, which this case are screwed into the side of the et valve chambers. The second source current consists of a double storage bat-y of three cells each, which in conjunc-n with a quadruple vibrator coil and a :cial timer admits of supplying ignition :rent independent of the magneto. The ıer is carried on the forward side of the sh, and is of the Bliss Company's own ınstruction. It consists of an insulating using of hard rubber, with a large hard ɔber screw plug in the centre of the front. ıe current is not carried into the timer ·ough a grounded shaft as usual, but ·ough a carbon brush bearing against a ɔnze ring. The commutating portion con-ts of a bronze brush carried on the cen-l revolving part and pressed outward by spring against four radial pin contacts ınnected to the primaries of the four coils. ıe timer is driven from the rear end of : inlet cam shaft through a double set of tre pinions and an almost vertical shaft th two universals and a sliding joint. ıis same gear serves to drive the mechan-l lubricator. The time of ignition with her source of current is controlled by a ·er on the steering wheel.

The radiator is of the flanged tube, tank-closed type, and consists of ten 5-16 inch ɔes behind one another, all surrounded by ingle flange, there being 15 of these sets of ɔes above one another. The surrounding ık has two partitions on opposite corners : water entering the tank on top, flowing rough the horizontal tubes from one com-ırtment to the other, and passing out at the ɔttom to the centrifugal pump, which ·rces it into the jackets at the bottom of e exhaust valve chambers. From the top the jackets the water returns to the top the radiator. The water connections are ɔpper tube manifolds and short lengths of exible hose. The pump consists of a two ırt aluminum case and a bronze revolving ırt, and is driven through a long shaft ith flexible joints, at a speed of 1,800 p. m. for the normal speed of the engine here is no fan behind the radiator, but the flywheel, which is 20 inches in diameter, is cast with fan-shaped spokes, and is closely surrounded by the dust pan underneath and a shield above, so that it creates a very strong draught of air through the engine space. The flywheel is keyed to a taper portion of the crank shaft. The total water capacity of the cooling system is 8 gallons.

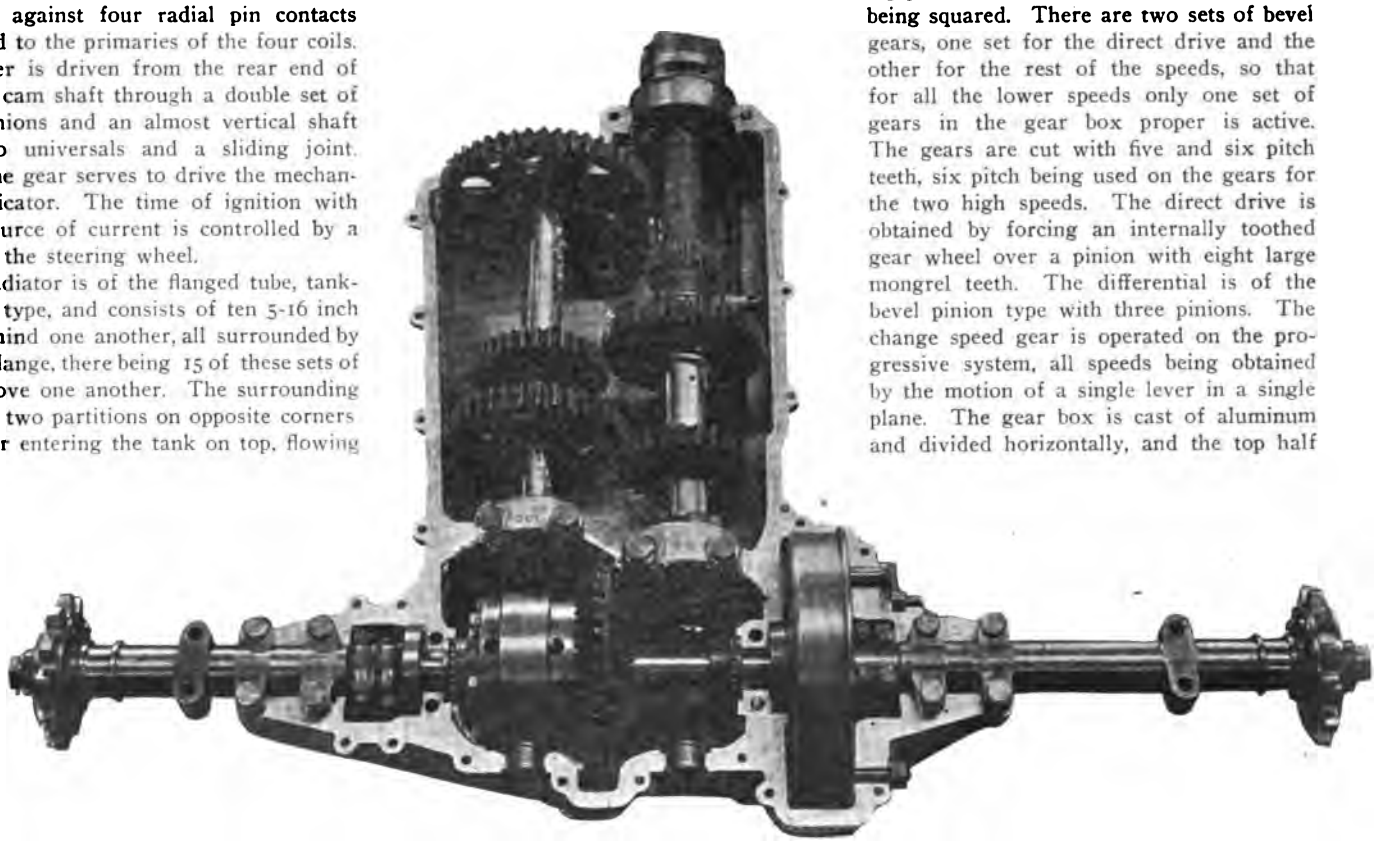
ENGINE LUBRICATION.

For the lubrication of the engine there is a seven lead Lunkenheimer mechanical lubricator secured to the rear of the dashboard. All of the feeds branch out, so that many more than seven bearings are supplied by the mechanical oiler. Two of the leads from the oiler supply the four cylinders, each feed pipe having two branches; one lead carries oil to all of the cam shaft bearings; one to all of the connecting rods, and three supply the main crank shaft bearing. The surplus oil, of course, collects in the crank chamber, and splash lubrication helps out when driving fast for long periods of time. or in mounting exceptionally long and stiff grades. The splash lubrication necessitates the provision of vent pipes for the crank chamber, one of which is screwed into the top half of each cam compartment. The circulation pump is provided with a compression grease cup.

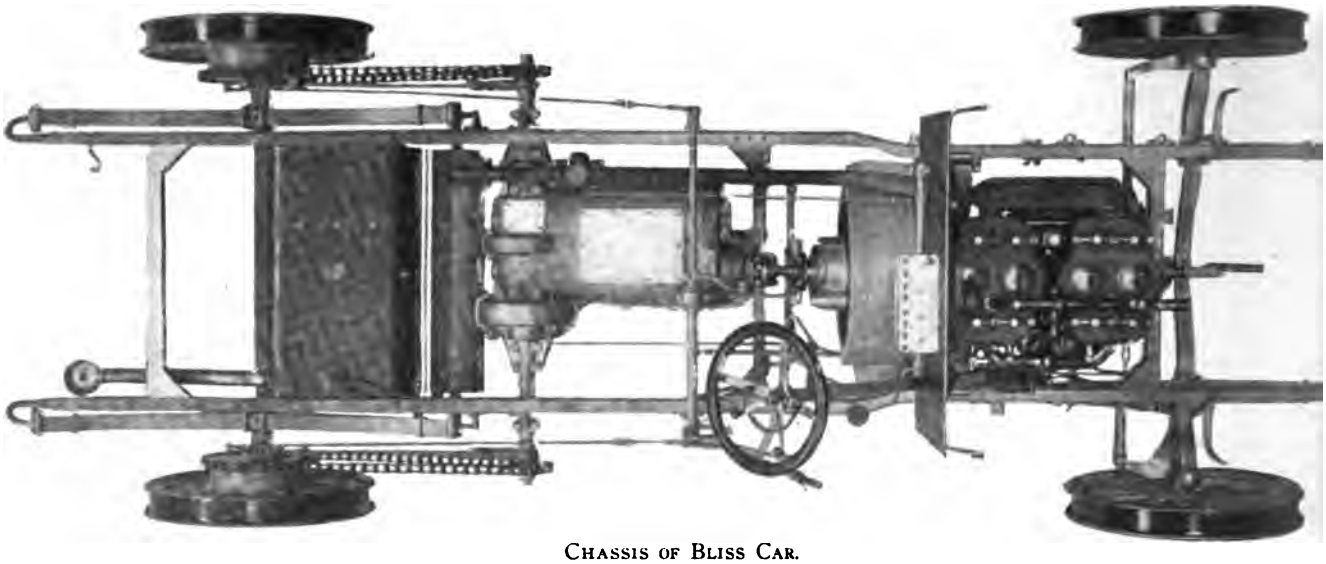
The exhaust is carried from the cylinders through an exceptionally large cast-iron manifold with eight longitudinal flanges to rapidly dissipate the heat. The muffler is located transversely of the frame just in front of the fuel tank; it is of the baffle plate type, and claimed to be extremely efficient as regards noise prevention. A muffler cut-out is inserted in the exhaust pipe, and can be actuated by a pedal convenient to the operator. The starting handle of the motor is provided with a saw-toothed ratchet with eight points.

The friction clutch is of the coiled or scroll type, the drum being 6 inches in diameter. A feature of the clutch wherein its construction differs from other similar ones is that the clutch spring is located within the clutch housing. The clutch is enclosed and operates in oil. The disengaging fork is provided with ball bearings. The flywheel is 20 inches in diameter and has a rim 4 inches wide.

The change speed gear affords four forward speeds and one reverse, as well as a direct drive on the high gear. The shafts are of special steel and mounted on H-B ball bearings. The shaft on which the sliding pinions are mounted is fluted instead of being squared. There are two sets of bevel gears, one set for the direct drive and the other for the rest of the speeds, so that for all the lower speeds only one set of gears in the gear box proper is active. The gears are cut with five and six pitch teeth, six pitch being used on the gears for the two high speeds. The direct drive is obtained by forcing an internally toothed gear wheel over a pinion with eight large mongrel teeth. The differential is of the bevel pinion type with three pinions. The change speed gear is operated on the progressive system, all speeds being obtained by the motion of a single lever in a single plane. The gear box is cast of aluminum and divided horizontally, and the top half can be removed without interfering with the gears, as is shown by the illustration. There are one large and one small hand holes in the top half, the covers of which are held in place by wing nuts. The gear box has a three point suspension—one point in front and two at the rear under the side frames. The transmission to the rear wheels is by 35 mm. pitch, 15 mm. width Brampton chains, the sprocket pinions being neatly encased to prevent interfering with entrance to the rear seat. The rear sprockets are formed integral with the hub brake drums, and are bolted with same to



BLISS GEAR BOX AND COUNTERSHAFT.

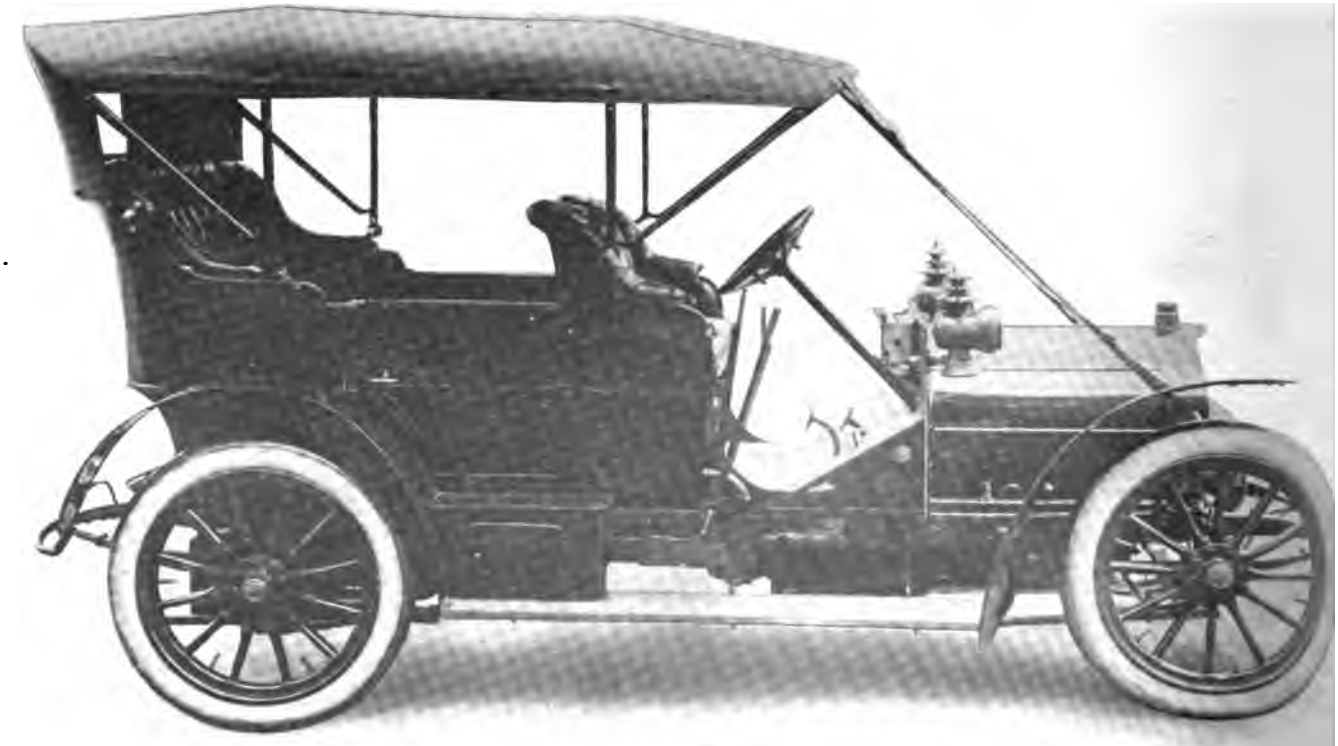


CHASSIS OF BLISS CAR.

the wheel spokes. The chain tension is regulated by distance rods between the countershaft bearing and the rear axle, just inside the sprocket wheels, a peculiarity of the distance rods being that they have vertical swivels near both ends, to relieve them of any strain in case of sideward swaying of the vehicle. The ratio of reduction from the engine to the 36 inch rear wheels on the high gear is 16 to 7. The countershaft and the road wheels are mounted on H-B ball bearings.

The frame of the car is hot pressed of 5-32 inch nickel steel stock. The side members are slightly bent inward at the dash to give a narrow front. The frame is supported upon eight leaf 40x1¼ inch semi-elliptic springs in front and ten leaf 53x2 inch springs in the rear, the latter being set out from the frame. Both front and rear axles are I section forgings and are dropped in the centre. The car has a wheel base of 116 inches and a gauge of 56 inches. The wheels are, as stated, 36 inches in diameter, and fitted with 4½ inch tires. The steering knuckles are of the inverted Elliott type, and mounted on ball thrust bearings and ball journals. The steering arms are bolted to the knuckles. The steering wheel consists of an aluminum centre with a polished mahogany rim 18 inches in diameter. The back lock gear is of the screw and nut type, and is enclosed [illegible] bronze casting in two halves divided [illegible] cally and secured to the side frame [illegible] ber. The connecting rod from the ste[illegible] gear arm to the right hand knuckle [illegible] double spring compensated ball and [illegible] joints at both ends. The tie rods [illegible] steering gear are located back of the [illegible]

The car is fitted with two indepen[illegible] brakes, the usual service brake co[illegible] sleeve of the differential and the di[illegible] rear wheel hub brakes. Both are o[illegible] internal expanding type and complete[illegible] closed, the differential brake within a [illegible] partment of the gear box. The differe[illegible] brake, which is foot actuated, is 10 in



THE BLISS CAR.

diameter, operated by a cam, and consts of a bronze expanding member in conct with a steel drum. The rear brakes e 12 inches in diameter by 2½ inches in idth, and consist of bronze sectors forced gainst the steel drum by means of a lever echanism. The rear brakes are supported a brake carrier secured to the rear axle clips, and the action of the two brakes equalized by a steel cable. The emerncy brakes are interconnected with the utch.

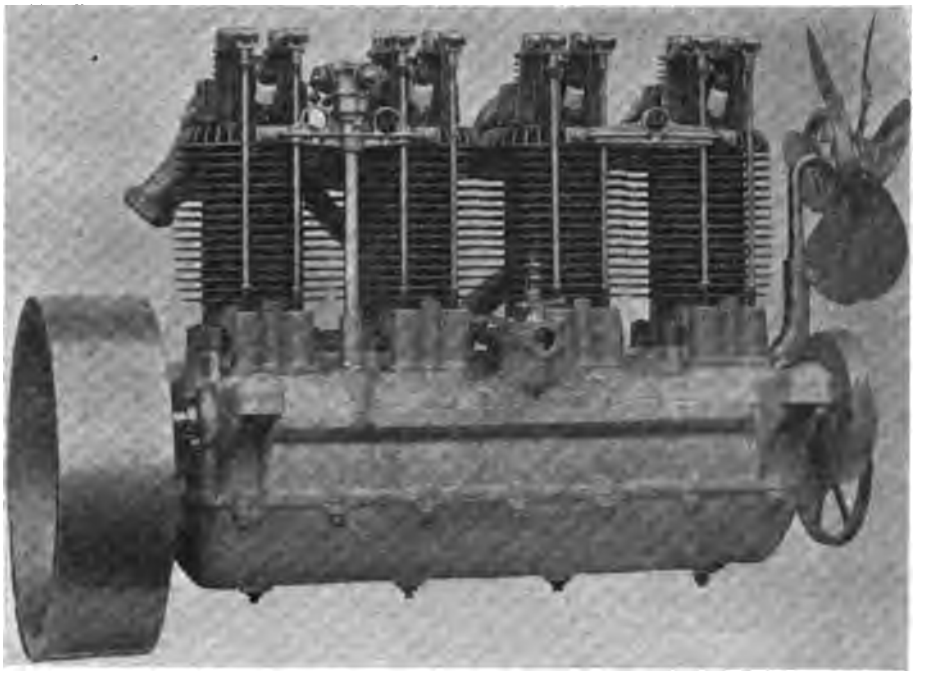
The chassis complete weighs 2,150 ounds. Demarest or Healy bodies are rnished, of any type desired by the cusmer. The car is fitted with a mahogany ish and with an aluminum hood secured four substantial spring locks. There is tool box of liberal dimensions underneath e frame in the rear. A special feature of e mechanical construction that is worth oticing is that the bearings for the brake id change gear lever shafts have a vertical unnion support in brackets riveted to the de frames, and that after removing a nut the bottom of each trunnion the shafts ith their levers can be removed integrally. he shaft of the brake and clutch pedals is milarly arranged.

The Carrico Engine.

The Speed Changing Pulley Company, of dianapolis, has been experimenting with tomobile construction for some time, and ill enter the field with a new line of parts, cluding two sizes of the air cooled enes here shown.

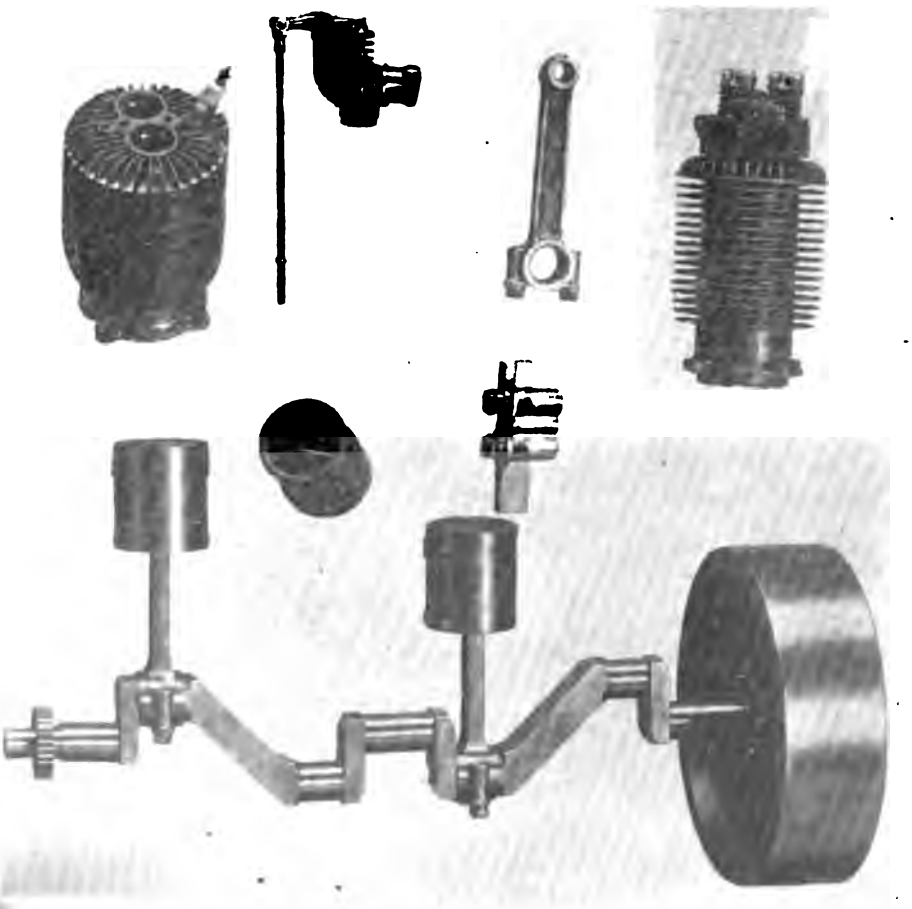
This engine was designed by F. D. Carco, and will be known as "The Carrico" gine. The only size now completed is a ur cylinder, 4 inch bore and 4 inch oke of 20-24 horse power. Its features e that the cylinders are made with no gs or projections, which the makers claim events the distortion of the cylinder by even thickness of metal. The spark plugs e placed at an angle of 30 degrees in the linder heads. The cylinder heads are ossed by 36 vertical tapering fins, each an h wide, 11-64ths of an inch thick at the se and 3-32 inch at the top. For additional radiation both exhaust and inlet valve ges, which are interchangeable, have ten rtical fins. These valve cages project into cylinder head only [illegible] inch, it is pointed out, tends to overcome pocketing of heat of the exhaust gases the cylinder head.

The cylinder [illegible] ep, evenly spaced, [illegible] h thick at the [illegible] tside. The valve cages are held in place two carbon steel bolts and jammer- e cylinders and piston [illegible] ay iron. The pistons are provided with ir rings, three above and one below the low wrist pins, the rings having a width 5-16 inch and 45° diagonal joints. The ist pins are of steel one inch outside meter and 9 [illegible] and hardened After being



THE CARRICO AIR COOLED ENGINE.

annealed and ground to size. The cylinders are rough turned within .002 of size, and after seasoning are ground. The connecting rods are I beam section drop forgings, the crank pin ends being split and fitted with removable Parsons white bronze bushings, while the wrist pin ends are fitted with phosphor bronze bushings. The crank pin end can be adjusted by means of six thin brass liners on each side, which are placed between the rod and cap, the latter being held in place by two 7-16 inch studs



SHOWING VARIOUS PARTS OF THE CARRICO ENGINE.

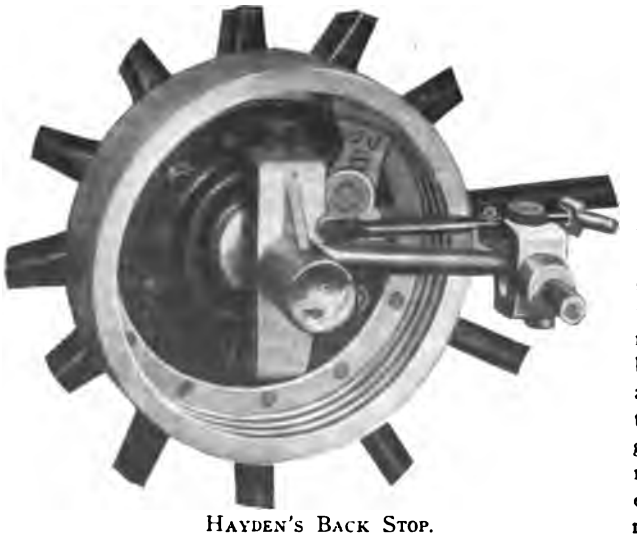
threaded into the connecting rod and riveted, and two castellated nuts. The adjustment of the connecting rod can be made through hand holes in the side of the engine without removing the lower half of crank case.

The crank shaft is of the three bearing type, with crank pins and main journals, each of 1¾ inch diameter. It is machined and hammered out of a solid bar of special steel, and has a disc of 4½ inches in diameter, to which the flywheel is bolted, forged integral with it.

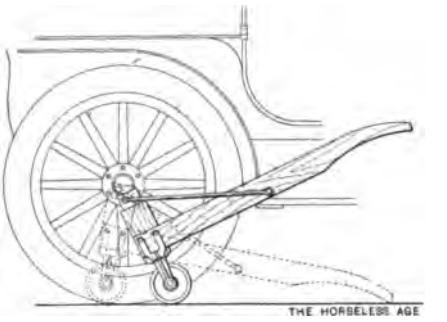
The upper half of the crank chamber is of nickel aluminum, with four hollow supporting arms cast integral with it. The three crank shaft bearings are cast integral with the upper half of the crank case. The crank shaft bearing caps are held in place by ten ½ inch bolts, two on the front engine bearing and four each on the centre and the flywheel end of the bearing. The bottom of the upper crank case is one inch below the crank shaft centre. This construction is claimed to make a very rigid case and also gives wide openings on the left side of engine to make bearing adjustments. The lower half of the crank case is an aluminum casting, and is held up to the upper crank case by ⅜ inch studs. The lower crank case is partitioned off into four compartments, and serves as an oil well, being arranged so that it can be readily removed without disturbing any adjustment of bearings.

The cam shaft and gears are placed on the right of the engine. The gears are covered by a removable aluminum case. The cam shaft is mounted on three bearings. The cams are of special steel, hardened and ground, and are mounted on the cam shaft by Woodruff keys.

The commutator is placed on a vertical shaft between the two rear cylinders, and is driven from the cam shaft by a pair of mitre gears. The commutator and vertical shaft are supported by a bronze casting, which also supports all wiring to the spark plugs and commutator. On the front end of the crank case there is cast a boss to support the fan bracket.



HAYDEN'S BACK STOP.



THE MURRAY JACK.

The Murray Automatic Jack.

The Bicycle Step Ladder Company, of 65 Randolph street, Chicago, Ill., have just brought out the Murray automatic jacks shown in the sketch herewith. They are designed for garage use only, and are supplied in sets of four, so that the car may be jacked up completely off the tires when left standing. The construction, which is perfectly evident from the sketch, is very simple, consisting of two wooden pieces secured at right angles with each other, while the shorter and vertical one carries a roller caster on its lower end. The longer serves as a handle, and when the top of the shorter is placed under a hub and the end of the longer pushed down the caster moves over the floor and the hub is raised.

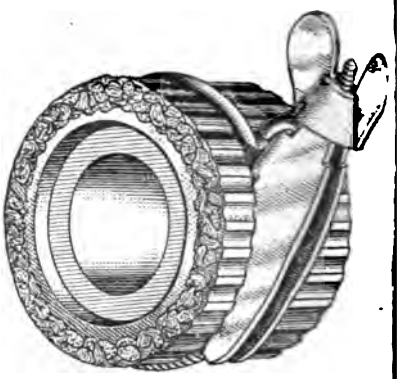
Hayden's Back Stop.

We show herewith a photograph of the back stop or sprag which is being marketed by the Hayden Automatic and Equipment Company, of 26 Cortlandt street, New York city. The operation of the device was explained in our Patents Department a few week ago. It is here shown attached to a front hub, which, according to the manufacturers, is preferable to placing it on a rear hub, for the same reason that the brakes are placed on the latter.

The pawl, which is pivoted in a bracket supported on the steering knuckle, and the outer face of which is eccentric with the point of pivoting, is held out of engagement with the inner face of the ring bolted to the wheel by means of a series of links and bell cranks which connect it with a release catch located within reach of the operator of the car. When released, the pawl is forced into engagement with the ring by a coil spring which it encloses, and its eccentric face thereby produces a wedge action, which tends to retard and eventually to stop the ring, and therefore the car. It will be noticed that it is impossible to produce a locking action while the ring is traveling in the direction given it by the forward movement of the car even though the pawl is released.

Morgan's Hose Coupling.

B. Morgan, of 86-88 John street, Newport, R. I., manufactures a hose coupling that presents the advantage that it can be used for several diameters of pipe, so that dealers need not carry as large a stock as would otherwise be necessary. The device consists of a piece of pressed brass, a steel wire and a wing nut. The brass piece has one end of the steel wire hooked to it and forms a guide for the other end and a seat for the wing nut. The nut cannot be unscrewed completely to take the coupling off the pipe, and the fitting may be regarded as in one piece, of which the parts can be mislaid or lost.



MORGAN'S HOSE COUPLING.

A New Circulating Pump.

The New York Gear Works, of Greenpoint avenue, Brooklyn, N. Y., have recently put upon the market a gear circulating pump which is said to be non-corrosive. All of the bearings are lined with anti-friction metal. The gears and shaft are of bronze and are made integral, doing away with keys and pins. The pump is designed to run at about 600 revolutions per minute, weighs 5 pounds, and is tapped for a one-half inch inlet and outlet.

The Four Cylinder Maxwell.

We are now able to give the general specifications of the four cylinder car which the Maxwell-Briscoe Motor Company, of Tarrytown, N. Y., are soon to bring out. The vertical engine, rated at 40 horse power, has cylinders 5x5 inches in dimensions. The valves are mechanically operated, and are located on opposite sides of the cylinders. A three speed sliding change gear is used in conjunction with a multiple disc clutch, and the drive to the rear axle is by propeller shaft and bevel gears.

The engine crank case and change gear box are cast integral, and are hung on the three point system, the motor having two arms at the front end, and the gear box being attached to a cross member in the frame at the rear. The thermo-siphon system of cooling water circulation is employed. The car has a wheel base of 110 inches, 32x4 inch wheels and a double set of brakes, both acting on the rear wheels. It weighs about 2,350 pounds.

COMMUNICATIONS.

The Attitude of the Agricultural Press Toward Automobilists.

Editor HORSELESS AGE:

I enclose herewith two clippings, one from the *American Agriculturist* and the other from the *Farm Journal*, and it seems to me that they show a state of affairs which should be recognized by the automobile trade papers, to the end that automobile owners and operators should be made to realize that they owe some respect to the rights of other users of the highways.

The clippings I enclose are only two in number, but they are fairly representative of what is appearing in other agricultural papers, and it is quite apparent that a determined effort is being made by the agricultural press to create legislation unfavorable to automobile operators. The *Agriculturist* is said to have a circulation of over 85,000 and the *Farm Journal* of over 500,000. It seems to me that the automobile papers should get together and agree upon some line of action that will impress upon their readers the vital importance of so conducting themselves as to give no cause for complaint to drivers of horses. Of course this should not be necessary, but I am very much afraid that it is necessary if we would continue to enjoy the use of the highways with our machines.

FRANK R. MILLER.

The clipping from the *American Agriculturist* follows:

FARMERS AND THE AUTOMOBILE.

That this new comer, the wild, untamed automobile is to be civilized, brought under proper restraint and yet granted a square deal and a fair share of the rights of the road, is being shown by the practical work being done by the grange and other farmers' organizations. The following action has just been taken in New Jersey: We, the Princeton Agricultural Association, representing the counties of Mercer, Middlesex and Somerset, N. J., in meeting assembled, do declare ourselves opposed to the dangers of the reckless running of automobiles and the utter disregard of the rights of the traveling public; and, whereas, the present law is daily and hourly violated by reason of its lenient provisions,

Resolved, that we do declare it to be our judgment that automobiles should not be allowed to run faster than 15 miles per hour in the country, and not more than 10 miles per hour in the municipalities of this State, except in such highways as may be designated by the proper officials. And that all owners of aut[illegible]om without the State should p[illegible]ordance to the size of [illegible] to $100 per year, for the mainte[illegible]

the statutes should provide imprisonment and the revocation of license for violations of the law in accordance with the violation; that any person or persons shall have the right to make arrests, without warrants, who shall immediately take the offenders before a justice of the peace or other officer of the law, who shall have power to detain him and the machine until justice is satisfied. Be it further resolved that this resolution be spread upon our minutes and a copy presented to the next General Assembly of this State.

The clipping from the *Farm Journal* contained a number of paragraphs of which the two here given are characteristic:

"Writes a Massachusetts subscriber: 'I am glad that you are looking after the automobile fiends. I live on a fine State road, and as the auto fiends now are acting it will soon be of no value to footmen and owners of teams. Thirty per cent. of the machines which pass my home pay no attention to the law and disregard the rights of others. Now this is all wrong. A petty fine amounts to nothing. Something must be done to make these lawbreakers cease to thus impose upon the rest of the community. W. W. D.'"

"Oh, yes, we know that there are some users of automobiles who are gentlemen, and are considerate and careful; but alternating with them is the reckless road hog, and it is he that is doing the mischief. But both classes are on the same side where laws are to be considered designed for the protection of the public highways—they both want privileges that ought not to be granted, and which in justice cannot be granted.

"The good but thoughtless autoist helps to secure the passage of inadequate laws that the bad autoist persistently breaks. We say again, brethren of the farm, organize highway protective associations and fight this evil until our roads are safe for those who have the care and expense of them, to come and go at all hours of the day and night, and from year end to year end."

A Landholding Motorist's Attitude Toward the Frelinghuysen Bill.

Editor HORSELESS AGE:

I beg to enclose copy of letter sent to the Governor (of New Jersey) in regard to the proposed automobile law.

BOLTON HALL.

Governor Stokes, Trenton, N. J.:

MY DEAR SIR—The New York *Times* says that Senator Frelinghuysen is to introduce a bill, of which you approve, taxing automobiles according to their horse power.

I am a large holder of real estate, owning altogether more than 2,000 suburban lots in New Jersey, and I have kept an automobile there for my pleasure and convenience.

I was induced to buy the lots through a tour through New Jersey, but if this bill should become a law I should take my au-

Cedarhurst, L. I.

I am aware that the State of New Jersey would survive the loss of my automobile, but I am sure that I represent thousands of others, and I have spent in New Jersey upon that same automobile at least $250. I think that that would be poorly compensated for by an annual tax of $15 for the same.

It may well be that the check to the increasing values of land due to opening up through automobiles might be a relief to some of the natives of the State, but they do not look at it that way.

I am yours respectfully,

(Signed) BOLTON HALL.

Calls It Class Legislation.

Editor HORSELESS AGE:

Mr. L'Hommedieu, of the Assembly branch of the State Legislature, proposes again to collect tribute by laws from a certain class of people who use the public highways. It is stated that the strong and growing sentiment for improved roads is due to agitation produced by automobilists. If this be so, then instead of being taxed separately they should be pensioned, for any class of men who are responsible for a changed sentiment on the public roads question, which has been practically dormant for centuries, deserves favorable consideration.

In the county where the writer resides the people congratulate themselves that they have just witnessed the abolition of the last "toll gate." We are hardly adjusted to the new condition of toll exemption when along comes Mr. L'Hommedieu with a proposition to tax a certain class of road vehicles for State improved highways, regardless of whether or not the owner is able to reach and use such improved roadways. In our county there are no State improved highways, but if the proposed law is put into effect there is nothing to prevent a resident after a hard day's work on the farm from giving the crank a twist, jumping in, running about 100 miles, getting on a State improved section and taking a spin on smooth bottom. Why not erect toll gates on the improved highways, and thus collect tribute only from the actual user, and likewise exempt the poor unfortunate who does not happen to be richly favored by close proximity?

The idea of individual tax for use of roads is not new in the western hemisphere. The good old, wideawake, progressive Spaniard brought it over centuries ago. When he arrived in Cuba he killed the natives, put a wheel tax of $1.50 into effect, collected the revenues, was rich and happy, and took things easy. The wheel tax is yet in force in Havana. Why not a wheel tax in the State of New York? It would be much more handy than the old toll gate, just abolished, and reach the bicycle rider and the fellow who pushes a wheelbarrow on the highway.

The 40,000 owners of motor cars in the State of New York are principally the city rich. The plain people of the country have

been saving money, and are just about to purchase modest machines. They are about to give the automobile industry a greater boom than it ever has yet enjoyed, when the proposition is made to impose a State tax. If put into effect the revolution in road travel will receive a severe shock, and the hands on the face of progress will unfortunately be turned sharply backward.

SPARK PLUG.

A Call for the Two Cylinder, Two Cycle Runabout.

Editor HORSELESS AGE:

There are certain features of automobile construction on which the users' views are worthy of notice. This is especially true of the runabout, that great convenience which eventually will be used by a majority of the people. As now made this class of car is usually too heavy. The tire expense is of more importance than anything else, and the weight should, therefore, be reduced. To do this the engine should be simplified as much as possible.

The two cycle engine and air cooling have both proved successful, and for a runabout an air cooled engine can be made with comparatively small cylinders, and yet have plenty of power. The heavy flywheel, necessary with a single cylinder, is only dead weight. This weight should be in the cylinders, where it will help to produce a more constant torque; not necessarily four cycle cylinders with their complicated valves, but two cycle, air cooled cylinders, which it seems to me could be made at very much less expense. The cylinders might be cooled by copper flanges similar in shape to those on radiator tubes; and, as the expansion of copper is greater than that of iron, each flange should be held on by an iron ring or hoop driven or shrunk over that portion of the flange which is against the cylinder. This method is not patented, I believe, and I do not wish it to be. I venture to make these suggestions for the reason that users should, I think, have a little to say in regard to construction of cars.

DR. R. B. W.

A Two Cycle, Air Cooled Ideal.

Editor HORSELESS AGE:

For some time I used one of the best of the American two passenger gasoline cars. I attended to the car myself, and during the year I kept it had no trouble of any moment. I was, however, surprised at the seemingly useless complication of this little car, and though it had but two cylinders and was one of the simplest made, I fancied that the motor car of the future must and would be simpler.

I have watched for a car of about the type I have had in mind from the first, and am glad to note that it promises to come into greater prominence this year.

The car of the future will, in my opinion, be equipped with a two cycle, four cylinder, air cooled motor. Doing away with the valves, cams, etc., will do away with that noise that has seemed a necessary attendant with the air cooled cars, and there can be no question that, everything else being equal, the dropping of the pump, water, radiator, etc., will be most acceptable. It is my opinion that with such a car it would only be necessary to have two gears, the low to be used in starting and in cases of emergency. Possibly two cycle automobile motors will eventually be made reversible, and no reverse gear will then be necessary. This car will be driven by enclosed propeller shaft, and will have a clutch with a spring driving medium incorporated in it.

The average buyer wants simplicity, and if the type of car I mention were shown him, and he were convinced it would do the work, no other type yet dreamed of could compete with it.

COLEMAN YOUNG.



MR. HINMAN'S HOME MADE CAR.

Solid Tires and a Peculiar Spring Suspension.

Editor HORSELESS AGE:

I am sending you a photograph of my new machine. It has a wheel base of 108 inches; 30 inch wheels and 3 inch solid tires. The frame is made of 2½x⅜ angle iron; all bearings are of the roller type. The engine is a double opposed Brennan, and is rated at 16 horse power.

There are a few special features that I wish to call your attention to. In the first place motor wagon builders claim it is impossible to use solid tires, as the vibration will rattle the engine to pieces. With a suitable set of springs such as I had made for me, which are of a special design, that trouble is entirely overcome. The springs are of the full elliptic pattern, but of a different shape from the ordinary ones. Instead of the springs lengthening out when under load, both the top and bottom l work with an up and down motion same time, and the spring remains the length. The shape of these springs seen in the photograph.

The control of the car is very simple lever on one side gives the two forward while the reverse is obtain pedal. The machine weighs 1,670 p and can travel 35 miles per hour.

JAY A. HINM

Compression and Motor Spe

Editor HORSELESS AGE:

I am now trying to get time to reading and digesting your Engine Number. It requires considerable t to understand some of the articles, esp for a man who has not had a technica cation along those lines. The article compression have interested me great do not seem to be definite enough. It be that the variable elements are so m that it is hard to be more so, but I s like to know what the average results and then I could judge a little better what my engine is doing. I see from Engineering Number that, according t table for estimating compression values, engine (Franklin, type E) ought to ha very high compression, about 84 pou after deducting the atmospheric press This, I think, is too high. Could you me what it ought to be? My cylin are 3¾ inch bore and stroke, with inch clearance. Also, I find in article by Morris A. Hall that he timates the Franklin engine, such mine, to run at a speed of 1,800 revolu per minute. I think this is altogether high. I am of the opinion that the speed not over 1,200. Can you give me any formation? With the regular formula estimating horse power which I use, it

00 revolutions the engine gives the rated rse power of 12 brake, at 1,800 revolutions it rises to nearly 18 horse power. is I know is too much.

I am informed that in designing this gine the passages leading to the inlet lves are so constructed as to not allow e engine to run at a greater speed than 00. Is this true? I get this from an gineering journal which recently gave a scription of this engine. That seems to one of the secrets of the air cooling oposition, as worked out by recent degners: Increase the cylinder capacity in der to give the required horse power at low rate of speed, and thus make it easier get rid of the superabundant heat. If is is correct, said engine ought not to be ted by Mr. Hall as it is. Please give me hat light you can upon this question.

E. H. VAN PATTEN.

[The following is a reply to the above ieries by John Wilkinson, chief engineer the H. H. Franklin Manufacturing Comany:

Our type E engine is 3¼x3¼ inch, and, ccording to the adiabatic equation for the ompression of gases in a non-conducting ylinder, would give a gauge pressure of bout 70 pounds in this engine, proided the charge at the commencement of he compression was at atmospheric pressure.

As a matter of fact, one of these engines ormally at our factory has a gauge ompression of 62 pounds. The differnce between 62 and 70 is due principally o the loss of heating in the cylinder wall. nd partly to the unavoidable leakages. The ngine will safely run on the road up to a peed of 2,000 revolutions on the high gear f the car. It will give under the best conitions 12 horse power at 1,200 revolutions, nd reaches its maximum horse power beween 1,600 and 1,700 revolutions. Its maxnum torque is reached somewhere at bout 1,200 revolutions. Would say, the ormula that would give a gauge compresion of 84 pounds with this engine is entirey wrong.

We know of only one correct formula or the compression of gases, namely, the diabatic one of

$$\frac{P}{P^1} = \frac{(V)^\gamma}{(V^1)}$$

Compression.

Editor HORSELESS AGE:

On page 190 of your last issue I am uoted by a correspondent as saying that we may in the absence of actual measureents calculate compression by using the xponent 1.41." A second glance at ny article on page 44, January 10, will how that this statement is merely part of quotation from Wood. I do not advise he use of the exponent 1.41 for anything ut pure air, compressed adiabatically, as vill be noted in my article.

The results to be obtained from the ower curve, Fig. 2, page 44, and from the formula immediately below are not, as might be supposed from the editorial on page 46, purely theoretical. The exponent used was obtained from indicator cards of actual engines, and it is gratifying to note that Mr. Poole has obtained practically the same exponent by measuring a large number of cards.

By comparing the results obtained from the curve, Fig. 2, with those in the accompanying table, from Hiscox's "Gas, Gasoline and Oil Engines" (page 86), it will be seen that the results agree very closely with actual measurements:

Per Cent. Clearance.	Approximate Compression from 18 lbs. abs. Lbs. per sq. in. abs.
.50	57
.444	65
.40	70
.363	77
.333	84
.285	102
.25	114

As to the initial pressure in the cylinder, which seems to be causing so much anxiety, it is not difficult to get a rough idea of what this would be in any case by examining a few indicator cards. In a certain engine running at 240 r. p. m., with mechanical inlet, I found the initial pressure to be 4 pounds less than atmospheric. With high speeds and automatic valves, the initial pressure would certainly be much less, so that the compression is not always what it is supposed to be.

An article headed "Compression" in your last number (page 190) is another example of the apparently widespread tendency to calculate compression on the assumption that it is isothermal. This is a sad mistake, and the sooner it is weeded out of people's minds the better.

If Mr. Otis realizes the importance of compression, he certainly ought to realize the importance of giving correct information to the readers of THE HORSELESS AGE. It would seem advisable in future for the editor to make some comment on errors of this kind to prevent people from being misled.

L. E. FRENCH.

Coil Adjustment.

Editor HORSELESS AGE:

Will you please give detailed directions as to the accurate adjustment of a spark coil on a single cylinder engine? Every autoist knows the widely different methods of adjustment employed by so called auto experts. I have personally had six different directions given me; each one claimed to be correct. Furthermore, almost all garage men pay no attention to the tension adjustment of the vibrating blade, but depend solely on the screw which regulates the distance from the soft iron disc on the vibrator to the magnet in the centre of the coil, whereas the tension is most important.

What are the conditions to be obtained, and how do you actually have the correct adjustment? Your reply will benefit many.

E. H. BALDWIN.

[There are quite a number of different constructions of vibrators, and these require naturally different methods of adjustment. Moreover, "there are more ways of killing a cat than one," and even with the same type of vibrator you may obtain the proper adjustment by different procedures. This may explain why you have been recommended different methods. The conditions aimed at are evidently (1) that ignition occurs regularly; in other words, that every charge is fired; (2) that this is accomplished with a minimum current consumption. The tension of the spring determines the current consumption and must therefore be varied to arrive at the most economical adjustment. To properly adjust a coil to run on as small a current as possible it is desirable to have an amperemeter which can be inserted in circuit with the coil. The best method of adjusting a vibrator is undoubtedly to first connect the coil to the battery continuously, that is, without the engine running, and adjust the tension of the spring till it vibrates rapidly and uniformly. This may not be very definite, but more tension does not matter, the object being simply to have the coil give a good strong spark when the engine is started. Upon starting the engine, if everything else is in order, the charge will probably be fired regularly, and if this is the case, decrease the tension of the spring as much as possible without interfering with the regular explosions. If an ammeter were in circuit you would notice the current consumption decreasing as the spring tension is lessened. The voltage induced in the secondary of the coil depends upon the current flowing, and as high compression engines require a greater voltage or a more powerful spark than low compression engines, the adjustment must depend somewhat on the engine.

We have written to a number of coil makers for their instructions regarding the adjustment of their vibrators. The Connecticut Telephone and Electric Company say:

"The vibrators are adjusted to consume from .35 to .4 of an ampere of current on a closed circuit, that is, running continuously with the battery connected to the coil. When the engine is running, and the coil is therefore working intermittently, the current consumption will be about half of this amount, or not over one-quarter of an ampere. This consumption of current should be sufficient to take care of the highest compression engine, and if you have any trouble in firing your engine perfectly on, say, not to exceed one-half ampere of current, you should look to your plugs and wiring to make sure they do not leak. In adjusting this coil screwing down on the vibrator tension screw, which is the large knurled thumbscrew at the back of the coil, increases the tension on the vibrator spring, which in turn increases the amount of current passing through the coil. Loos-

ening the screws causes the reverse action. In ordinary practice on the average car it should not be necessary to touch the adjustments for a whole season; but when it is necessary to clean the points or readjust the coil, it should always be done by means of a Connecticut coil current indicator, placed in the circuit, which will show you exactly how much current is passing through your coil."

The Auto Coil Company say, in regard to their compound vibrator:

"When a new contact screw O is inserted, screw it down far enough so as to bring the armature as close as possible to the end of the core, but not too close to prevent the primary circuit being opened at the contacts; the contacts should open one-thirty-second of an inch before the armature strikes the core.

"For engines of low compression, the tension of the trembler should be light, as very little current is required for firing. The tension at the platinum contacts can be made very light if tension screw J is turned to the left. For engines of high compression more tension is given to the trembler by turning the screw J to the right; the right tension being found by experience.

"For low compression engines this vibrator when used in connection with four or five dry cells will give a satisfactory spark when the coil is drawing from 25-100ths to 4-10ths of an ampere, but for engines of high compression the current consumption will be usually found somewhere between 6-10ths and 12-10ths, depending on the make of the engine, the speed and the compression.

"Frequently the adjusting screw J is turned down twice as far as necessary for proper ignition, and this simply means something like double the battery consumption and a quick burning away of the platinum-iridium contacts. If the tension is set right by means of the screw J, that is, just far enough down for proper firing, the contact points should not require filing until the car has been run several thousand miles."—Ed.]

Who Makes This Tire Covering?

Editor Horseless Age:

Some time ago I received a circular showing a covering to go on the outside of automobile tires, the name of the covering being "Nomrah." I have mislaid this circular, and would like to inquire if you can tell me the name of the firm who manufactures same. H. O. Hyatt.

[We shall gladly forward reply.—Ed.]

Lift of Valves.

Editor Horseless Age:

I have a four cylinder air cooled automobile engine with cylinders 3¼×3¼ inches. The intake valves are 1⅛ inches in diameter, but the lifts are not equal. Will you please tell me what you think the lifts ought to be? Also, should not all lifts be alike? The exhausts I can set all alike, as they are worked with a cam motion.

S. I. Fries.

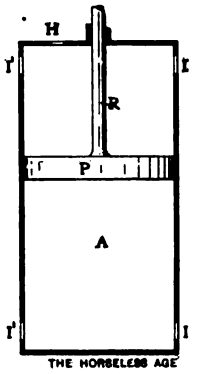
[The lifts ought to be about ¼ inch, provided 1⅛ inches is the clear diameter of the valve or the diameter of the port. The lifts of all inlet valves ought to be alike.—Ed.]

Queries.

Editor Horseless Age:

Why is it considered wise that coachmen should sit so that, by turning, they can see behind the carriage they drive, while on most automobiles the driver's seat is so low that it is impossible for him to see behind the vehicle he drives?

Why would not an air cylinder like a door check make an excellent shock absorber for automobiles? In the sketch herewith P is the piston, R the piston rod; I¹ are valves to allow air to enter,



A Spring Check Suggestion.

but not to leave the spaces in cylinder; I I are the inlets, which are closed until the piston opens the valve, when the compressed air is allowed to pass around the piston. Cortlandt de P. Field.

[We presume the reason automobile drivers do not demand a seat so placed that they can see behind their vehicle is that they do not intend to allow anybody to overtake them on the road. A shock absorber similar to the one you describe is already on the market.—Ed.]

What Car Is It?

Editor Horseless Age:

Will you please advise me who makes an automobile of the following general specifications, viz.:

Double opposed horizontal engine in front, of 20 horse power, with vertical valves.

Shaft drive, planetary transmission, detachable tonneau.

The chief consideration is the position of the valves, for in my experience a horizontal working valve is wrong; it wears badly on lower side. R. L. Selden.

[We do not recognize the car from the description given. We will gladly forward replies.—Ed.]

It is rumored that Percy Pierce, winner of the Glidden Trophy in 1905, is to enter the European contests next summer.

Manufacture of Non-Skidding Tire Bands.

Following is the method of manufacture of steel studded leather tire bands employed by one prominent English manufacturer of such bands:

The hides, as soon as they are received are washed for some period in running water to cleanse them. Then the best part only is cut out, for the purpose we are dealing with. This is termed the "butt," the flanks and other parts rejected being used for various purposes. The hide then being trimmed into its proper shape goes into lime water baths of various degrees of strength, where it remains at least four days, and when this process is complete the hair is very easily scraped off. It is then again thoroughly washed, and after going through a delicate process to clear off the vestiges of impurity (a bath of bran and water being the last) it emerges looking very much like a large pile of tripe.

Now comes the most important part of the manufacture. The hide goes into huge vats, where it is churned up with salts of chromium for sixty hours. Coming out it is found to be both water resisting and very supple; and after being subjected to the process of "staking" or "softening," it is ready for the work required, being now technically, "chrome leather."

It is first cut into strips, wide enough to take the tread of the road. These are placed over other strips broad enough to make the whole cover, the joints of which are cleverly done with a "skiving" machine, to make the complete cover is eventually turned under the rim, where it is not much thicker than a sheet of paper. Perfect joints are necessary to build up the whole cover. It is made in a similar manner, and vulcanized.

The upper portion or tread is then riveted to the cover proper by the rivets. This is to take the grip of the road, and prevent the car slipping under any circumstances. After many trials and experiments the washers now adopted have a taper hole which fits at the bottom very tightly over the rivet itself, and the head of the latter is riveted out by hand, in order to make the perfect union between the rivet and the washer. This ensures the wearing down simultaneously of each, without any possibility of the washer coming off, and also possesses the great advantage that the surface of the band which comes against the rubber of the tire inside it is perfectly smooth.

The band is then turned inside out and receives ten coats of solution, each of which is allowed to dry. The tire to which the cover is to be affixed is inflated or rubbed its surface slightly scratched, and also solutioned. The band is then strained by main force over the tire, so as to take the "stretch" out of the leather before it comes into use on the road. The band and the tire are then vulcanized firmly together by what is known as "the cold cure" process to the rim itself, and the finishing touches given by the last workman, who makes the edge of the cover over the bead

The Chicago Show.

The Show in General.

For several weeks past painters, decorators, sculptors and artists have been busy preparing for what is the largest and most elaborate national Automobile Show ever held in Chicago, and which was thrown open to the public on Saturday, February 3.

It is really two shows in one, as both the Coliseum and First Regiment Armory had to be pressed into service, and to add available exhibition space a platform 11 feet wide and 508 feet long was built around the gallery of the Coliseum. Over 250 manufacturers of cars and accessories are represented, many of whom show several distinct cars. It is undoubtedly the largest national show of its kind ever held in this country. Very few foreign cars are shown, but practically all of the Western firms who did not exhibit at New York are represented, and nearly all of the prominent Eastern manufacturers moved their exhibits almost direct from the New York shows.

The two buildings in use are connected by a covered passage built of wood to make it weatherproof, which makes it possible to have the exhibits in both buildings without going out of doors.

The most apparent and striking feature of this year's show is the beauty and uniformity of the decorations, which are so artistically arranged that even the signs, which in the previous shows were an unsightly jumble, have been made to add to the beauty of the scene. The color scheme is of black, white and gold, with green for floors and back grounds. The scheme of decoration is the same in both buildings and is carried out to minute details. Upon entering either building the unity and harmony of the unobstructed view is very noticeable and pleasing to a visitor at previous Chicago shows.

The halls are divided into aisles by colonnades of black and gold decorated columns, surmounted by a continuous fringe of staff work in green and gold, bearing aloft multitudes of electric lights. Below the staff work is a continuous ribbon of wood stained black, and bearing in gold letters the names of each exhibiting firm. Draped below this hangs a border of yellow sateen as a background, against the folds of which are hung commanding rows of black shields bearing large gold letters which spell the names of the cars exhibited beneath. The exhibition spaces are divided by wooden rails hung with dark red curtains. The floors of each space are carpeted in dark green and edged with red, while the stairs are treated in a similar manner. The walls under the balconies are completely covered with burlap, paneled by stained wood strips, which harmonize with the mission furniture in the booths. Overhead, the girders of the roof are concealed in hangings of white, gold and green.

Commercial vehicles are much more prominent than ever before, and their makers advocate their use with an assurance which they did not have a year ago. On all sides marked advances in refinement of construction, the quality of the material used, simplicity of design and accessibility of the parts are shown. In regard to the power of stock pleasure cars, the pendulum has doubtless swung too far and must inevitably swing back, as some "runabouts" are shown with as high as 80 and 90 horse power, yet the majority of the large cars keep within the limits of 30 to 50 horse power. The ratio of total weight to horse power, which only two years back was in the neighborhood of 100 pounds to each horse power, has suddenly dropped to about 55 pounds to each horse power, while in several instances it is much lower, the figures in one case showing 1 horse power to every 26 pounds total weight.

While there is much activity inside the buildings, on the outside the streets are lined with demonstrating cars, loaded and unloaded trucks and delivery wagons. Every indication points to increased sales this season in all lines, but especially in commercial vehicles.

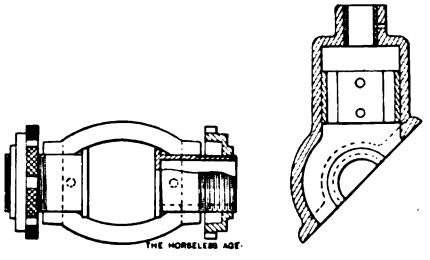
Among the Exhibitors.

Among the exhibitors are a number who were not at either show in New York and some who were who show here cars, parts or accessories that were not exhibited there. It is with these more especially that we will deal in describing the exhibits and the new things brought out here for the first time.

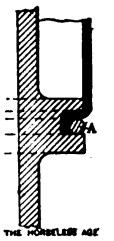
TINCHER MOTOR CAR COMPANY,

of Chicago, show two very large models for 1906. The cars are similar in details of construction; the smaller one is 50 horse power, and the large one 80 horse power. The engine has its cylinders and cylinder heads cast separately, and a copper jacket which forms its own gasket is used. The lower portion of the gasket is flanged inward into a groove cut in a ring cast integral with the cylinder. A one-eighth inch annealed copper wire is then calked into the groove by a special tool with steel rollers. The construction is shown in the accompanying sketch, in which A represents the wire before it is crushed into the groove.

In the 1906 models chrome-nickel steel is used for the gears, shafts, connecting rod, axles and the crank shaft, which is machined from a solid slab of metal and not forged. The frame is peculiar in being made of carbon steel of angle section,



TINCHER VALVE ROD GUIDE.



TINCHER COPPER JACKET JOINT.

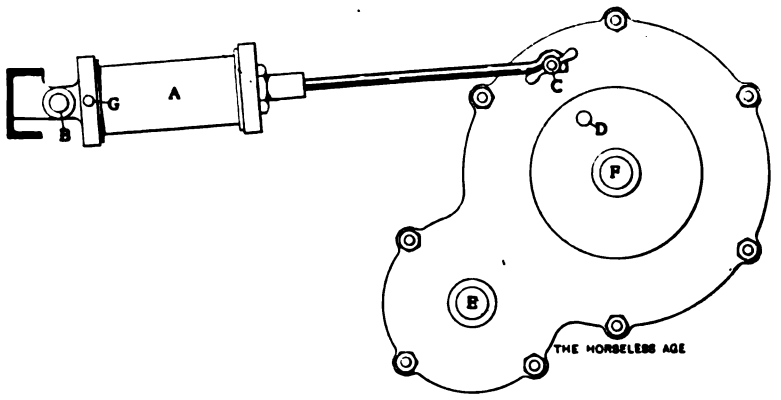
with the extreme ends formed into channel section, to which are brazed and riveted the drop forged steel spring ends. A heavy truss of channel iron arranged with a strut under the offset in the sills extends the whole length and can be tightened up by nuts at the rear.

The gear shifting lever is designed on a new form of selective system, and can be moved up and down before pushing it forward or back. For the reverse a thumb button on top is used, and all gear shifting rods are locked except the one in use. A neutral position is provided between each two speeds.

The engine case is made of aluminum, with four divisions with strong webs between, and the cam shafts are held in place by an aluminum housing, as shown in the accompanying drawing. This is split on a diagonal, and is held in position by two screw collars of brass, which fit over a slight taper. By using this construction the cam shaft may be removed, or the various cams and valve tappets inspected very readily.

THE SILENT KNIGHT CAR,

built by the Knight & Kilbourne Company, of Chicago, contains a large number of new features. The engine is entirely without poppet valves and springs. The pistons move up and down inside of a thin cast iron sleeve. These sleeves are moved in opposite directions by short connecting rods from an auxiliary shaft with 1 inch throws, run from the engine shaft by encased gears. In the sleeves are cut the port openings at the top and bottom. The inner sleeve moves with the piston, but at a slower rate of speed, while the outer sleeve moves always in the opposite direction, closing and opening the ports at the proper time. These ports are from five to six times the area of the ordinary poppet valve, and opening and closing is very rapid, as the sleeves are moving in opposite directions. A stationary head bearing ordinary piston rings projects down into the inner sleeve, and as the explosions take place between this head and the piston, it aways maintains a tight combustion chamber without the use of gaskets. The engine is supported by a cross tube at the front and rear fitted into aluminum sockets bolted to the frame. The cylinders are 4½x5½, and the engine is said to develop from 30 to 40 horse power at from 900 to 1,200 revolutions per minute. The oiling system is entirely new, and consists of four atomizing tubes projecting into the bottom of the crank case, which



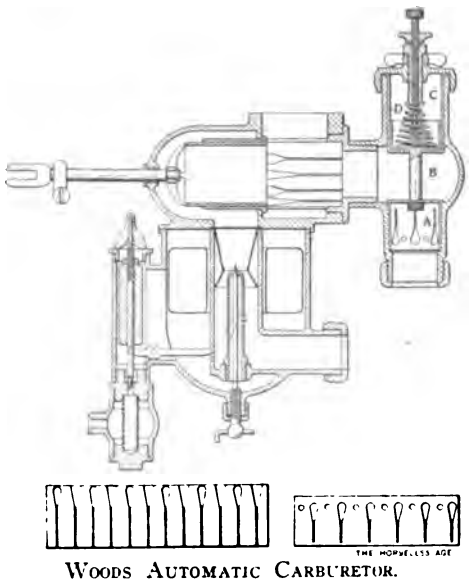
THE "SILENT KNIGHT" AIR PUMP.

is without divisions. These atomizing tubes by means of a three-way piston plunger valve, which allows the ingress of a jet of exhaust gas, inject a cloud of oil mist into the case, and thence by tubes to the transmission and differential. Oil which collects in the crank case drains down and runs into the oil tank under the bottom of the case. The piston of the three-way valve which allows the exhaust pressure to produce the spray is operated by a helical cam which can be moved from the seat by the driver to vary the number of exhaust impulses on the oil per minute. On the front, just back of the radiator, is an air pump A, which is pivoted to the side frame at B, and its plunger when not in use hooked at C and held by a thumb nut. When desired to pump the tires the end is hooked over a pin D, which pulls out and revolves around the centre F of the auxiliary shaft. A rubber tube may be connected at G. A complete description of this car will appear in an early issue of THE HORSELESS AGE.

WOODS MOTOR VEHICLE COMPANY,

of Chicago, exhibit the following line of electric and gasoline pleasure vehicles: Eight electric models consisting of broughams, landaulets, victorias, with tops and without; stanhopes and surreys. One model with three-quarter platform springs front and rear was shown finished in the natural wood and steel. These springs are a new feature, and by means of a special shackle which holds the lower half of the three-quarter elliptic rigidly to the end of the cross spring the rear axle moves only in a vertical plane, and is always maintained parallel to the front axle.

The gasoline models consisted of a touring car and a Pullman handsomely finished and fitted with speaking tubes, electric lights, signals, toilet, smoking outfit, etc. This machine seats seven in the rear and two in front, has a 120 inch wheel base and carries a 40 horse power engine. Chrome nickel steel and Hess-Bright bearings are used throughout. In the accompanying cut is shown a cross section of the carburetor, in which an auxiliary air inlet A gradually rises (so that its openings coincide with openings in the side) as the vacuum in chambers B and C increases. These chambers are interconnected by eight small channels not shown. The upper piston D being a tight fit in its cylinder, and acting against the spring, serves as a dash pot which steadies the action of the auxiliary air valve. The air inlet is entirely enclosed and the air taken up from around the exhaust is passed through a screen before it enters.



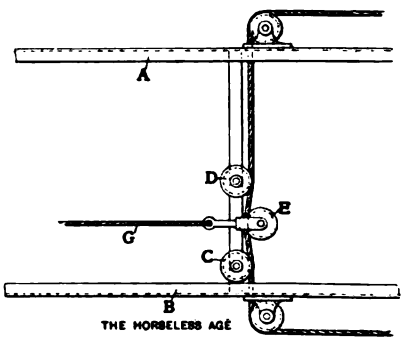
WOODS AUTOMATIC CARBURETOR.

All brakes are operated by bronze cables and interlock with the clutch by means of cams which can be quickly adjusted or thrown out completely at the option of the driver. The application of the emergency brake also throttles the engine by means of an adjustable connection. The pull of the brakes is equalized as shown in the sketch. A and B are the side frames. The pull on G operates the pulley E, which tightens the cable against stationary pulleys D and C, thus equalizing the power applied to the rear internal expanding brakes.

THE HOLSMAN AUTO COMPANY

show two models for 1906, the mechanism in each model being the same. The larger machine is a surrey, in which access to the removable rear seat is had from the back. The other is a runabout. Both of these vehicles adhere to the line adopted by this company some years ago, in that they resemble horse drawn vehicles more than the conventional motor car. The axles are solid. A 10 horse power, double opposed, air cooled motor is located lengthwise under the body. The flywheel is cast with blades for cooling the motor. The engine transmits its power to a swinging countershaft suspended below the engine in ro bearing hangers, by means of two chain one for hill climbing and the other for high speeds. By means of a side lever which moves a positive dog clutch ei sprocket may be made fast to the counter shaft.

Each end of the countershaft carries large and small deeply grooved pulley. the large pulley and a corresponding pu fastened to the spokes of the rear whe near the rim, passes the specially made ste driving cable. By using the side lever t countershaft may be swung forward, tig ening the cable in the pulleys and giv the forward motion, or swung backwa loosening the cables or releasing the engi and at the same time and with the sam motion shoes are applied to the pul grooves of each rear wheel, thus apply the brake. By a further backward mot of the countershaft, after releasing a ca on the side lever, the small countersh pulleys are made to engage the tires of rear wheels directly, thus giving the



WOODS BRAKE EQUALIZING ARRANGEMENT

verse. Ignition is by jump spark, with dr batteries. Two spark plugs are placed each cylinder, one acting as a reverse. Oi ing is by a forced feed lubricator locate under the seat.

THE WESTERN TOOL WORKS,

manufacturers of the Gale car, show two models, a single cylinder runabout and a two cylinder opposed touring car. The runabout is a reconstruction of last year's model, but the larger car is new. Both cars are fitted with the Gale tilting body, which is hinged at the rear end of the sills and easily lifted and held at any desired position, giving even freer access to the parts than an engine under the hood, so the wheels and mud guards are not in the way

The engine is 5x5 inches. The body has a roomy side entrance tonneau, which is removable and will accommodate five passengers. The two speed and reverse planetary speed change gear is of the three spur type without internal gears, and drives to the rear axle by a heavy chain. The differential is at the extreme end, which gives more road clearance at the centre, and also brings the forward sprocket and the thrust of the chain very close to the side bearings. The rear axle runs in Hyatt roller bearings

nd is provided at each end with ball thrust earings. The water tank and 16 gallon asoline tank are under the hood at the ront, and a Hill precision oiler run by hain from the engine shaft forces oil hrough the hollow crank shaft and out at he crank pin; the overflow supplies oil for he splash lubrication of the other parts. The spark and throttle control levers are nder the steering wheel. A single lever ontrols the forward speeds, while a foot ever operates the reverse. The remaining oot lever applies the contracting band rakes on the rear wheel drums made integral with the hubs.

THE RELIANCE MOTOR CAR COMPANY

how their small two cylinder opposed touring car, practically the same as last year's model, also their new two cylinder vertical wo cycle engine touring car. The engine in this model is under the hood at the front, has 5¼x5 inch cylinders, and is rated at 25-28 horse power. A three speed sliding gear is used, operated on the progressive system by a side lever. Power is transmitted through a leather faced cone clutch and universal joint to the transmission, and then by shaft to the rear axle. The engine is of the three port type, with side bypass covered by a hand hole plate. The crank cases are, of course, divided. The oiling is by a Hill precision oiler operated by an eccentric and arm from the front end of the engine shaft. Oil is forced to each cylinder and into each end of the crank shaft which then oils the crank pin bearings by centrifugal action. A grease cup is also used to force semi-fluid lubricant to each of the main bearings which have rings turned integral with them, and bearing against a shoulder to prevent leakage at the ends.

The same engine is used in the 2 ton truck which is shown, and is located in a vertical position under the driver's seat. The same type of sliding gear is also used, but the drive is through side chains to the rear wheels. The sliding gear shifting lever is on the vertical column just under the steering wheel. Spark and throttle levers are on top of the wheel on a stationary sector. There are two sets of brakes on the rear wheel drums. One is operated by a side lever and the other by a foot lever. Both of these throw out the clutch. The remaining foot pedal operates the clutch. The gasoline tank is on the back of the dash. The front springs are semi-elliptic, and the rear of the platform type. Jump spark ignition with storage battery is used on all this company's models.

THE CHICAGO PNEUMATIC TOOL COMPANY

exhibit their riveting hammers, drills, storage batteries and a four cylinder 22 horse power runabout which was designed by the vice president of the company, W. O. Duntley, and which they are now building for the use of their salesmen on the road. The cars are not for sale, and are provided for the use of the salesmen, and the company pay for all expenses of operating and upkeep. Their experience, they say, has been that the increase in the business which the salesmen are able to obtain more than pays for the expense which the firm has incurred.

The car is fitted with a four cylinder engine, 4x4½ inches stroke, three speeds and reverse, sliding gear transmission and shaft drive. The wheel base is 90 inches and the wheels 30x3½ inches. The cooling is by a Briscoe radiator and gear pump. The engine is oiled by a force feed oiler, with individual plungers to each of the four pipes which oil the cylinders and then overflow into the crank case for the splash lubrication which takes care of the rest of the engine. The Krun carburetor of their own make is used, and the Little Giant storage battery, also a product of their works, furnishes the current for a jump spark system of ignition.

THE AUBURN AUTOMOBILE COMPANY,

of Auburn, Ind., show their two cylinder opposed engine touring car, which is modeled on conventional lines. The engine is 5x5, and is rated at 24 horse power. The engine is under the body, and the gasoline and water tanks are under the hood at the front. The planetary gear gives two speeds and reverse, and is without an internal gear. The reverse is obtained by foot pedal and the forward speeds by side lever. The spark and throttle control levers are on each side of the steering post just beneath the wheel. The car is supplied with a double acting, foot operated band brake on the differential drum. The car weighs 1,750 pounds.

THE WINDSOR AUTO COMPANY

show practically the same cars as at the New York show, but with the addition of their large limousine car. The particular feature of this car is its gearless transmission, which consists of two large leather covered discs which act as a flywheel, and are fastened about one inch apart on a continuation of the engine shaft. Between these discs, on each side of the engine shaft, are two metal wheels splined onto a short shaft at right angles to the engine shaft. One wheel engages the forward disc for the forward speeds, and by slightly altering the position of the splined shaft the other wheel engages the rear disc, while the first one releases; this gives the reverse speed. The short shaft which forms the central portion of the jack shaft is flexibly connected to the ends of the jack shaft to allow of this slight motion. Either friction wheel may be moved across the face of the driving disc, thus varying the speeds.

The four cylinder engine is hung upon a hollow shaft which passes through the centre of the engine case at right angles to its length, and rests in sockets fastened to each side rail of the frame. The engine shaft is then supported in a bearing at the rear on a cross frame, which gives the power plant a three point suspension.

THE CHICAGO AUTOMOBILE MANUFACTURING COMPANY

display at their stand the complete touring car and the chassis of their new steam vehicle, which possess several new and distinctive features.

This chassis, which they equip with either a touring or limousine body, has a 114 inch wheel base, standard tread, and 34 inch wheels. The special features are the new types of springs just brought out by the Garden City Spring Company, and here exhibited for the first time, their new generator and the general arrangement of parts.

The springs are sagged low on each side of the axle and curved up sharply at the ends. No shackles are necessary, the tendency being for the axle to move up and down without disturbing the body.

The steel coil tube generator is located at the front of the car under a hood, the front of which is filled by a vertical flanged tube condenser of special construction. An aluminum fan draws air through the condenser and forces it over the top of the generator and down through cuts in the lower part of the water tank, which is in the dash, thus giving a down draft without flues. A 5 inch diameter vertical standpipe, which acts as a separator, is surrounded by five horizontal coils at the top, which are connected to each other by overflows and by six horizontal coils at the bottom, each of which is divided into four units, one end of each unit being connected to the lower end of the standpipe and the other end to the upper end or steam space from which the steam is carried across the burner for superheating and to the engine.

The flow of water into the generator is regulated by a bypass back to the tank operated by a thermostat, while the gasoline is shut off by the steam pressure at 325 pounds acting on a diaphragm regulator of the floating needle valve type, in which there is no packing.

The engine just under the footboards has four single acting cylinders set two on each side of the crank case and at 45 degrees to the horizontal. A box mounted at the rear of the engine on the same pressed steel subframe contains the change gear, giving a reduction of 7 to 1 for hills and mud, and also the water pumps and the air pump, all operated from a single eccentric. The drive usually used is direct by means of a positive clutch through shaft and bevel gears with a reduction of 3 to 1.

THE SYNNESTVEDT MACHINE COMPANY,

of Pittsburg, Pa., show at their stand their 5 ton electric truck, which is exhibited here for the first time. The drive is by a single motor spring suspended from the channel steel chassis frame, driving by side chains to the rear axle. The chain used is the Morse frictionless rocker joint, and the adjustment is maintained by radius rods pivoted to the rear axle, which allow the motor and sprockets to play up and down. The wheels and motor run on Moffett roller bearings. The standard equipment is forty cells of Universal 21 B battery, carried under the middle of the body. The motor is of the ironclad railway type, built by the manufacturers themselves. The control is patented, and consists of grouping

the eight field windings of the motor in various combinations, instead of paralleling the battery cells. By this system the battery is connected in series at all times and all cells do their proportional share of the work. It also obviates the use of any external resistance for any position of the controller, consequently all current drawn from the battery does work in the motor, and none of it is used up in heating external resistances. The mechanical features are well worked out. The outboard end of the motor shaft runs in a bearing, so that the pull of the chain comes between two bearings and not on an overhanging shaft. The steering is through a pinion and segment which operates a vertical shaft at the front of the vehicle. This shaft is connected at its lower end by means of a lever and tie rod to a forwardly projecting steering arm on the knuckle. The wheels are shod with 6 inch Firestone tires in front and 7 inch in the rear. Two brakes are provided, one on the motor shaft and one working on drums on the rear wheels, either of which is capable of holding the wagon with full load on a 10 per cent. grade, it is claimed.

THE ADAMS COMPANY,

of Dubuque, Ia., show five models of Adams-Farwell cars, two being continuations of last year's models and three are entirely new. One is the 40-50 horse power tonneau car with the new five cylinder, 5x5 inch stroke engine, and the other two have different transmissions. One is an extension front brougham. This car can be operated from either inside or outside. The other is a convertible brougham. Nothing in their exhibit is specially finished for the show, all the cars being exhibited with the standard finish. The five cylinder revolving engine is located under the rear seats, and is primed and started by a pull-up lever at the front seat. There is no starting crank. The combined brake and clutch lever is located between the front seats, and the steering column and wheel can be swung toward the centre, out of the way of anyone entering the car. This also allows either person in the front seats to operate the car. The transmission has two expanding band clutches which run in oil and allow of meshing the gears for one speed before the other speed is thrown out, so that on hills there is no danger of missing a gear shift and leaving the car helpless. The transmission case is of manganese bronze and forms the support for the engine crank shaft, which is stationary. The five cylinders revolve around the centre of this shaft. The crank pin is off centre by half the stroke, and the pistons and connecting rods rotate around this as a centre, the result being that the pistons reciprocate in the cylinders. All valves are mechanically operated in the head, and the centrifugal force helps to keep them tight if anything and does not affect their ...ing. At the bottom of each cylin... an auxiliary exhaust opened by the piston. The exhaust is directly into the air, no muffler being necessary owing to the churning effect of the air cooled cylinders. The speed is controlled by holding the valves open for a part of the compression stroke. A special timer is so arranged that not only the timing of the spark is advanced automatically as the engine speed increases, but also the length of the contact is increased. The spark is not hand controlled.

THE SOULES MOTOR CAR COMPANY,

builders of light commercial trucks, show two models, one a closed delivery wagon and the other an open wagon body with a removable top. All are fitted with two cylinder opposed engines 5½x5, rated at 22 horse power. The two speed and reverse sliding gear transmisison and the self contained leather-to-metal cone clutch are all encased and bolted to the engine, and form one piece supported at the end of each cylinder and at the rear, thus having a three point suspension. The drive is by shaft through one universal joint to the divided rear axle. The clutch is of new design, and so arranged that it gives no end thrust in either direction. The timer has a bearing on a stationary sleeve on the front of the crank case. Two small studs project from the case, and at their ends carry a piece of fibre with a metal brush, to which the wires are attached. These brushes rub on brass strips set into the timer, so that rotating the timer does not move any wires. A Hill precision oiler run by a rod from the end of the cam shaft supplies oil to the upper side of the cylinders and to the crank case and bearings. Thermal circulation is used, and two fans are placed one on each side of and above the flywhel just back of the vertical tube radiator.

THE M'CREA MOTOR TRUCK COMPANY,

of Cleveland, show only their 2,800 pound standard electric delivery wagon. They build all sizes, from an 800 pound light delivery wagon up to a 10 ton truck. They are making a specialty of their small models for very light delivery work. One is an 800 pound wagon with single Westinghouse motor, and the other a 1,500 pound with two motors, with single reduction transmission to the wheels, thus dispensing with the countershaft. They also specialize in light weight trucks. All trucks over 2 tons are equipped with hardwood or steel tires.

THE H. SARGENT MICHAELS COMPANY,

of Chicago, exhibit a 45 horse power Clement-Bayard and a modern limousine body trimmed with white broadcloth and fitted with air cushions and all the newest French devices.

RALPH TEMPLE,

of Chicago, shows the De Dietrich and Panhard cars; also the chassis of the 40-50 horse power De Dietrich, which won the Pyrenées Cup in France. Several new features are shown. The fan is supported on a vertical post, its shaft resting on a helical spring which keeps the belt always tight. The aluminum cone clutch has an exhaust fan instead of spokes.

THE LOOK ELECTRIC COMPANY

show their sparking batteries, which are manufactured in three types and of any size to order. These are provided with large vents, made as compact as possible, and fitted with a large handle. A quarter inch cushion packing is interposed between the rubber cell and the wood case to prevent breaking the rubber jar and to provide against leakage. This battery, it is claimed, can be charged quicker than any battery on the market, and also has more capacity per pound of weight, which on a gasoline machine means increased mileage. The positive and negative terminals are marked in such a way that they are always easily recognized and the marks will not rub off. The terminals are standard threaded.

THE VENTILATED CUSHION COMPANY,

of Chicago, show a complete line of their new ventilated cushions. They are arranged with long springs, and also short ones which take the weight in going over sudden bumps. Air is admitted through holes in the front, but cannot go out again, as the hole is covered by a leather which acts as a valve. The air then acts as a cushion, but is continually escaping through grommets located in place of the usual buttons.

(To be continued.)

Exhibitors in the Coliseum and First Regiment Armory.

COMPLETE CARS.

COLISEUM.

American Motor Car Company, Apperson Brothers Auto Company, Aerocar Company, Auburn Auto Company, Austin Auto Co., Autocar Co., Baker Motor Vehicle Co., the Bartholomew Co., Buick Motor Car Co., Columbus Buggy Co., Cadillac Motor Vehicle Co., Corbin Motor Vehicle Co., Chicago Pneumatic Tool Co., Chicago Auto Manufacturing Co., Detroit Auto Vehicle Co., Duryea Power Co., Dorris Motor Car Co., Electric Vehicle Co., Elmore Manufacturing Co., H. H. Franklin Manufacturing Co., Ford Motor Co., Grout Brothers Auto Co., Harrison Wagon Co., Haynes Automobile Co., Holsman Auto Co., Jackson Automobile Co., T. B. Jeffery & Co., Knox Auto Co., Locomobile Co. of America, Mitchell Motor Car Co., Maxwell-Briscoe Motor Co., Mercedes Importing Co., National Motor Vehicle Co., Northern Manufacturing Co., Nordyke & Marmon Co., Olds Motor Works, Packard Motor Car Co., Peerless Motor Car Co., Geo. N. Pierce Co., Pierce Engine Co., Pope Motor Car Co., Pope Manufacturing Co., Premier Motor Manufacturing Co., Pungs-Finch Auto and Gas Engine Co., Reliance Motor Car Co., Roy Motor Car Co., F. B. Stearns Co., J. Stevens Arms & Tool Co., St. Louis Motor Carriage Co., Studebaker Auto Co., E. R. Thomas Motor Co., Tincher Auto Co., Vehicle Equipment Co., Waltham Manufac-

g Co., Wayne Auto Co., Welch Motor
le Co., Windsor Auto Co., White Sew-
Machine Co., Winton Motor Carriage
Woods Motor Vehicle Co.

FIRST REGIMENT ARMORY.

e Adams Co., Acme Motor Car Co.,
Importing Co., American Locomotive
Co., American Motor Truck Co.,
er & Co., Buffalo Electric Carriage Co.,
eye Manufacturing Co., C. H. Blom-
n Motor Co., Berkshire Automobile Co.,
land Motor Car Co., John L. Dolson
ons, Daimler Manufacturing Co., Day-
Motor Vehicle Co., English Daimler
Knight & Kilbourne, Kansas City Mo-
Car Co., Logan Construction Co., Lozier
or Co., Oscar Lear Automobile Co.,
S. Michaels & Co., Moon Motor Car
Marion Motor Car Co., Maxwell-Bris-
Motor Co., Moline Automobile Co., Mc-
Motor Truck Co., Palais de l'Automo-
Panhard & Levassor, Reo Motor Car
Rapid Motor Vehicle Co., the Rainier
Synnestvedt Machine Co., Smith &
ley, Inc.; Soules Motor Car Co., Ralph
ple Auto Co., Western Tool Works.

ACCESSORIES.

OLISEUM GALLERY AND SECOND FLOOR.

merican Electrical Novelty and Manu-
aring Co., Atwood Manufacturing Co.,
coil Co., Aurora Automatic Machinery
Automobile Supply Co., Badger Brass
ufacturing Co., Baldwin Chain and
ufacturing Co., Beckley-Ralston Co.,
len Auto Transmission Co., Brennan
ufacturing Co., S. F. Bowser & Co.,
; Wm. H. Brown, Brown-Lipe Gear
Byrne, Kingston & Co., Cook Railway
ck Appliance Co., Chicago Battery Co.,
tinental Caoutchouc Co., Consolidated
ufacturing Co., Cullman Wheel Co.,
Automobile Supply House, Dayton
trical Manufacturing Co., R. E. Dietz
Dayton Folding Tonneau Co., Detroit
or Car Supply Co., Diamond Chain and
ufacturing Co., Diamond Rubber Co.,
ph Dixon Crucible Co., Duff Manufac-
ng Co., Westinghouse Building; Duplex
Co., Edmunds & Jones Manufacturing
Excelsior Supply Co., F. M. S. Cycle
ufacturing Co., Firestone Tire and
ber Co., Fisk Rubber Co., Gaulois Tire
G & J Tire Co., B. F. Goodrich Co.,
riel Horn Manufacturing Co., Goodyear
e and Rubber Co., Gray & Davis, the R.
Hardy Co., A. W. Harris Oil Co., Hart-
l Rubber Works Co., Hartford Suspen-
n Co., Hendee Manufacturing Co., Hine-
tt Manufacturing Co., Hyatt Roller
ring Co., Imperial Brass Manufacturing
, International A. & V. Tire Co., Jones
edometer, Knoblock-Heideman Manu-
turing Co., Limousine Carriage Manu-
turing Co., London Auto Supply Co.,
g Manufacturing Co., Madison-Kipp
ricator Co., Midvale Steel Co., Morgan
Wright, Manhattan Storage Co., Motor
Equipment Co., McCord & Co., Mc-
han Odometer and Manufacturing Co.,
tsinger Device Manufacturing Co., Na-
tional Carbon Co., N. Y. & N. J. Lubri-
cants Co., North Chicago Machine Co.,
Oliver Manufacturing Co., Pantasote
Leather Co., Pennsylvania Rubber Co.,
Pneumatic Tire Protector Co, Prest-o-Lite
Co., Railway Appliance Co, Remy Electric
Co., Rose Manufacturing Co., Samson
Leather Tire Co., Shelby Steel Tube Co.,
Sherwin-Williams Co., C. F. Splitdorf,
Umbrella Co., Spicer Universal Joint Man-
ufacturing Co., Standard Carriage Lamp
Co, Standard Oil Co., Standard Roller
Bearing Co., Steel Ball Co., Schwarz Wheel
Co., Swinehart Clincher Tire and Rubber
Co., Timken Roller Bearing Axle Co.,
Tokheim Manufacturing Co., Universal
Electric Storage Battery Co., Valentine &
Co., Veeder Manufacturing Co., Vesta Ac-
cumulator Co., Volta Battery Co., Warner
Gear Co., Warner Instrument Co., the
Webb Co., Webster Manufacturing Co.,
Wheeler Manufacturing Co., Weed Chain
Tire Grip Co., Whiteley Steel Co., Whitney
Manufacturing Co., Wray Pump and Reg-
ister Co., Adams & Elting Co., American
Lamp Co., Auto. Accessories Manufac-
turing Co., Eugene Arnstein, Baker Gear
Co., Bethlehem Steel Co., the Wm. Cramp
& Sons Co., Culver Novelty Co., Electric
Rubber Co., Gearless Transmission Co.,
Hancock Manufacturing Co., Heinze Elec-
tric Co., Hensel Storage Battery Co., the
Hotchkin Anti-Jolt Device, Hutchinson
Electric Horn Co., Hicks Speed Indicator
Co., Kinsey Manufacturing Co., Lang &
Lyon, Look Electric Co., Milwaukee Rub-
ber Works Co., Michelin Tire American
Agency, Thomas Prosser & Son, P. Reilly
& Son, Speed Changing Pulley Co., Teel
Manufacturing Co., Inc.; Turner & Fish,
Tritt Electric Co., Ventilated Cushion Co.,
Way Muffler Co.

Securing a Patent in Mexico.

To procure a patent in Mexico the party making application (unless present in person) must furnish his representative with a letter of authority (carta-poder) in Spanish, signed by himself or herself in presence of two witnesses. Ordinarily legalization by a Mexican consul is not required. It must be borne in mind that one carta-poder will not answer for several applications, as each application for either patent or trademark must be accompanied by a separate carta-poder. This must be accompanied by a full and complete description, and claims of and for the invention. If they are sent in Spanish ready for filing they must be triplicate, on clear white paper 330 by 215 mm. (approximately 13 by 18½ English inches), written with typewriter on one side only of the paper, leaving on each sheet a left hand margin of one-fourth the width of the paper. Of course if they are not sent in Spanish the local representative attends to all the details, which is by far the better way. He should be furnished with full names, profession, citizenship and residence of applicant.—*Consular Reports.*

OUR FOREIGN EXCHANGES.

Petition Against Proposed German Automobile Tax.

The German Reichstag is at present discussing a tax on automobiles, which is being strenuously opposed by the automobile interests, trade and users' organizations alike. As propositions for taxing automobiles are also "in the air" in this country at the present moment, we believe the arguments advanced against the proposed tax in a petition addressed to the Reichstag jointly by the "Imperial" Automobile Club, the Automobile Technical Association, the German Automobile Association, the German Motor Cyclists' Association and the German Automobile Manufacturers' Association, will be of interest to our readers. A translation of the petition follows:

"The undersigned humbly request that the exalted Reichstag do not grant its approval of the change in the Imperial tax law of July 14, 1900, regarding the taxing of automobiles, which has been submitted to it for consideration; gather information on the proportion of pleasure vehicles to vehicles used for practical purposes, and obtain the opinion of experts.

"Recognized by few and mistrusted by many, a revolution is taking place in our methods of transportation which as a civilizing factor does not yield in importance to the remarkable technical accomplishments of the past few decades: the substitution of mechanical for animal motive power for road locomotion. This transformation is progressing everywhere and in sharp competition in the markets of the world. It will depend upon the wise provisions of the governments and the comprehending consideration of the legislative bodies whether Germany shall assume a leading position in automobile engineering or be definitely relegated to second or third place in a branch of industry which is also of the utmost importance in connection with the national defense, as even now, in case of a mobilization, 2,000 automobiles could be requisitioned.

"German inventors have created the automobile, and yet have we been far surpassed in this industry by France, as the following figures will show. (Here follow tabulated figures of German and French automobile imports and exports which have already been published in THE HORSELESS AGE.)

"These figures show first of all the rapid growth of the automobile industry during the past two years. But it is also seen at once, in a comparison with the taxes imposed in France, that Germany, where the 5 horse power vehicle, for instance, is to be taxed two and one-half times as high as in France, has only one-fifth the foreign automobile trade of the latter country.

"From the weights and values of automo-

biles imported into Germany from 1902 to 1904, inclusive, it is seen that the average value was almost continually 9 marks per kilogram (about $1 per pound), which will probably remain the same for 1905 and 1906. But as, since 1902, automobiles have been continuously lightened in weight and become more refined in design, and the price per unit of weight has not increased, but remained the same, it follows that we are approaching constantly toward lower average prices. This becomes even more evident when it is considered that a portion of the cars in 1904 and 1905 represented a value per kilogram of 15 to 20 marks, whereas in 1902 the price per kilogram of the most expensive vehicles was hardly more than 13 to 14 marks. Consequently, as the average of 9 marks has remained unchanged, it follows that a very considerable number of vehicles were produced at an average price of less than 9 marks per kilogram.

"We are approaching the era of the low priced vehicle, i. e., the automobile in the design of which everything that smacks of luxury is avoided; in which all dead weight which tends to greater comfort in driving, but which at the same time increases the first cost and maintenance, is eliminated, and which is designed throughout with a view to making its first cost as well as its running expense so low as to render it accessible to the middle class.

"The question whether taxes on articles of luxury are justifiable from the standpoint of the political economist will not be discussed here. A luxury tax on automobiles for personal transportation must, however, be considered as irrational. Only a small proportion of automobiles serves for purposes of sport and of luxury, and the use of the great majority of cars is closely connected with attention to professional duties. The farmer and the manufacturer, the physician and the lawyer, the merchant and the tradesman, all are placing low priced automobiles in the service of their calling. How important a place is occupied by the low priced vehicle today may be judged from the following figures:

"There were occupied in the manufacture of vehicles under 10 horse power and selling at a price below 4,000 marks (about $1,000) in 1904, six, and in 1905 twenty-seven manufacturers, while in 1906, according to privately gathered figures, sixty German factories will occupy themselves with the construction or the study of the low priced automobile. Untold millions had to be invested in experiments before it became possible to reduce the operating cost of the small vehicle even 100 marks per annum, and these millions will be lost if the operating cost which is thus saved should now be replaced with a tax.

"According to the reasons advanced for the automobile tax it is to be a tax on luxury, and with this designation of a luxury tax the bill is to achieve popularity. motor car, however, does not serve :s of luxury, but the modern demand for a more rapid annihilation of space and time [time!—Ed.]. We are living in the age of traffic. The century of wireless telegraphy, of high speed railroads and of motor cars sees new traffic in all territories and on all roads. As once the steam car on iron rails began to supersede the mail coach of the good olden times, so the motor car independent of iron tracks will and must take the place of the older methods of transportation, often very limited in their possibilities.

"'In Germany a mightily developing automobile industry justifies even now the greatest expectations; the automobile movement is gaining devotees in all circles. The very large attendance at the exhibitions and the participation in the trade events demonstrate that the object in view, viz., to develop a commercial car for general application, is being recognized by constantly greater classes of the general public; nuisances in the operation of the new class of vehicles are gradually disappearing, in consequence of rational regulations issued by the proper authorities who proceeded in cooperation with experts. But now that the success of years of effort is beginning to receive its reward, anti-automobile legislation threatens to set in in a manner that must destroy a well promising seed. The automobile tax bill itself, as well as the views laid down in its justification, are detrimental to the automobile industry and to the application of power wagons; the bill because it is ahead of the times, to say the least, and the justification because it is illogical and designed to spread false notions with regard to the automobile movement.

"Germany is not a land of luxury, and the comments on the law, in so far as they are based on a comparison with the French figures, are erroneous. At the time when France put a tax upon automobiles running upon its system of highways (that are free from tolls) there was already a general vehicle tax in effect. In our country all horse vehicles are left tax free, and an exception law is passed for the passenger motor car which is unconcernedly designated a vehicle de luxe. The moral effect of such a view is equally damaging as the financial burden.

"The taxing of reserve vehicles is also a mistake. The commercial vehicle, the regular use of which is demanded by important interests, requires the provision of a reserve vehicle, and to put an extra tax upon this reserve car is unfair. Even the sportsman would try to get along with a minimum number of taxed vehicles, and would thereby reduce the demand for cars to the disadvantage of the industry.

"We would add, finally, that a tax based upon horse power would be unfair, because not the horse power but the price determines whether a car is a vehicle de luxe. We would mention that an electrically propelled city vehicle of 3 horse power with its elegant body work costs as high as 20,000 marks, whereas the 8 or 12 horse power car of a country doctor would hardly cost 6,000 marks, and in many cases to even and yet the first vehicle would be liable tax of only 100 marks, and the bus wagon of the country doctor to 450 ma

"We would further point out that the will not be profitable, as it will destro industry and will not bring the state appreciable gain. According to stati compiled by the Imperial Automobile C our seven largest manufacturers, during year 1905, produced together only 2,62 hicles. Of these 1,421 were exported only 1,205 cars remained in Germany. cording to a reliable estimate the total duction of all the other factories was to about half that of the above, which an aggregate of 1,800 cars made and in Germany in 1905.

"However much these figures may pro for the future, for the present they, in nection with the above quoted impor ures for the past few years, indicate tha trade estimate of a maximum of 5,0 6,000 automobiles in use in Germa about correct. This figure is also in har with the statement made above, that in of a mobilization of the army the auth would be able to requisition only 2,00 hicles of more than 8 horse power, a remainder of approximately 4,000 ve is made up of low priced and low po cars. The amount of the tax might be estimated as follows:

4,000 cars, each 150 marks..	600,000 m
2,000 cars, each 100 marks..	200,000 m
80,000 horse power, each 5 marks	400,000 m
Total	1,200,000 m

"Even under the most unfavorable sup tions, and on the basis of the now pro tax, there would be at least 25 per cen these vehicles entirely tax free. The amount raised by the tax could, there be estimated at 900,000 marks. Of this a considerable portion would be nece for the organization of tax collection

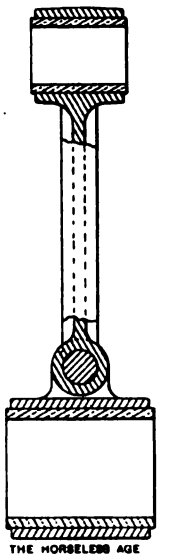
"On the other hand it would hardly roneous to assume that each of the factories which are at present engaged introduction of the low priced vehicl made an expenditure of from 100,0 150,000 marks for works and equip consequently, in contrast to the mi gain of the State, which could hard ceed a half million, there would be a loss to the industry of 6,000,000 to 9,00

"In the foregoing we have confined selves to presenting general views. W harboring the expectation that the e Reichstag will not disdain to listen t arguments, and will favorably consid propositions mentioned at the begin this petition."

A proposal to provide two mor for the carriage of samples of tea fr sale tea warehouse at Garden Rea cutta, to the distributing centre in L has been approved by the Port C sioners.

Jointed Connecting Rod.

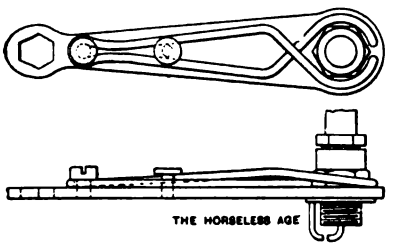
new design of connecting rod, the idea in English inventor, is illustrated here-. It will be seen that the rod is pro-d with a hinged joint near the crank , the axis of the hinge being at right les to the plane through the two bear-s of the connecting rod. The object of inventor is obvious. It is practically ossible to get the cylinders absolutely pendicular to the crank shaft, and in sequence there is considerable friction the connecting rod bearings at certain nts in the crank revolution. This fric-n is, of course, obviated by the intro-tion of a pivot joint in the rod. The it, however, adds to the complication of motor, and would appear to weaken rod, so probably most manufacturers l think it preferable to use a simple, e-piece rod and try to get the wrist pins nearly in line with the crank shaft as sible.



A Jointed Connecting Rod.

The Evrard Pinch Wrench.

This is a simple little tool marketed by a nch manufacturer for removing spark gs from cylinders while the motor is in eration. It is stated that when the mo-ist removes a plug from the engine, ien it is practically unscrewed, he grasps



Novel Spark Plug Wrench.

with the fingers in order to pre-nt it from dropping to the ground and eaking. In the majority of instances he ill find it too hot to hold and let it drop nyhow, with the consequence that it is equently broken. It is to obviate this ouble that the "pinch wrench" is designed. n top of the spanner is secured a heavy ire spring, which grasps the hexagon ortion of the plug and holds it firmly after e plug has been completely unscrewed, so at it cannot be dropped and damaged.

A correspondent in the *Automobile Club ournal* relates the following comic inci-ent: "I was in Abingdon on Saturday with 25-30 horse power car, and as it had been ouring had with rain for some hours, I sked the ostler—a Frenchman, by the way -to wash the car. We had been seated at nch for some ten minutes or so, when he ostler came rushing into the coffee oom, ghastly white and too excited to re-nove his cap, shouting 'The moto has one! The moto has gone!' Thunder-truck to think that some one had stolen the car, I rushed out to find the engine running, as in cleaning the dashboard he had switched on the current unwittingly."

On the suggestion of the touring committee, the executive committee of the Automobile Club of France imposed the following penalties upon contestants in the recent voiturette trials for misleading advertisements referring to the results of these trials: 1,000 francs fine and six months' suspension of the Lacoste & Battmann firm; 100 francs fine for the Vulpes firm, and 100 francs fine for De Dion, Bouton & Cie.

British Foreign Automobile Trade.

The *Automotor Journal* publishes figures of automobile imports and exports to and from Great Britain for the past four years, from which we extract the following:

Imports.

	No. of Cars and Motor Cycles.	Value.	Parts Value.
1902	3,747	£992,229	£110,836
1903	6,134	1,714,166	274,387

	No. of Cars.	Value.	Parts Value.	No. of Motor Cycles.	Value.	Parts Value.
1904	5,378	£2,080,371	£343,569	979	£30,855	£16,872
1905	5,622	2,438,002	929,121	1,700	55,788	24,055

Exports.

	No. of Cars and Motor Cycles.	Value.	Parts Value.
1902	415	£155,340	£16,803
1903	955	285,669	58,148

	No. of Cars.	Value.	Parts Value.	No. of Motor Cycles.	Value.	Parts Value.
1904	703	£241,708	£80,258	771	£31,117	£7,294
1905	1,079	376,853	125,861	695	23,867	17,447

Foreign and Colonial Re-exportation.

	No. of Cars and Motor Cycles.	Value.	Parts Value.
1902	183	£52,714	£5,161
1903	382	126,659	16,249

	No. of Cars.	Value.	Parts Value.	No. of Motor Cycles.	Value.	Parts Value.
1904	406	£168,257	£27,523	87	£2,749	£1,216
1905	612	285,527	53,587	100	3,189	1,513

A novel application of the motor bus was tried in London on January 24 by the management of the Palace Theatre, with a view to expediting Miss Kate Cutler's double journey and double change of costume necessitated by her appearance both in "The Spring Chicken" at the Gaiety and in "Hero and Heroine" at the Palace. A Vanguard motor omnibus was fitted up completely as a dressing room. The whole of the inside was draped with pink and white chintz, and a dressing table and mirror, with electric lamps, fixed. Miss Cutler had exactly forty-five minutes to spare from "The Spring Chicken," and in that short interval she appeared in an entirely different costume at the Palace Theatre.

Austrian Anti-Dust Society.

Consul General Rublee, of Vienna, sends the information that a society has been organized in Vienna, having for its object the abatement of the dust nuisance on streets and public highways. It has a large membership, including men of prominence in scientific, professional and business circles, and it is hoped by thorough study and experiment to arrive at some practical means of accomplishing the object aimed at. The society has completed its organization and will hold a series of public meetings in Vienna, at which papers are to be read by university professors and other competent authorities possessing special knowledge on the dust question. These discussions will be followed by practical experiments at Vienna and other parts of Austria. The Vienna engineering department has placed all its resources at the disposal of the society in order to facilitate practical tests, and similar offers have been made by other municipal and provincial bodies.

LEGISLATIVE and LEGAL

Three Bills in Ohio.

COLUMBUS, Ohio.—The Ohio Legislature now have under consideration three bills relating to automobiles. One providing for the oiling of roads by city councils; another, the registration of automobiles with county auditors and the payment of a fee of $5 annually, and the third, the filing with the Secretary of State the owners name, description of car, factory number, style, motive power, etc., for which a fee of $2 is to be paid. According to this bill every vehicle shall be numbered by the Secretary of State, who shall deliver a 2 inch circular tag bearing the words "Registered Motor Vehicle, No. ———." Transfers or sales shall be reported to the Secretary of State within ten days, and all numbers assigned by him shall be displayed on the rear of the car. The Legislature recently passed one bill allowing country commissioners to oil roads, and another permitting the employment of convicts on public roads.

An Iowa Motor Bill.

DES MOINES, Ia.—Representative Offill introduced a bill in the House last week providing for a speed limit outside of cities of 16 miles per hour, and in closely built up cities or towns 8 miles an hour. The bill also adds, "Any person operating a motor vehicle shall, upon approaching a person or persons riding or driving horses in an opposite direction, bring said vehicle to a stop not less than 100 feet from said person and cause his vehicle to remain stationary, and the operator of the motor car shall alight and remain standing beside said motor vehicle, and shall hold himself in readiness to render necessary assistance to the person or persons riding or driving horses or other animals in so passing."

Contract in Restraint of Trade.

MILWAUKEE, Wis.—Judge Sanborn, in the suit of the Rubber Tire Wheel Company of Ohio vs. the Milwaukee Rubber Works Company, held in his decision that the former firm could not collect royalties amounting to $2,517 from the Milwaukee concern. While not denying the owner of a patent the right to do as he pleases with his property, selling it to whom he elects, and at such price as meets his convenience, the judge held that the owners of a patent or the licensees have no right to create a fund for crushing interstate commerce. The Milwaukee Company averred that the contracts were illegal and in restraint of trade, and that prices had been raised above the legitimate market prices and the amount of manufacturing restricted.

TRENTON, N. J.—Senator Jackson of Middlesex County has introduced a bill into the Legislature which limits the age of drivers to eighteen years; the weights of loaded machines to 20,000 pounds; the speed to 20 miles per hour; the tread to 62 inches, and the body to 7 feet in width. It also provides for lights at night, large numbers for the front and rear, permits municipalities to limit the speed to 6 miles per hour, and provides fines and imprisonment for violation.

CHICAGO, Ill.—The Automobile Supply Company on February 2 filed a creditor's bill in the Superior Court against the Yale Automobile Company, asking that the defendant company be dissolved and its assets sold for the benefit of its creditors. The Supply Company's claims amount to $280. The Kirk Manufacturing Company, also a complainant, asks for $707. It is alleged that the Yale Company is owned and controlled by Wm. W. Tarr, who is also made a defendant.

CHICAGO, Ill.—After the city building department refused a permit for the erection of a garage at 4711 Forrestville avenue, it was recently found that the structure has been built under the guise of a warehouse, and is now being used for storing automobiles. Acting Deputy Commissioner of Buildings Andrew M. Hughes issued an order notifying Simon Lederer, the proprietor, that unless owners of the adjoining properties consent to this use, as is required by city ordinances, and changes in the structure are made, the police will be ordered to close it.

New Incorporations.

The Commercial Automobile and Supply Company, Alexandria, Tenn.—Capital, $20,000.

Mexican Automobile Manufacturing Company, New York City.—Capital, $100,000.

Southern California Motor Car Company, Los Angeles, Cal.—Capital, $50,000. Directors, J. E. Paul, J. J. Paul and C. W. Harshey.

Northern Automobile Agency, Boston, Mass.—Capital, $10,000. Incorporators, Chas. Haigh, David A. Sausser and Louis H. Butterworth.

Stenhart, Gensen Automobile Company, Joliet, Ill.—To deal in and rent automobiles. Incorporators, E. W. Stenhart, F. Jensen and W. H. Whitemore.

Gullman Wheel Company, Chicago, Ill.—To manufacture automobile parts and appliances. Capital, $15,000. Incorporators, A. A. Worsley, N. H. Hanchette and J. H. Whitfield.

The Interstate Automobile Clearing Company, New York City.—To deal in motor vehicles. Capital, $50,000. Incorporators, Chas. A. Wardle, Wm. E. Metzger and Giles H. Stillwell.

The Motor Component Manufacturing Company, Des Moines, Ia.—To manufacture and sell automobile fixtures. Capital, $30,000. Incorporators, B. S. Walker, W. H. Ditto, G. C. Hubbell, H. G. Guer[illegible] McCutcheon and F. C. Hubbell.

American Motor Truck Company, Lod[illegible] port, N. Y.—To manufacture motor ve[illegible] cles. Capital, $10,000. Directors, H. J. B[illegible] cock, Robert Hall, Chas. R. Bishop, B[illegible] W. Hall and Henry C. Eddy.

Standard Garage Company, Buffalo, N. [illegible] —To manufacture and deal in automobile[illegible] Capital, $10,000. Incorporators, Louis [illegible] Gertsch, Wm. C. Schultze, John G. [illegible] Knoll, Grosvenor R. Trowbridge and Har[illegible] M. Kraft.

Mount Vernon Motor Company, Bal[illegible] more, Md.—To buy, sell, exchange and re[illegible] pair automobiles. Capital, $5,000. Inco[illegible] porators, Wm. A. Fisher, Jr., Jesse Rig[illegible] Thos. C. Goodwin, C. W. Pope and Alfr[illegible] R. Riggs.

Club Notes.

LOUISVILLE A. C.

The club has been formed late[illegible] maintain the rights of automobile own[illegible] and to discourage reckless driving of mo[illegible] cars, as well as to encourage rational leg[illegible] lation and good roads.

COLORADO A. C.

At the annual meeting of the club the fo[illegible] lowing officers were elected: Dr. Frank [illegible] Bartlett, president; Dr. J. W. O'Conn[illegible] vice president; Dr. W. H. Bergtold, sec[illegible] tary, and Louis Searing, treasurer.

A. C. OF AMERICA.

The club will hold a commercial [illegible] pleasure vehicle contest in the spring. [illegible] committee of seven will be appointed [illegible] take charge of all matters. Robert L. Du[illegible] lectured at the clubrooms on the night [illegible] February 6 on "How Russia Lost."

KNOX COUNTY (ME.) A. C.

The club has been sending out circu[illegible] to the selectmen of all the towns in Kn[illegible] County and forty-two towns surrounc[illegible] calling attention to the State law relat[illegible] to guide posts. The club is endeavoring [illegible] have all roads bear proper guide posts [illegible] is required by law.

ASSOCIATED A. C. OF NEW JERSEY.

The association has named a delega[illegible] to lobby against the Frelinghuysen [illegible] which was introduced in the State Sen[illegible] on January 23. They are sending out [illegible] culars to all the members requesting [illegible] to be present at the hearing on this [illegible] to be held in Trenton.

PENNSYLVANIA M. C. FEDERATION

At a meeting held in New York on Jan[illegible] ary 16 preliminary steps were taken to[illegible] organizing the Federation, to be compo[illegible] of motor clubs or associations and c[illegible] lates of the American Motor League in [illegible] State of Pennsylvania. The object[illegible] to promote and foster the formation of [illegible] tor organizations throughout the State[illegible] endeavor to secure the enactment [illegible] laws regulating the use of motor and [illegible] vehicles; to advocate the cause of g[illegible] roads and to further the best interest[illegible] motorists in general. A meeting w[illegible] held to complete the organization and [illegible] officers at Philadelphia about March 1

MINOR MENTION



The Olds Motor Works, Lansing, Mich., ive increased their capital stock to $612,000.

The Pennsylvania Railroad Company are id to have ordered 100 special box cars to rry automobiles.

An increase in capital to $35,000 is announced by the Union Automobile Company, of St. Louis, Mo.

The Hayes Manufacturing Company, of etroit, have been admitted to membership the Motor and Accessories Manufacturrs, Inc.

The Cincinnati Automobile Company ave opened a salesroom at 20 East Seventh street, where they will sell automoile supplies.

The George N. Pierce Company will build new factory on Elmwood avenue, south of ne Belt Line, Buffalo, N. Y., which will rovide about 250,000 square feet of floor pace.

The Berkshire Automobile Company, of ittsfield, Mass., will increase their capital tock to $250,000. The officers were all relected at the annual meeting of the comany held last week.

The Interstate Automobile Clearing Company of New York City, recently incorporated by Wm. E. Metzger, G. H. Stillwell nd C. A. Wardle, with offices at 5 East Forty-second street, will sell second hand utomobiles of owners and dealers.

The Ford Manufacturing Company, of Detroit, Mich., recently incorporated to make small engines and automobile parts, have leased a building on Bellevue avenue, south of Mack street, formerly occupied by the Hayes Manufacturing Company.

The Tiley-Pratt Company call our attention to a misstatement in the description of their tire inflater in our last issue. The hub attachment fits over and clamps on the regular hub cap, so that it is not necessary to remove the latter when using the device.

A bill is in preparation for presentation in the present session of the Legislature at Trenton providing for the construction of a boulevard from Jersey City to Newark, N. J., with special provision for automobiles.

George Wahlgren, of Denver, Col., anticipates conducting in the fall a transcontinental automobile show, similar to the one recently conducted by the Winton Motor Carriage Company, composed of two trainloads of the latest models of ten or fifteen American manufacturers.

B. V. Covert, of Lockport, N. Y., and a number of local capitalists are said to have purchased the interests of the Rochester parties in the Covert Motor Vehicle Company, located on Richmond avenue, Rochester, N. Y. The new company will resume operations in the present location.

The Matheson Motor Car Company, of Holyoke, Mass., write us that two of the brakes on their cars are water cooled, although Chas. Tailleur, in an article on 1906 brake design in our January 17 issue, stated that he had not noticed at the shows any instances in which such brakes were fitted to American cars.

A new gasoline pump that can be attached to any receptacle or tank has been placed on the market by the Boyer, Radford & Gordon Tank and Pump Company, Detroit. The pump contains two gauges, one of which registers only up to one gallon, which is drawn from the tank by four strokes, and the other shows the total amount of gasoline taken out.

At a recent meeting of the Forest City Motor Car Company, Detroit, the following officers were elected: H. A. Croxton, president; W. E. Stone, vice president, and W. E. N. Hemperly, secretary and treasurer. The new directors of the company are H. A. Croxton, F. F. Taggart, L. A. Coons and W. E. N. Hemperly. The firm will manufacture two styles of runabout.

Agency and Garage Notes.

F. W. Howe is erecting a three story garage at Sidney, N. Y.

Morgan & Wright's Cleveland branch has lately moved to 1829 Euclid avenue.

George J. Bohnet has acquired the Saginaw and Bay City agency for Reo cars.

J. M. Lauder and A. B. Smith are to open a garage on Howard street, Akron, Ohio.

The Chicago agency for the Lozier car during this season will be handled by Dan B. Southard.

J. W. Hammond is erecting a garage 15x51 feet in Freeland, Pa., which will be two stories high.

The Pope-Waverley car will be represented at Evansville, Ind., by the C. W. Travis Auto Company.

The Torbensen Motor Car Company, of Bloomfield, N. J., have become representatives of the Frayer-Miller car.

A garage will be erected at Columbus, Ohio, at the corner of Bancroft street and Ashland avenue, by L. R. Blood.

Fred H. Adams, of 541 Tremont street, Boston, writes that he has given up the New England agency for the Atlas trucks.

Richard H. Mahlke, of Wheeling, W. Va., is converting the first floor of his machine shop building into an auto garage.

The Baker Motor Vehicle Company have appointed the Utica Motor Car Company, of Utica, N. Y., their agents in that section.

The Levenhager Automobile and Garage Company have been organized at Warsaw, Wis., where they will represent the Rambler car.

The Lexington Automobile Company, Lexington, Ky., have opened a two story garage and repair shop on West Main street.

The Reo car will be represented at Asbury Park during 1906 by Fred H. Decker, who expects to open a garage some time in March.

A building on Short street, Lexington, Ky., has been leased by C. Ora Updike, who will occupy it about March 1 and conduct a garage.

A garage is in course of erection for the Bridgeport Automobile Company, Bridgeport, Conn., on Fairfield avenue, near Courtland street.

E. B. Robertson has opened a garage at 204 Washington street, South Norwalk, Conn., in addition to which he will run a repair shop.

J. L. Bane and J. C. Zellers, Ottawa, Ill., have organized the Ottawa Motor and Cycle Company, and will conduct a garage and general repair shop.

The Auto Shop Company, 731 Vincent avenue, Cleveland, Ohio, recently incorporated, will act as agents this season for the Thomas and Franklin cars.

C. B. Rice, New York representative of the Baker electric vehicle, has opened a garage at 941 Eighth avenue. He will continue his salesrooms at their present location.

The Detroit Auto Vehicle Company, of Detroit, have appointed F. M. Prescott, with quarters at 36 Columbus avenue, Boston, Mass., their New England representative, and Chas. W. Prescott, 538 Washington street, Hudson, N. Y., their representative in that city.

The Motor Car and Storage Company, Incorporated, Paterson and Ellison streets, Paterson, N. J., of which H. Coulson Fairchild is president and manager, will represent the Wayne and Ford cars during this year. They will also have a branch showroom at Passaic, N. J., corner of Prospect street and Bloomfield avenue.

Exports for 1905.

During December, 1905, the value of automobiles and parts exported amounted to $196,645, which is a falling off from the figures for December, 1904, the amount that month being $214,516. The total value for the year 1905 is $2,695,655; a substantial gain over the years 1904 and 1903, in which they were $1,897,510 and $1,643,029, respectively. The following table shows the distribution of the exports among our foreign customers:

Country.	Dec. 1905.	Total 1905.
United Kingdom.....	$75,258	$707,045
France	7,645	269,703
Germany	1,651	105,457
Italy	4,073	163,978
Other Europe.....	1,477	239,379
British North America.	23,827	537,588
Mexico	29,672	192,452
W. Indies and Bermuda	20,498	151,859
South America.....	5,507	61,419
British West Indies...	696	31,793
British Australasia....	8,964	120,083
Other Asia & Oceanica.	2,699	63,577
Africa	5,760	39,288
Other countries.....	8,918	12,034
Total	$196,645	$2,695,655

Commercial Vehicle Notes.

C. W. Gray is building a garage and repair shop at Watertown, N. Y.

The Pope-Waverley car will hereafter be handled in Akron, Ohio, by F. F. Miller.

It is reported that the health department of Cincinnati, Ohio, will adopt automobiles in a number of branches.

The Nevada Mobile Transit Company, of Tonopah, Nev., have established an additional motor bus line, which runs between Tonopah and the new camp.

Dr. Johnson, of Xenia, Ill., is endeavoring to organize a company to run an interurban automobile line on a special track, to be constructed of concrete.

The Hotel and Railroad News Company, of Boston, Mass., have recently placed two motor wagons of their own construction in service delivering newspapers within the city limits.

David Jarum, of Albany, N. Y., is negotiating for the establishment of a gasoline bus line between Albany and Loudenville, which he expects to have in operation the early part of April.

The Cleveland Council made an appropriation of $2,000 recently for the purchase of more automobiles for the city's use. An ordinance authorizing the purchase is to be introduced this week.

The Gibson Short Cycle and Automobile Company, of Indianapolis, Ind., will in the future represent the Reo Motor Car Company, Nordyke & Marmon Company and the American Motor Car Company.

William Stonebourne, of Albany, N. Y., who operates a stage line between Albany and Rensselaerville, purchased a sixteen passenger bus last week, which will be placed in service on or about May 1.

The St. Paul Commercial Club, of St. Paul, Minn., proposes to establish a sight seeing automobile line. The plan which will likely be adopted will be to interest some private company or individual to operate the cars, so that the system can be started at once or early in the spring.

A Commercial Photographer's Motor Car.

Royal T. Gillett, a commercial photographer of Grand Rapids, Mich., states that he finds the automobile very valuable in his line of work. He does considerable work for the daily newspapers of that city, and by means of his car he is able to do "rush work" on very short notice. When a "hurry-up" order comes in he can get to the scene of action, take the picture and get back to the developing room in time to have the print ready for the engraver while the news is fresh.

Mr. Gillett uses a 7 horse power Olds runabout, which has been fitted with a box 4 feet long, 22 inches high and 20 inches wide, which is located just back of the seat and is of sufficient capacity to carry three cameras with plates, making a total additional weight of about 200 pounds. Fifteen miles a day is his average run, and this is made mostly over paved roadways, although a 10 or 15 mile run into the country is not unusual. The car consumes about a gallon of gasoline a day, and the cost of operating is placed at $15 per month, which is about the same as the cost of keeping a horse. According to Mr. Gillett, however, the car does his work much quicker than a horse could.

Trade Literature Received.

The Aerocar Company, Detroit, Mich.—Latest catalogue of Aerocars.

The Randall-Faichney Company, Boston, Mass.—Circular mentioning "B"-Line motor oilers.

W. S. Sheppard, 21 Lawrence street, Newark, N. J.—Booklet on "Ideal Oil Gasoline Engines."

Wm. C. Rand, 51 McComb Street, Detroit, Mich.—Circular illustrating the Standard adjustable lamp bracket.

Daimler Manufacturing Company, Long Island City, N. Y.—The first number of *The Autocrat*, to be issued monthly.

Vehicle Equipment Company, Long Island City.—Folder showing various styles of electric vehicles for commercial use.

Green, Tweed & Co., 17 Murray street, New York City.—Illustrated folder describing the multiplus force feed lubricator.

Dover Stamping and Manufacturing Company, 385 Putnam Avenue, Cambridge, Mass.—Booklet containing auto specialties.

The Packard Motor Car Company, Detroit, Mich.—Illustrated booklet showing and describing the 1906 Packard Model 24.

Thos. B. Jeffery & Co., Kenosha, Wis.—1906 catalogue describing and showing the various models of the Rambler car, printed in colors.

Jones Speedometer Company, 17 Thirty-second Street, New York C Folder describing the Jones tachomet annunciator.

Knox Automobile Company, Spring Mass.—Catalogues illustrating and de ing Knox pleasure cars and commer hicles.

The Buckeye Manufacturing Co Anderson, Ind.—Illustrated catalog colors showing various models of the bert car.

Samson Leather Tire Company, Thirty-third Street, New York City.—I let containing sizes and prices of S leather tires.

The Kansas City Motor Car Co Kansas City, Mo.—Booklet showing th ferent styles of commercial vehicles factured by the company.

The Connecticut Telephone and E Company, Incorporated, Meriden, C Catalogue No. 12, which is illustrated describes the coils, switches, ammeter voltmeters they make.

Electric Vehicle Manufactur Association Formed.

The Association of Electric V Manufacturers was incorporated at A this week. The objects of this assoc are "to foster trade, reform abuses i ness, and to promote harmony amon trade." The directors are Robert Lloyd, of New York city, Geo. Po Hartford, Conn.; M. L. Goss and J McCrea, of Cleveland, Ohio; T. W. G ridge, of South Bend, Ind., and J Naughton, of Buffalo, N. Y. The as tion's chief office will be located in York city.



The Motor Car as an Aid to Commercial Photography.

MOTOR VEHICLE PATENTS.

Patents of January 30.

0,921. Tire for Vehicle Wheels.—dnego Dewes, New York, N. Y. Filed 20, 1905.

0,929. Storage Battery.—William Fen- and William P. Perry, Leytonstone, land. Filed March 17, 1904.

10,930. Storage Battery.—William Fen- and William P. Perry, Leytonstone, land. Filed March 6, 1905.

10,944. Elastic Tire.—John E. Hopkin-, West Drayton, England. Filed August 1905.

10,959. Oil System.—Howard C. Mar-n, Indianapolis, Ind. Filed February 13, 5.

10,963. Electric Igniter.—Homer N. otsinger, Pendleton, Ind. Filed May 31, 04.

811,109. Pneumatic Tire.—Friedrich ith, Höchst-in-the-Odenwald, Germany. led April 29, 1905.

811,112. Automobile Wheel.—Earl A. heeler and William Heckert, Sharon, Pa. led December 29, 1904.

811,116. Jack for Lifting and Transport-g Motor Cars, etc.—Henry Adams, Tun-idge Wells, England. Filed March 11, 05.

811,122. Sparking Igniter for Internal ombustion Engines.—Alfred R. Bellamy, dgeley, Stockport, England. Filed Sep-mber 27, 1904.

811,136. Lifting Jack.—Samuel S. Eve-nd, Philadelphia, Pa. Filed August 23, 04.

811,178. Lady's Automobile Hat.—Hor-e A. Saks, New York, N. Y. Filed Sep-mber 12, 1905.

811,232. Vehicle Tire.—Jules Lang and ugust Fischer, Chicago, Ill. Filed Novem-er 14, 1904.

811,250. Cushion Fork for Motor Cycles nd Other Vehicles.—William G. Schaeffer, eading, Pa. Filed May 19, 1905.

811,258. Power Transmitting Mechan-m.—Horace H. Taylor, San José, Cal. iled January 11, 1905.

811,296. Pneumatic Spring for Vehicles. -Matthew M. Howland, Providence, R. I. iled May 11, 1905.

811,314. Driving Mechanism for Motor ehicles.—Charles E. Muff, Mülhausen, ermany. Filed October 5, 1905.

811,327. Transmission Mechanism for lotor Cycles.—Louis C. G. Rivierre, Paris, rance. Filed October 31, 1904.

811,345. Tire Protector.—Harris Wax-an, New York, N. Y. Filed November 3, 04.

811,391. Drive Chain.—William H. Gates, Worcester, Mass. Filed May 14, 1903.

811,397. Vaporizer.—Charles Hibbard nd Warren Hibbard, Sandyhill, N. Y. iled November 15, 1904.

811,403. Motor Vehicle.—Alexander Inglis, Indianapolis, Ind. Filed June 27, 1905.

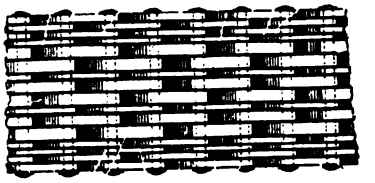
811,490. Pneumatic Tire.—James M. Elder, Indianapolis, Ind. Filed March 24, 1905.

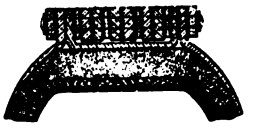
811,507. Automatic Air Brake Apparatus for Automobiles.—Frederick Kalisch, St. Louis, Mo. Filed March 24, 1905.

Review of Specifications.

807,611. Non-Skidding Cover for Tires.—Edward Fairburn, Brighouse, England. December 19, 1905. Filed July 24, 1905.

This tire cover is constructed of a number of strips of leather and links of metal arranged about the tread of the tire and held together by cross pins, which also hold the multiple chains so formed within the channel shaped ring of leather which surrounds the tire, and is held on by leather side pieces running from the tread to the wheel rim.





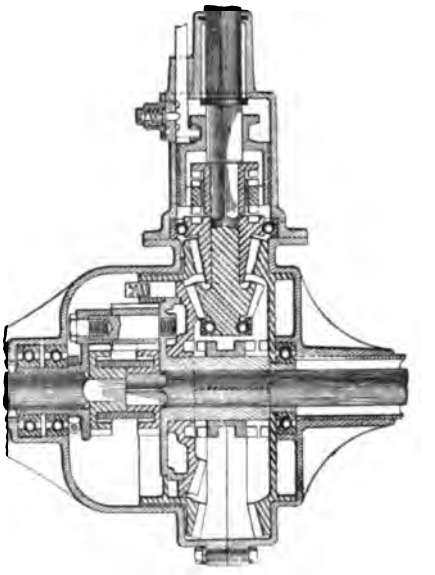
No. 807,611.

807,771. Speed Changing and Transmission Gearing.—Irvin H. Plenkharp, Columbus, Ohio. December 19, 1905. Filed May 10, 1905.

In this invention the change speed gear is incorporated in the axle construction and involves the use of a double set of bevel gears.

The driving shaft is supported in alignment with a short shaft beyond and made angular throughout a portion of its length, and a sliding sleeve has an angular bore at one end to slide freely on the driving shaft, yet always locked to turn therewith. The main portion of this sleeve is of general cylindrical cup shape formation separated by a bushing from the housing and connected by internal webs with a jaw clutch. This clutch is supported upon and spaced from a sleeve by a bushing, and the sleeve has an angular bore to seat upon the angular end portion of short shaft. An annular flange is provided on the sleeve at one end, and this flange and the end of low speed bevel pinion facing the same are both made with a series of beveled notches to receive the teeth of the clutch, and said clutch may be locked to either the sleeve or gear or lie idle between them at the will of the operator

A sleeve between the driven bevel gears is made angular to slidingly key a clutch thereon, and this clutch is adapted to lock



No. 807,771.

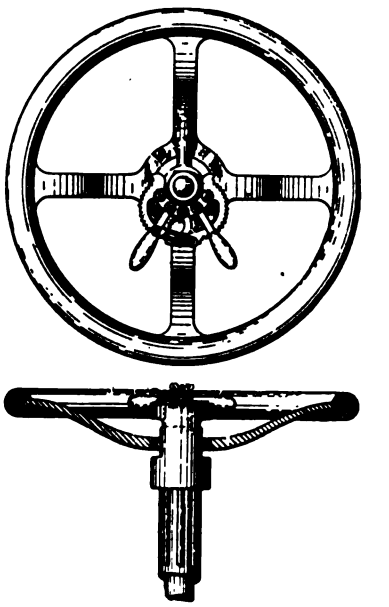
with either of the bevel gears, according to the direction of movement desired.

The drive from the bevel gears is delivered to the differential housing by a pawl and ratchet combination. The two forward speeds are obtained by manipulating the clutch on the driving shaft and the reverse by the clutch between the driven bevel gears.

809,916. Controlling Device for Motor Vehicles.—John C. Gallagher, Elmira, N. Y. January 9, 1905. Filed November 5, 1904.

The objects of this invention are to locate the engine controlling rods upon the outside of the steering column with the levers above the wheel and to couple the air and gas levers together so that they may be moved simultaneously by the manipulation of one lever.

The wheel is attached to the steering shaft by means of a hub, outside of and surrounding which is a web, from which the spokes of the wheel radiate to the



No. 809,916.

raised rim. The web is provided with an annular slot which nearly surrounds the hub, the wheel being attached to the hub by means of one of the spokes, said spoke being increased in thickness to give the necessary strength and support to the steering wheel.

At the head of the standard is an upright, which passes through the annular slot, the lower end of said upright being secured to the standard by means of a collar. This upright projects a short distance above the hub of the wheel, so as to bring its top surface in line with the rim of the steering wheel. The control rods are run up on the outside of the standard and pass through the upright, where they are provided with operating levers, a segment plate being secured to the upright below said levers by means of screws which enter side projections formed on the upright.

A slotted link is provided, so that two of the levers may be fastened together in various relative positions.

809,738. Dust Allayer for Automobiles.—William H. Parker, Royaloak, Mich. January 9, 1906. Filed March 11, 1905.

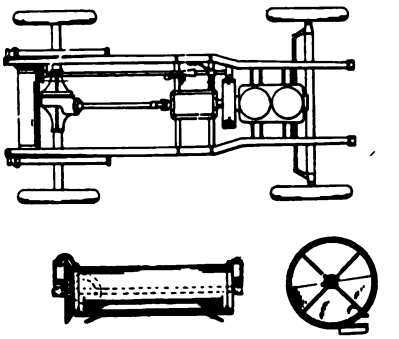
Means for preventing the raising of dust behind motor cars is the subject of this patent.

The object is to throw a thin sheet or blast of air substantially backward from the machine which shall be strong enough to overcome the air currents drawn up by the travel of the machine from the road, and thus prevent for an appreciable distance in the rear of the machine the rising of the dust by preventing the rising of the air currents.

The principal claim is:

"In a motor carriage, a fan and fan casing disposed in the rear thereof, said fan casing having a longitudinal opening transverse to the line of travel of said carriage and adapted to deliver forcibly a sheet of air through said opening, means for varying the opening of said fan case, and means for driving said fan connected with the propelling means of said carriage, substantially as described."

809,338. Power Transmitting Mechanism for Motor Vehicles.—Robert Symmonds, Jr., Kenosha, Wis. January 9, 1906. Filed April 7, 1905.



No. 809,738.

In the change speed gear covered by this patent a power transmitting sleeve is mounted for rotation and sliding on the power shaft, and has at the end next to the power wheel a disc, which terminates in a flange operating one element of a friction clutch for engaging the power wheel, such engagement being effected against the inner frusto-conical surface of the rim of said power wheel. A spring, stopped at its outer end by the parts constituting the bearing of the power shaft, reacts at its inner end against a collar on the sleeve for holding the sleeve inward toward the power wheel for making frictional engagement between the friction flange and the face of the rim of said wheel. The power is delivered to the driving wheels by sprocket and chain. The claim is:

"A power transmitting mechanism comprising a power shaft; a power transmitting wheel loose on such shaft; a driving gear rigid with the power shaft; a driven gear rigid with the power transmitting wheel; a gear frame and a gear train therein having an initial wheel meshing with said driving gear and comprising two gears in different transverse planes connected in the train for opposite rotation and each adapted for meshing with the driven gear, said gear frame being movable along the power shaft and means for moving it back and forth."

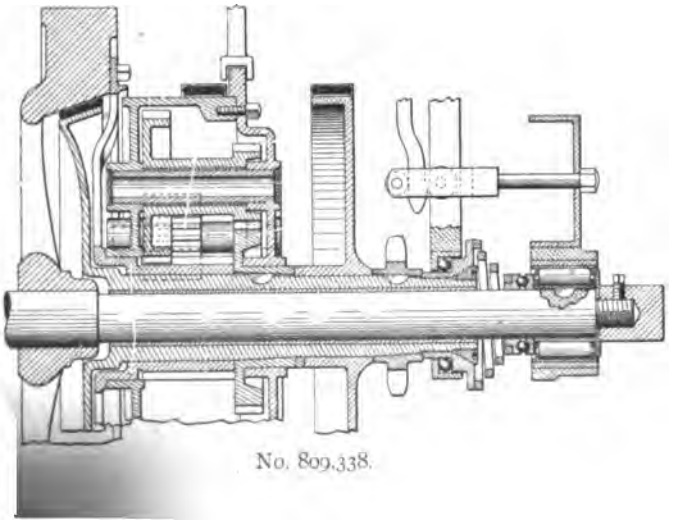
809,453. High Tension Current Distributer for Internal Combustion Engines.—Leon Jules Le Pontois, New Rochelle, N. January 9, 1906. Filed December 13, 19

The high tension current distributer covered by this patent comprises a cylinder casing of an insulating material, a plur of projections extending from the base said casing, metallic segments secured said projections, each of said segments b connected to a terminal leading to a co sponding spark plug, a shaft supported bearing carried by said casing, a current tributing arm secured to the outer en said shaft and adapted to pass in c proximity to said segments, means to r said shaft and arm so as to cause the a to distribute to said segments succes sufficient current for the efficient ignition an explosive mixture, and a circular also projecting from the base of the ca and interposed between said bearing said segments for the purpose described

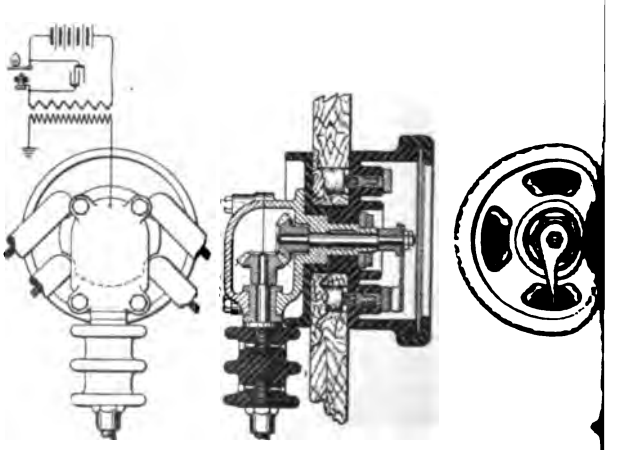
Take Your Choice.

One of the speakers at the Farmer stitute in this place, who is credited as making the best address of the meeting, in discussing the question of tralized schools, said it was not an im ability that some time country pupils w be carried to these schools over macad ized roads in automobiles at the exp of the school districts. Another spe advocated that instead of trying to our roads better, they should be mad much worse that automobiles could n used on them, and the progressive far might then be privileged to bump stones and sods and plow through mud peace.—*Conneautville, Pa., Courier*

According to the *Bulletin* (Spain) French Chamber of Commerce at Bar the "Catalana" Omnibus Company (t traction) of that city have recently successful trials with a motor bus, an hoped shortly that their entire service be carried on by means of these veh As soon as the necessary municipal i ities have been complied with, it is th that the motor buses of this compan run from Barcelona to Gracia, to San San Gervasio and to San Andrés.



No. 809,338.



No. 809,453.

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VOLUME 17 FEBRUARY 14, 1906 NUMBER 7

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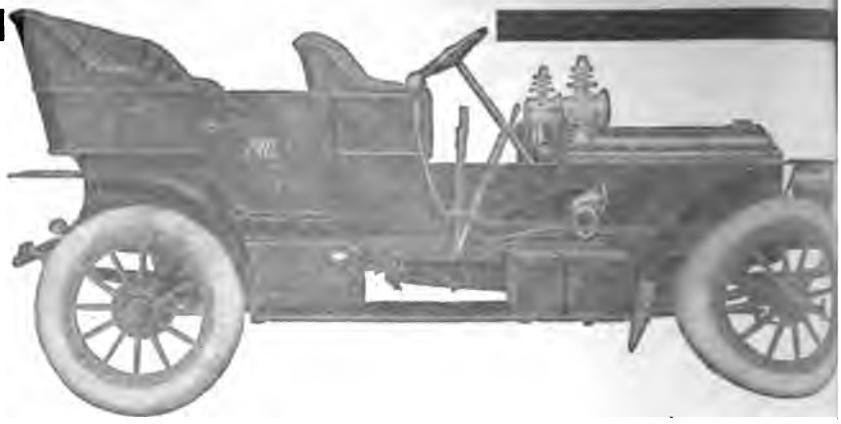
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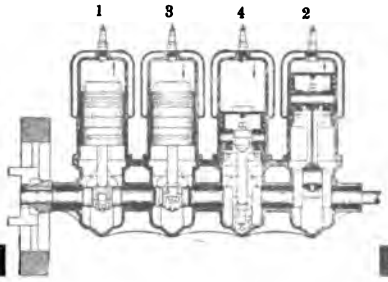
The simplicity of the Two-Cycle Engine has given it great motor prominence. Look at Cylinder No. 1. Half way down with force of explosion acting upon it. At the same time the piston of Cylinder No. 2 is just starting down from another explosion, and before the force of explosion is exhausted the third cylinder will come into action, then the fourth, and so on as long as gas is fed into the cylinder and there is spark to fire it. The many advantages of the 1906 Elmore are too numerous to mention in this space.

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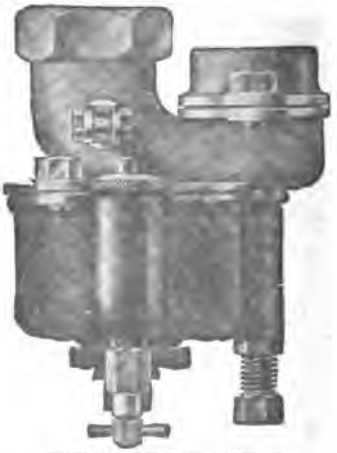


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"Running-In" of Cars by Users.

By Albert L. Clough.

In one of his inimitable stories, entitled "The Ship that Found Herself," Rudyard Kipling personifies the various parts of a freight steamer which is making her maiden trip, and describes most cleverly that process—common as well to all mechanisms, when first put into service—by which the different parts of the vessel, at first working harshly, with friction and stiffness, finally accommodated themselves one to another through operating together, with the result that by the end of the voyage the steamer was running "sweetly."

Every "brand new" automobile has to "find" itself; that is, before arriving at its best running condition, there is a period during which the parts do not work together with perfect smoothness. There is a certain stiffness in the moving elements and a need of that "limbering up" which, after it is effected, insures smoothness of operation.

This is a matter of common knowledge and the statement, so frequently made, that a machine, just from the factory, is "stiff" and requires "sweetening," is based upon the foundation of universal experience.

During the period of its earliest use, when a car is "wearing down" to its condition of normal operation, it should be most carefully watched, in order that the process may be facilitated, and that no serious results may arise from the somewhat inharmonious relations existing between parts as yet imperfectly fitted one to another.

No matter how careful the machine work may be which is involved in the construction of the moving parts of a car, or how carefully the parts may be assembled, even though a conscientious factory test has preceded the delivery of the car, and despite the fact that many of the fitted parts which move one upon the other have been ground to size by the use of the most refined apparatus, there is still an element of human imperfection and fallibility, the results of which, it seems, can only be overcome by operating the vehicle carefully and considerately under close inspection.

BOLTS STRETCH UNDER VIBRATION.

There is not only to be considered the probable lack of a perfect and permanent wearing fit between moving parts, but it is to be remembered that all the errors of assembling are likely to make themselves manifest during this early period of the car's use. Almost everyone must have noticed that the first time adjusting or holding nuts or screws are "set" it is very unlikely that permanent tightness will be attained. Bolts stretch and the held parts settle into more compact relations after being subjected to vibration and the stresses of use, and there is a general loosening of nuts to be watched for after a car has been used for a short time. In general, after a second tightening, a permanent condition is more likely to be realized. No doubt, a prolonged factory test tends to remove such conditions, but, under the influence of the "rush" production existing in most factories, cars are frequently left to "find themselves" after being placed in the hands of their owners.

Gasoline engine cylinders and pistons, if fitted by the most advanced methods, are, as a rule, nearly in their best condition when they leave the factory; but if cruder and more hurried processes are relied upon and the cylinder bore and rings are not ground, there is a lack of smoothness and accuracy of fit in these parts which causes, at first, excessive engine friction and a considerable leakage of the charge, and results in poor fuel and cooling water economy.

"WORKING IN" OF CYLINDERS.

While the mechanical imperfections of the cylinder walls and the expanding rings are being worn off by this process of mutual fitting, an unusually liberal amount of oil should be fed the cylinders, and the engine should be given frequent periods of rest and cooling. In general, a new engine, no matter how well made, will be slightly stiff and should be given plenty of lubrication. Too much stress cannot be put upon the desirability of giving all moving parts of a new car an unusually large amount of oil. However carefully fitted the bearings of the crank shaft and of the connecting rods upon the crank pins may be, there are usually imperfections in the surfaces of the shaft and its bushings which have to be worn down before the metallic contact becomes compressed and "laid down" into that glassy, smooth condition which conduces to perfect running. Well ground crank shafts and carefully scraped bushings require but very little use before the bearing surfaces become excellent, but if tool marks are left on the surfaces there is required considerable wearing down before conditions become favorable. The process of effacing these imperfections is attended by a considerable evolution of heat, and unless the bearing is carefully watched it may stick or melt out. After the surfaces do finally become smooth from running together, the bearing has usually become slightly loose and requires to be "taken up." After being tightened it will ordinarily run for a long time without further adjustment.

WATCH FOR HOT BEARINGS!

Hot bearings are to be anxiously watched for in every new car during its first few days of use, and one should not wait for tangible evidences of sticking, but should frequently try the temperature of the bearings with the hand, and if any of them is found abnormally hot it should be slightly loosened and flooded with oil. After a few long runs have been made with a new car, without any serious heating of the bearings, there is usually very little danger of its occurrence, except from lack of oil.

METAL CHIPS IN CASES.

Every manufacturer earnestly endeavors to prevent metal chips from being left in the gear or crank case of the car, and also tries to so clean the internal surfaces of these cases that there will be no scale shed off them while in service. Too frequently, however, these precautions are not completely success, and the crank and gear case of a new car will be found to contain, mixed with the oil, a quantity of this destructive foreign material, some of which may enter the bearings with the lubricant and there produce the abrasive effect of emery, causing the shafts and bushings to cut and perhaps be ruined. If splash lubrication is employed, these foreign particles are likely to prove very detrimental to an engine, as they are scattered over all its bearing surfaces.

It is well to wash out the crank and gear case of a new car very freely with kerosene, after drawing off the oil. The oil ways into the bearings should be squirted with kerosene, from an oil gun, and fresh lubricant supplied. After a few treatments of this kind the abrasive particles will all be washed away.

TESTING THE LUBRICATION.

Too great care cannot be taken with a new car to determine that it is reallly getting lubrication. The factory test may have been made with a testing body which carried the mechanical lubricator, and the lubricator supplied with the car may never have been tested more than very cursorily. There is nothing more convincing than disconnecting the oil pipes from their discharge points and observing if the lubricant feeds all right when the engine is running.

Speaking of the practice of trying out cars at the factory with "test" bodies, reminds one that "test" wheels are also used during the trying-out process, in order to prevent marring the varnish on the wheels which are actually to be furnished the customer. The car has thus not been run for any distance upon its own wheels, and no car can be operated with confidence unless the owner assures himself that both the front and rear wheels are properly secured to their axles. Cases of wheels coming off on the road are by no means unheard of. Many manufacturers state that their wheel bearings and differential and bevel gear cases are packed, before leaving the factory, with grease which should furnish lubrication for an entire season. That there is a possibility of a mistake being made in this direction was forcibly demonstrated to the writer by his being present at the post mortem of a differential about which this statement had been made, but from which the grease had evidently been left out. The purchaser of a new car ought to be willing to take the slight amount of trouble necessary to assure him as to these points. Trying out the car at the factory, principally with a testing body, instead of with the body to be supplied with the car, leaves some other questions open, and as a practice may be open to criticism. One may be in doubt as to the integrity of the fastenings of the body of a new car to its frame.

ATTENTION TO CLUTCHES AND BRAKES.

Metal to metal clutches and metal to metal brake shoes wear rapidly until tool marks are effaced and the surfaces smoothly glossed over, and early adjustments of

these important parts are likely to prove necessary in a new car which is "finding itself." Wire cables operating the brakes and the leather belts of the fan and mechanical oiler stretch rapidly at first, and may require an adjustment early, after which a long period of service may elapse before another tightening is required.

The leather forming the friction bands of clutches is often stiff and harsh in a new car, causing the engagement of the power to be jerky and violent. With use and proper treatment with a suitable unguent the leather seems to become more pliable and better adapted to effect a gentle clutch engagement.

Driving chains and those used for operating the auxiliaries are usually subject to a considerable initial stretch, taking place during the early use of a car. The rivets seat more deeply in the side plates, and there is a general "give" throughout the whole chain length after it has done its first hard work. The stretch that comes from subsequent wear is quite another matter. An early adjustment of chains may be expected to be required with a new car.

The stiffness of the body springs of new cars is proverbial, and it is only after some little use that they acquire their expected easy riding qualities. Careful driving over rough roads is advisable with a new car, in order to bring the springs into condition, with the least amount of general wear and tear.

LOOSE PIECES OF SOLDER IN TANK.

It often happens that in the process of making the gasoline tank small pieces of solder, soldering flux or metal are left within it. These pass out through the gasoline pipe, and it is not uncommon for a new car to exhibit carburetor troubles, due to the filtering screen or the vaporizer spraying nozzle becoming clogged with this foreign material. The carburetor strainer of a new car should be cleaned and the float chamber flushed out after they have been in use a short time.

The unions which connect the various parts of the water and gasoline system, especially if packed with washers of leather or similar material, may need tightening after a few days of rough riding. The packings squeeze considerably at first, and a second tightening is likely to be necessary before they assume their final dimensions.

Allusion has already been made to the annoying failing possessed by bolts, cap screws and other holding devices, of working loose under vibration, especially when new and holding newly fitted parts which have not fully been shaken down to a bearing. A very large number of nuts may usually be "taken up" on a new machine after it has been run a short time.

LOCKING DEVICES.

The lockiing devices of adjustable parts, such as the carburetor, brake and clutch operating devices, and distance rods, specially require scrutiny on a car newly from the factory. All these parts have presumably been subjected to several experimental adjustments, and it is quite possible that they may have been left somewhat loose during the "tuning up" process and not finally locked, through some inadvertence, when the car was deemed fully adjusted. Then, too, cotter pins, lock nuts or lock washers may have been left out by some careless tester. At any rate, the parts are worthy of an inspection.

Welds in Motor Cars.

By Thomas J. Fay, E. E.

A very large percentage of the welds that are made in parts for motor cars fail sooner or later, and if a weld once made does not fail in its performance, it is a sure sign that the part welded is stronger and heavier than it ought to be. The writer during some of his earlier experiences with motor cars noticed that many of the serious troubles were directly traceable to welds in axles, distance rods, control levers, and other parts that are not easily manufactured without introducing welds. As is generally well appreciated, axles may not be readily die forged in one piece, and it is common practice to weld the two halves. The cost of producing axles in one piece is extremely high in comparison; nevertheless, the security afforded is well worth the increase in cost.

Welds are objectionable for various reasons. If a bar is "notched" it may be readily fractured, this fact being generally known among mechanics, because they utilize the notching process to part a bar at some desired point. The reason the notched bar will break at the notch is because the stresses are concentrated at that point, instead of being spread out uniformly. If a notch put in a bar purposely will result in fracture at the point of notching, an imperfect weld (as welds nearly always are) will effect the same end.

In a motor car the result is a little more pronounced, because the metal is deformed in alternate directions and persistently. Distance rods, knuckle arms, driving spiders and numerous other parts besides axles, are very difficult to forge without resorting to welding. Moreover, the very parts most difficult to make without resorting to welds are the identical parts subjected to strains of the greatest magnitude. Unfortunately, welds in the very parts so difficult to produce without welds spell danger to motorists and a heavy repair bill. Herein lies one of the reasons for the great difference in the cost of quality cars and of cars not inferior in general appearance.

In motor car work it is very difficult to do entirely without welding. The average smith thinks he can make a perfect weld every time, and resents every imputation to the contrary. He may know that some steel products may be welded more or less perfectly, but the steel monger who fills the order for weldable steel may not be so particular, so that what the smith may know would have but small bearing upon the value of welds in the steel in stock.

Although welds are not desirable in ma car parts, it may, nevertheless, be of in est to point out the influences tending limit the weldability of steel. Certain of components of steel are so determined their action from the point of view of we as to prohibit the employment of steel which these components abound, if we are necessary. The fact that steel is said be weldable does not make the weld strong as the unwelded sections of same specimen.

Of the components likely to mingle against weldability there are two divisions They first affect welding no matter wh their proportions, and regardless of oth components. The effect of the other ele is influenced by variation of the other com ponents, or the use of neutralizing agen Arsenic, for instance, reduces the weldi qualities of steel, no matter what its pe centage in the steel may be, and any vari tions in the proportion of the other com ponents do not seem to change this. On the other hand, arsenic does not in any w improve steel for structural or machine pu poses, unless it increases the elongation hardened steel—that is, its ability to wi stand shock stresses.

In the absence of definite data in relati to this matter, arsenic must be viewed as a undesirable component in steel in gener and in steel to be welded in particu Phosphorus, on the other hand, has a mor or less marked effect upon the general m welding qualities of steel, depending upo the carbon percentage present. If the car bon is high, the effect of phosphorus is in tensified. In any case, phosphorus is th most detrimental of all the components o steel, and should only be present in minu quantities. One way to grade motor car steel, aside from its general terms, might b in terms of the phosphorus present, say, as follows:

Per Cent. of Phosphorus.	Grade of Steel
0.10	Quite useless.
0.08	Scarcely worth considering
0.06	Indifferent.
0.04	Fairly good metal.
0.02	Very good metal.
0.01	Thoroughly good metal.

It seems quite safe to grade steel in ac cord with the phosphorus component, abso lutely independent of the other components and while this matter is only partially ger mane to the subject, yet even so it may be well to enlarge upon this phase of the sub ject. With a view, then, to showing the relation between phosphorus and quality in steel, reference may be had to tests of products, and the qualities of the same products, as shown in the table at the top of the next column.

In every instance in which high phosphor us metal failed, low phosphorus steel of no greater section served the purpose, with no sign of failure. True, in some instances a different grade of metal was substituted metal, perhaps, of greater inherent strength but from the evidence that has come to the

Per Cent. of Phosphorus.	Name of Steel.	Service Rendered.
0.105	Machine steel.	As a crank shaft in a motor ruptured in service after running some time.
0.082	Machine steel.	Distance rod in a car parted at the weld.
0.061	Machine steel.	Cardan shaft twisted off in service.
0.05	Nickel steel.	Very satisfactory for responsible work.
0.032	Nickel chrome steel gear.	Of indifferent quality; lower phosphorous metal serves much better.
0.015	Nickel chrome steel gear.	Very fine results under all conditions.
0.023	Acid O. H. steel connecting rods for motors.	Served perfectly well for an extended period in many cases.
0.013	Nickel chrome steel crank shafts.	Thoroughly good in every way.

notice of the writer, all steels with high phosphorus, no matter what the composition otherwise, proved valueless or nearly so, at any rate for the specific purpose for which they were supposed to suffice.

High phosphorus steel is cold-short, treacherous and incapable of resisting successfully any suitable shock test. The writer believes that all concerns should provide themselves with a suitable drop hammer, by means of which shock tests could be made at will on specimens of the metal to be employed, particularly in motor car work. Strange as it may seem, metal may test satisfactorily in every other way, as to tensile strength, elastic limit, elongation and contraction; may hold the rigid percentages of the components said to be proper for use, and yet a shock test may show it to be unsuited for

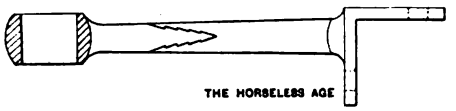


FIG. 1.

the service. Phosphorus is most largely responsible for this peculiarity, hence phosphorus is the one component to be always taken into account. In further relation to this important question, to more clearly bring out the facts, it may not be out of place to take a peep into the processes of iron making as it was conducted in the past, and the differences time has wrought, for it is the change in the process which, for the most part, renders welds so objectionable now.

"Puddle iron," as it was called, was produced by a process involving much personal exertion on the part of the workmen, and the process limited the weight of material that could be rendered plastic and manipulated in the puddling furnaces; but by combining several balls of the product after the "slag" was expelled by hammering, and subjecting the mass to a rolling process, the resultant "puddled bar" would weigh upward of 500 pounds. The puddled bars were afterward cut up into short lengths and laid up into "piles," which in turn were raised to a welding heat.

It is perfectly obvious that weldability was an essential to the production of this iron. The "piles" as they entered the rolls were at full welding heat, hence the need of cutting the bars into short lengths, for at this welding heat but a short length could be picked up integral. The process was of necessity more or less manual, and altogether costly. It also follows that it was a welding process pure and simple, dictated wholly by convenience.

Nevertheless, puddled iron (which is little used at the present time), though not strong, was always a reliable product. The iron was always uniform, owing, no doubt, to the purity of the product, the low carbon component and the process of welding the metal, which involved much work expended thereon.

It is plain from the success of the puddling process that for welding one must raise the mass to a welding heat, and must use a metal not likely to deteriorate in heating to the high temperature required in the process. The chemical composition of puddled iron might be set down as follows: Carbon, .057; silicon, .036; sulphur, .006; phosphorus, .013; manganese, .109; copper, .001; arsenic, .006.

A very low carbon component is a pronounced feature of the composition, while on the whole the iron is comparatively pure, for the total admixture of foreign ingredients represents only 0.228 per cent. Raising metal such as this to a welding heat is easy enough, and a good weld is likely to result if the smith has any skill at all; but puddled iron is not a strong product, nor is it readily obtainable, although there are probably two or three sources of supply in France and Northern Europe, for puddled iron is used to a limited extent for axles and other parts of cars subjected to shock stresses, and which are more easily produced if welds are permissible.

Steel, on the other hand, is a very different product when welding is considered, for the physical qualities of the steel are affected by the heating, the effect depending on (a) the carbon contained; (b) the time heating is continued; (c) the rate of increasing the temperature; (d) the total work done upon the heated products;

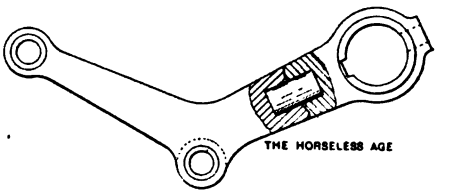


FIG. 2.

(e) the continuity of work and the uniformity thereof between the forging limits of temperature.

Low carbon steel may be welded, but the weld is not as strong as the unwelded section in the same steel. On the other hand, high carbon steel as now to be had is in no sense weldable, for steel with any considerable carbon component cannot be raised to the welding heat, lest it be "burned." Steel with as low as 0.15 carbon is susceptible to heat, and must be handled with care; 0.20 carbon steel becomes entirely unreliable when subjected to a cementing temperature, while 0.50 carbon steel is wholly unmanageable at well below the welding temperature.

While other components are to be taken into account when considering the possibility of welding, the fact remains that carbon is the main stumbling block. To make a weld requires a welding temperature which is far higher than can be attained in carbon steel without burning the metal. What the average smith calls a weld is not a weld at all. Indeed, it is nothing but mechanical pressure and what might be termed a "shark's grip" (see Fig. 1), depending upon the roughened surfaces interlocking with each other, but the temperature usually employed is too low to effect a real weld; or, if it is high enough, the product is so reduced in quality as to preclude its safe employment in a motor car.

Fig. 2 illustrates another kind of so-called weld that affords a good argument to the effect that no real weld is obtained by the usual process, for in this example a pin is used as a coupling between the two members, this proving that the smith has no faith in his own process. The construction shown in Fig. 3 is the absolute limit of absurdity when reference is had to so-called welds, for in this example a cold piece of metal is driven into a hot piece and the two are brought into intimate relation by the pressure of hammer blows. In this case the

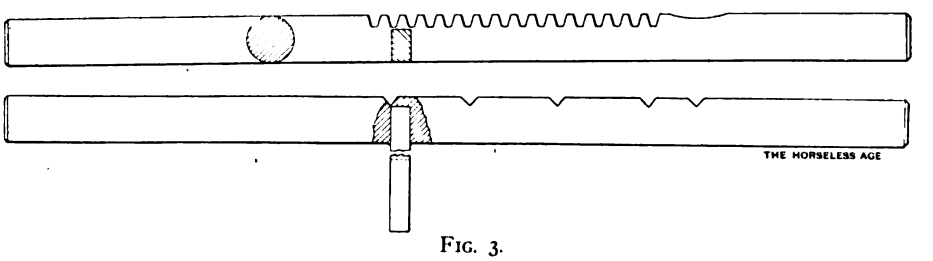


FIG. 3.

claim of a weld is perfectly absurd, since one of the members is cold.

As a further proof of the effect of carbon on the welding qualities of iron and steel, it is only necessary to point out two simple but well authenticated facts, as follows: In the production of puddled iron the "crop ends" of sections or bars are sent to the puddle bars in the pile, and with the rest of the pile are utilized in the production of bars, even improving the qualities of the bars, in which "crop ends" form an appreciable percentage. On the other hand, "crop ends" of steel bars will not weld, hence in the open hearth process they must be remelted, or in the Bessemer process a small portion may go into the melting cupola, or still smaller quantities into the vessel when there is a "hot blow." On the whole, however, the quantity of "crop ends" possible to use in this way is very limited, and the non-welding qualities of steel would prevent the process employed for iron to be used for steel were it not for the fact that steel "crop ends" may be disposed of by the Siemens-Martin process.

On page 300 of Kent's "Mechanical Engineer's Pocket Book" are given some test results on the strength of welds, and the statement is made that "the ratio of weld to solid in all the tests ranging from 37.0 to 95.4 is proof of the great variation of workmanship in welding." Kent is only right about this matter as it is put, because all the tests given were on iron. If steel had been welded and tested, the variations in the workmanship would have been just as great, but the results would have been even worse, for, aside from the workmanship, there would have been the non-welding nature of the material to consider. Even with iron only there were but few of the records that showed better than 75 per cent., while a large number of them fell below 50 per cent.

In a motor car one must take into account the worst possible case, and on such a basis a weld in iron would be worth but 37 per cent. of the same solid section. Fortunately, alloy steel products containing nickel, chromium, vanadium, titanium, tungsten, aluminum, boron, uranium, copper, tin zinc, platinum, manganese and other ingredients, do not lend themselves to the welding process, nor is it likely the future will disclose any change in this direction.

The Responsibility for Damage to a Hired Car.

Whether a person hiring a motor car is liable for tire repair is a point just decided by a Manchester, England, court. A British motorist hired a car for $25 a day for a run from Manchester to Lands End. A back tire burst and a new one, costing $55, was paid for by the customer, who sought to recover from the owner. The judge decided that persons hiring motor cars, like persons hiring cabs, were not responsible for any damage and gave judgment for the

Exhaust Heating for Winter Driving.

BY THE "TROUBLE MAN."

An automobile, on account of its high rate of speed, as compared with other road conveyances, is a very cold vehicle for winter use, and when it is considered that at all times during its operation it is giving off large amounts of waste heat, it is rather surprising that so little use is made of this otherwise useless "caloric" to heat the vehicle and thus render its employment more comfortable during the cold season. Either the circulating water or the exhaust gases may be employed for useful heating, but the latter source is by far the more practical of the two. Some closed vehicles have been warmed by coils, through which the jacket water is caused to circulate, and this method works well, if properly installed, although the full heating effect is not realized until the motor has been run for a certain length of time. It is not generally advisable to attempt to apply an arrangement of hot water coils to an ordinary car, as the cooling system may be deranged by its addition, considerable expense is involved, and the possible chances for water leaks (already numerous enough) are thereby increased.

ADVANTAGES OF EXHAUST GASES.

On the other hand, the exhaust possesses its full temperature as soon as the motor is started; it may be drawn upon to any extent without affecting the operation of the motor, no possibility of annoyingly leaky connections are involved, and the arrangement for utilizing it is very simple and cheap.

ARRANGEMENT OF HEATERS.

For use upon ordinary cars, two foot warmers, set one into the floor board of the front seat and the other into the flooring of the tonneau, will be found very effective, especially if arrangements be made to button the lap robes to the car body in such a way as to confine the heat. These foot warmers should be thin, flat, rectangular chambers of strong sheet iron, in shape like shallow closed boxes. At the upper corners they should be provided with angular lugs riveted on, adapted to rest upon and be fastened to some part of the car frame or floor, and hold the upper surface of the heater about flush with the level of the rest of the footboard.

The seams of the sheet iron of the heater had best be brazed, and several stay bolts should hold together the flat top and bottom. It should be covered with several servings of asbestos paper, well banded into place. Such a heater need not be more than 2½ or 3 inches in depth, and may be of any convenient horizontal length and breadth. On some cars, owing to the presence of interfering portions of the mechanism, it may not be easy to find a place for it in the front footboard, but usually room for it may be found in the section of flooring next the heelboard. This board may be removed or cut away to give space for it. Ordinarily, there will be no difficulty in applying a heater of this sort to the tonneau. A mat of some rather thin material, not too much affected by heat, may cover the first upper surface of the heater and the remaining floor boards.

PIPE CONNECTIONS.

On one end of the heater—whichever may happen to be most convenient—should be a fitting arranged to take a small pipe leading from the muffler or exhaust pipe. This pipe should contain a union, which may readily be broken, and allow of the easy removal of the heater when desired. This should be provided for with especial care in case the presence of the heater prevents access to any important portion of the car mechanism. In this supply pipe, preferably close to its entrance to the heater, should be located a valve capable of withstanding the heat of the gases—an ordinary globe valve should suffice. There should also be inserted in this pipe a fitting containing a fine mesh gauze screen to prevent the communication of flame to the heater and the explosion of any unburnt gases which may have entered it. If desired, a spring check valve opening toward the heater may also be located in this supply pipe.

REGULATION OF HEAT.

At the opposite end of the heater from that at which the supply pipe enters should be drilled a number of very small holes, the number and size of which may best be determined by experiment. Through these fine holes the gases gradually escape, and a current of hot gas is constantly passing slowly through the heater, maintaining it at a suitable temperature. By means of the shut-off valve the entering gas may be throttled to any desired extent, and the temperature of the heater thus controlled in a measure. The supply pipe for the heater may be tapped from the exhaust pipe preferably close to the muffler, or, if more convenient it may be connected to the muffler itself, the connection being made at such a point that the proper pressure may be obtained. When not required the supply of gas to the heater may be entirely shut off by the valve, and during the warm months the whole arrangement may be removed and a plug screwed into the exhaust pipe or muffler shell where the supply pipe was connected.

The use of such foot warmers adds very greatly to the comfort of winter driving and their installation does not involve a large expense. When once properly arranged they should not give any trouble for a long time.

Italian Touring Maps.

The Italian Touring Club, 14 Via Mar Napoleone, Milan, sends us copies of the constitution and bylaws, and of several the touring maps which ought to be of interest to automobile tourists who wish to visit Italy. The two maps sent us relate to the Stelvio and Mont Cenis passes in Upper Italy, and are accompanied by profile maps and considerable descriptive matter, the whole being bound in paper covers.

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...EVERY WEDNESDAY...

Devoted to Motor Interests

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Decline in the Demand for Foreign Cars.

According to cable reports of the daily press from Paris, the January trade in automobiles has been very dull there, owing chiefly to a lessening in the demand for cars for export. The reasons assigned for the decline are that the London Olympia Show, which was held a month before the Paris Show, diverted a great deal of the English business that would otherwise have gone to France, and that the earliness of the season in the United States, which insures purchasers earlier delivery of native built cars, has determined many Americans to buy at home. It is recognized that the other automobile manufacturing countries are rapidly coming into line with the French, and that the competition in the world's market will soon become very severe.

There was a very heavy increase in the importation of French cars into this country during the past year, which may have given French manufacturers rather exaggerated views as to the future market prospects for their product in the United States. They were the first to recognize the large immediate profits to be realized from catering to the demand of what might be called the select automobile purchasing public, while the early American manufacturers, one and all, kept in view the average purchaser and built their cars accordingly. The French have reaped about all the benefits that were to be derived from their policy, for now that the automobile industry in this country has grown to such enormous proportions and a tendency toward specialization is making itself manifest, the would-be purchaser of a luxurious car finds himself provided for by the home industry as much as, if not more than, the purchaser of a cheap but serviceable car. Purchasers of automobiles may be divided roughly into three classes. There are in this country a considerable number of persons to whom money is a small object, and who delight in having a thing simply because the average person cannot afford it. This class will continue to provide purchasers for foreign cars. The next class, those who are simply looking for quality regardless of any other consideration, will soon have no need of going abroad, if indeed they have now. Those, finally, to whom cost is a consideration of prime importance will, in view of the 45 per cent, tariff, hardly go in for imported cars.

It was foreseen that the hold of the French industry upon the American market would be but temporary, and if the report above referred to is based on fact, as we have no reason to doubt, the turning point seems now to have been reached. The decline in the sales of French cars in this country cannot be due to want of quality—indeed, until quite recently all those imported here were of the highest grade—but it was a foregone conclusion that, with the liberal protection which the American industry enjoys, the French would be unable to compete in the American market in the long run.

Recharging of Ignition Storage Batteries.

The accumulator is evidently gaining ground very rapidly as the accepted source of current for ignition purposes, and is, upon the whole, proving extremely reliable and generally satisfactory. Almost the only serious objection to its general use arises from the fact that direct current, suitable for charging it, is very seldom supplied outside the great cities, and is not available in the stables of the majority of motorists—the alternating current being now generally supplied for domestic purposes. To the relatively small proportion of motorists to

whom direct current supply is available the recharging of ignition batteries in the stable by the aid of extremely simple and inexpensive apparatus is an easy matter, but a very large proportion of the users of ignition accumulators are accustomed to rely, for recharging service, upon garages which are equipped with converters for vehicle charging, either of the motor generator or mercury type. The ordinary user of ignition accumulators, who lives outside certain sections of the great cities or has no access to a direct current isolated lighting plant, is accustomed to carry his accumulators to a garage and leave them there to be charged. Considerable inconvenience and delay is often involved, and batteries are not always properly restored or handled in as careful a manner as the owner could wish. The charging of these small four or six volt batteries from the comparatively large and high voltage rectifiers employed for vehicle charging is a very wasteful process, and the first cost of such powerful apparatus is too great to warrant its installation in a private stable for such small work as ignition battery charging.

It is only recently that rectifying apparatus, properly adapted in size to this requirement and not involving an excessive outlay, has been placed upon the market.

Three kinds of rectifiers, of small capacity and low voltage, are now obtainable which are suitable for private use.

The mercury arc rectifier, which has been fully described in these columns, is now offered in a small and convenient form of appropriate output, designed especially for this service. Miniature motor generator sets, consisting of a small single phase alternating current motor, direct connected to a low voltage direct current generator, of a capacity of one-tenth kilowatt, more or less, are also to be had. Such a little outfit is readily installed upon a small shelf in the stable and operated from the alternating current lighting circuit. Rectifiers of the electrolytic or chemical type are also to be had, giving an output commensurate to the demands of this service at an appropriately low voltage.

An outfit of any one of these three types would not appreciably encumber a private stable, and its first cost would not be prohibitive. To anyone making an extensive use of ignition accumulators the use of such an arrangement would probably in the

rove a decided economy.

Lubrication in Cold Weather.

It should be carefully borne in mind by all who use motor vehicles during the winter months that low temperatures involve special dangers to the car mechanism, resulting from failure of lubrication devices. Automobile oils increase in viscosity very markedly when subjected to cold, and under extreme conditions become semi-solid and incapable of flowing, except when under the influence of very considerable pressure. Unless the means of feeding the lubricant to the various bearings be absolutely positive, there is no certainty that oil is being properly distributed, in very cold weather, unless the lubricant supply and its flow pipes are so located as to benefit from the heat developed from the engine to an extent sufficient to prevent the dangerous solidification of the lubricant contained within them.

Many, if not most, mechanical lubricators using individual pumps are sufficiently positive in their action to drive the lubricant through a small and exposed pipe, even though the oil be rendered very viscous through cold. The oil in the lubricator reservoir must, however, be sufficiently fluid to allow the pumps to fill and operate properly, and hence the oil reservoir must be so placed as to be under the influence of heat from the motor.

Gas pressure lubricators which distribute oil through tubes, under the influence of pressure derived from the crank case, are likely to prove much less positive in cold weather than are those of the mechanically driven type, the pressure acting upon the oil being relatively low. It may prove insufficient to force the lubricant through the pipes when it is very viscous through cold, and serious damage to important bearings may result. The same objection may be made in regard to gas pressure lubricators operated by the exhaust, although in a less degree. The oil in the reservoir of this kind of lubricator is likely to be kept well warmed and fluid by the gases which produce the pressure, and this is also true in the type of oiler employing crank case pressure.

Oil cups arranged to feed by gravity are not to be depended upon in very cold weather, unless they are placed where they are constantly kept warm and are attached directly to the points they are designed to supply.

With an oil supply under powerful pressure, located where it will be kept moderately warm at all times, the use of lubricant of a rather low normal viscosity, and distributing pipes of short length and exposed as little as may be, good results may be relied upon, even in the coldest weather, but when these conditions are not properly fulfilled a high degree of watchfulness should be maintained in order that damage to bearings may be avoided.

"Literary Advertisements."

The *Times* of London, which the average Englishman regards as the greatest newspaper in the world, has recently introduced what it is pleased to call "literary advertisements," consisting of articles on the wares of manufacturing firms or commercial houses, prepared by the staff of the *Times* and paid for at more than the usual advertising rates of that paper by the firm concerned. Although the articles are prepared by the *Times'* own writers and published as editorial matter, advertisers are informed in a circular that the text will be changed in any way desired by them. It appears that special efforts are now being made to induce automobile firms to "literary-advertise" their goods.

One of the first firms to take space in the *Times* literary-advertising columns was a London agency for a French automobile manufacturer seeking to introduce French motor omnibuses in the British capital. This literary advertisement was entitled "The Coming of the Motor Bus," and was chiefly a belittlement of the British automobile industry. Such an epistle, in the Little Englander style, reads particularly queerish in the columns of the *Times*, which politically is of notoriously jingoistic tendencies, and cannot see anything good outside the British Isles and the colonies. But business is business, and politics is politics.

In this respect the New York dailies follow an entirely different policy. We have no doubt that the appreciatively written trade notes which a number of them are printing regularly, and which must be of vital interest to the tradespeople to whom they refer, even if they are not to the average reader, are inserted absolutely free of charge. Their number is nearly always a direct multiple of the number of automobile advertisements carried in the same issue of the paper, usually three notes per advertisement, although occasionally the exigencies of make up or other conditions may mar this studied proportion to some extent.

The Chauffeur.

By W. B. Harsel.

w many owners of automobiles when g their driver ever look into his capa- as to handling their particular car? following article is intended to give rs some hints in regard to the selec- of a competent driver.

gentleman in selecting a car desires cure the neatest and simplest he can considering its construction and oper-, and also to secure a suitable driver, who will look after his car and keep it nape. Consequently, he is undecided where to get one, and some of his ds perhaps suggest that he ought to a driver from the factory, or, better select a bright, intelligent, young man, send him to the factory to be instruct- nd when his car is ready the driver be in trim.

happen to know of several first class ufacturers who employ in their engine repair departments such help as stu-; that is to say, men who offer their ces gratis for a stated term, say, three ths, with the understanding that at expiration of that time they are to be mmended as drivers, and the same tical person you personally select must ired under the same conditions.

ow, in the beginning, the person may r have had a hammer or wrench in hand or know the difference between il can and a flywheel; he is started in the same, we will say, in the engine nbly department. The first few days really industrious; he is instructed in use of tools and turned over to the sub-man, who, perhaps, has a dozen or engines under way in a particular of the department. As he is not a nanic, he is given a wrench and screw-er to set up bolts and screws. After w days he tires of this and demands r work. He is given, perhaps, a ham- file, etc., and turned over to the in-tor, who will give him a pump, wheel, uretor or some easy job to fit or put It will not be anything of importance, ever, as he could not do it. In the ntime pay day has arrived and he ws that he does not have any coin com- to him, and in consequence makes up mind not to work so hard. He doesn't to, as he does not get paid for it. asks his foreman to be transferred to test stand, and after a day or so thinks knows about all the kinks of the ne, and is tired of cranking the engine , anyway; in consequence he goes back he regular work again. He is given necting rods to assemble on crank ts, or perhaps the caps to shine up put back in place, and after a time s familiar with the engine and may be rved leaning up against the post or h watching other people work.

perhaps, is the manner and extent inst tion for a stated time; the nd if he is dense that is no concern of theirs. However, he gets a largeness of the head and thinks he can pull the engine down and put it up again as good as any one. This may be true, inasmuch as the parts usually go together without very much trouble. He puts up a "holler" to go out on rough testing of cars and is transferred to the yards, filling gasoline tanks, oiling and greasing necessary parts, and receiving instruction in the several adjustments, and finally after eight or ten days he can perhaps handle a car nicely, and gradually becomes familiar with the little troubles connected with the machine, and every chance he gets he drives at top speed, and finally is ready to go out with a car as a competent driver.

We will assume this particular driver is selected to go with the $3,000 car just purchased by Mr. So-and-So. The owner arrives for his car. Mr. Driver swells up, explains various things, gives the owner plenty of hot air and the owner goes along rejoicing—fine car, swell driver, etc. Usually a new car gives very little trouble the first season, as it all depends on management and the use the car has had, and we will say the car for the season has had good luck, just a few adjustments and the unavoidable tire troubles. The owner and driver will be blowing and telling all their friends that they have driven so many thousand miles and have never touched a thing and their friends ought to have purchased a car like theirs.

In the meantime there is a nasty little knock or rattle developing somewhere in the car, and the owner calls the driver's attention to same. The driver assures him that it is nothing and it will be taken care of in accordance with the owner's wishes. He looks all over the outfit thoroughly externally; he cannot locate it, and satisfies himself that it doesn't do any damage and lets it go at that. He is told to get the car ready for a trip; the owner and party start out and the owner tells the driver to "cut loose" and show his friends what he can do. Somehow the car is not at its best and there is a strained feeling somewhere, and the driver realizes that he must coax the car if he ever wants to get it home. He has had to stop several times and make adjustments, but the car doesn't respond to the usual treatment and he just manages to crawl home. The owner is mad and demands to know what the trouble is. The driver finally states the car is all out of joint and should be thoroughly overhauled. He cannot do it, and consequently the car is shipped back to the factory to be overhauled.

Let us see what condition the outfit is in when it arrives. The repair department receives the car and removes the engine from the frame, sets it on horses or a truck and slides it down to the engine repair department, with orders to thoroughly overhaul it. The first thing to do is to clean or scrape off the dirt, this being necessary before the nuts and bolts can be located. The next operation is to remove all small parts, then the oil pan and oil case, if any. The oil pan is found about half full of black, gritty oil, which simply means that the driver did not clean it about once a week, as he should have. Next, when the cylinders are removed it will be noted that these are awfully coated with carbon on top of the piston and on the head of the cylinder, all of which must be removed. The valve seats are all pit-marked and will not hold compression. They should have been reground several times during the season. On further examination the piston rings and cylinders are found badly worn, and a few rings are black in places where the explosion has blown through. We also find one or more wrist pins badly "frozen" or burned fast to the connecting rod, so badly that it is necessary to smash the piston in order to remove the pin; cause, lack of oil or too tight a fit in the first place.

The next operation is to remove the crank shaft. Upon examination of the connecting rod caps we find several with a blued or burned appearance, and that the bearings are all scored up; also that shims have been entirely removed from one or more caps, or about half of the shims removed unequally from the caps, which would indicate that the driver did not know what he was doing or how to do it. This means that the crank shaft must be filed and polished on all main bearings, as well as the wrist pin bearings; also that all bearings must be scraped, both in the crank case and in the connecting rods, and in many cases new bushings must be put in, as the old ones are too badly worn to stand the scraping and refitting, and the caps must be remilled to give the proper clearance for shims, if the old ones can be used. In addition to all this, new keys must be refitted all over the engine wherever keys are used, and the crank shaft must be straightened; new piston rings, and perhaps a new piston in addition to the ones that were smashed to get the wrist pin out, must be fitted; all of which means time, say, perhaps three days for two or three men, at a charge of from 70 cents to $1 per hour for time, in addition to the cost of new parts.

In the meantime, what about the rest of the car? Gears are worn out, the shafting is rent, the chain, if any, is worn so that it is useless; the clutches are loose and the car in general needs a thorough overhauling, and many small parts are fit for scrap iron. The wheels are shaky and so are, too, many other parts too numerous to mention. Of course, this car has run 2,000 miles, and has never been touched. A piece of machinery that is subjected to so many changes of conditions as an auto must be looked after all the time. Why could not the driver save the owner all this expense and overhaul the car? He simply could not do it to save his life, with the limited amount of experience, such as hundreds of so-called drivers have, and there was too much work about it, anyway.

All he was paid to do was to run the car.

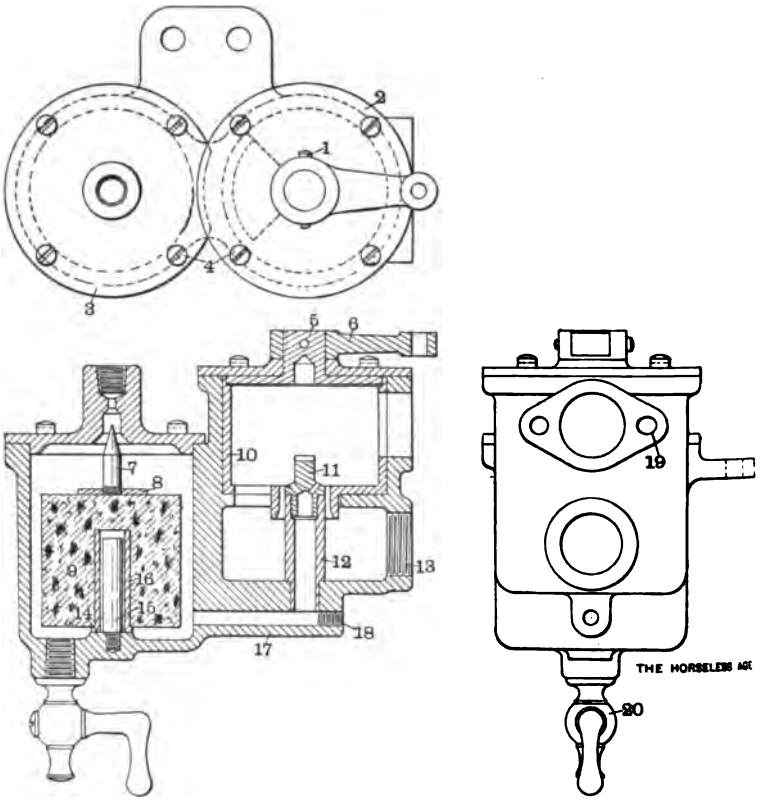
This is not half of what could be said in regard to some of the drivers. There are also many good and bright ones, and to such I gladly give due recognition. It would have been better satisfaction to the owner to have hired a good first class machinist and paid him the salary he pays the ordinary driver; the machinist would have kept the car in better shape, as his intelligence or a brighter mechanical mind would naturally make him look after these things. It is just as easy to teach a mechanic to run a car as it is a student. Furthermore, first class mechanics do not get the salary you pay your chauffeur, and it is to be hoped the time is near at hand when a man to be a driver will have to pass a civil service examination as to his mechanical ability, and only then can the owners be assured of competent operators and drivers, who will look after their employers' interests.

A Carburetor Design.

By Harry Allen.

The drawings herewith illustrate a carburetor of simple design and of the conventional float feed, spraying type; its construction will be explained by reference to the drawings.

In the first place, the body, 17, can either be an aluminum or a brass casting, but is preferably made of brass. In the float chamber the only finishing required is on the boss at the bottom, which can, however, be spot faced and then drilled to take piece 15. Then drill and tap the boss on the bottom for a ⅛ pet cock. At the top of the chamber just finish down enough to take care of the flange on the cover; then tap the flange of the body for 3-16 inch fillister head screws. At 18 we drill straight through into the float chamber, and then tap the end and plug it. At 13 the casting may be tapped to take a pipe for admitting hot air and only the upper part of the body, that is the valve chamber, is finished, and the flange is tapped as before for fillister screws. The flange at the side is faced and tapped to bolt another flange upon to convey the mixture to the cylinders. The arm on the side is drilled and is used to fasten the carburetor to the frame, engine or wherever one may wish it. The partition in the valve chamber has a V shaped opening in it, and the bottom of the valve is provided with a similar opening to allow the incoming air to pulverize or spray the gasoline; when the valve is turned to close this spring the carburetor is throttled. There is a boss cast upon the cover of the valve chamber, so that one will know when the arm is back against it that the carburetor is completely throttled. This cover, the same as the float chamber cover, is drilled for fillister head fastening screws. The float chamber cover is tapped for a ⅛ inch pipe fitting. The needle 7 has soldered to it the circular disc 8, which is fastened to the float by tacks or short springs. The float itself is of cork, and is drilled at the bottom for the brass bushing 16, to which is soldered a washer to keep the float level on the boss at the bottom. The bushing 16 is put in the float tight, the float guide 15 is shouldered at one end, and made a driving fit in the body itself. The float is then dropped over the guide, and the cover is put on. As the gasoline comes in at the top, it causes the float to rise, thereby shutting off the gasoline supply. From the float chamber the gasoline passes up through the drilled hole, up through the standpipe, into which the spray nozzle is screwed at the top. The standpipe 12 is put into the body with a drive fit, and then the piece 11 is screwed



Carburetor Design.

into it. The latter has three small holes drilled at an angle into the interior drill hole. This piece is made separate, that it may be readily removed and the small holes cleaned. These holes are known to clog up sometimes. As the gasoline comes up through this piece, the incoming air, swishing all around it, makes the gas which goes out the flanged opening to the cylinders. The valve body 10 is machined all over on the outside, and down a slight distance at the top inside, into which is fitted the top piece 5 of the valve, which is also finished on the sides and on top, and drilled at the bottom to make it lighter. A small lever or arm 6, fastened to the valve by a taper pin, serves to control the carburetor in throttling it. The pet cock 20 is put at the bottom of the carburetor to drain it and also to get gasoline at any time one may need it, as, for instance, after having repaired the car and gotten dirty hands, etc. The float may be made [illegible] per, and the needle and washer [illegible] to it; in that case the guide bushing case could go all the way through [illegible] No sizes are given. The covers [illegible] on by plain fillister head screws. [illegible] carburetor is a good, substantial [illegible] few parts, and not easily put out [illegible]

Motor Omnibus Fires.

Fires are occurring with disquiet[illegible] quency just now in the machinery [illegible] of motor omnibuses, says a London [illegible] On January 25 two mishaps of th[illegible] were reported. The more serious [illegible] place in the Haymarket late in the [illegible] ing, when two fire engines were sum[illegible] to extinguish the fire, which total[illegible] stroyed the fore-carriage and damaged [illegible] machinery. The omnibus was proceed[illegible] northward when a sheet of fire burst [illegible] denly from beneath the driver's footb[illegible] Immediately afterward flames burst [illegible] the seat by the side of the driver, who [illegible] mediately stopped the omnibus, and, [illegible] locating the fire in a leaking pipe, cu[illegible] a valve in the tank, and allowed the [illegible] line to run off into the drain. Four of [illegible] passengers on the omnibus promptly [illegible] scended, but two elderly ladies sitting [illegible] side kept their seats until warned by [illegible] conductor.

The second accident occurred in [illegible] Strand. The passengers had descend[illegible] from the omnibus when flames were [illegible] darting from under the driver's seat. [illegible] vehicle was promptly taken into Chan[illegible] street, when a few bucketfuls of sand [illegible] tinguished the blaze.

Vehicles and Parts.

"Silent Knight" 35-40 Horse Power Touring Car.

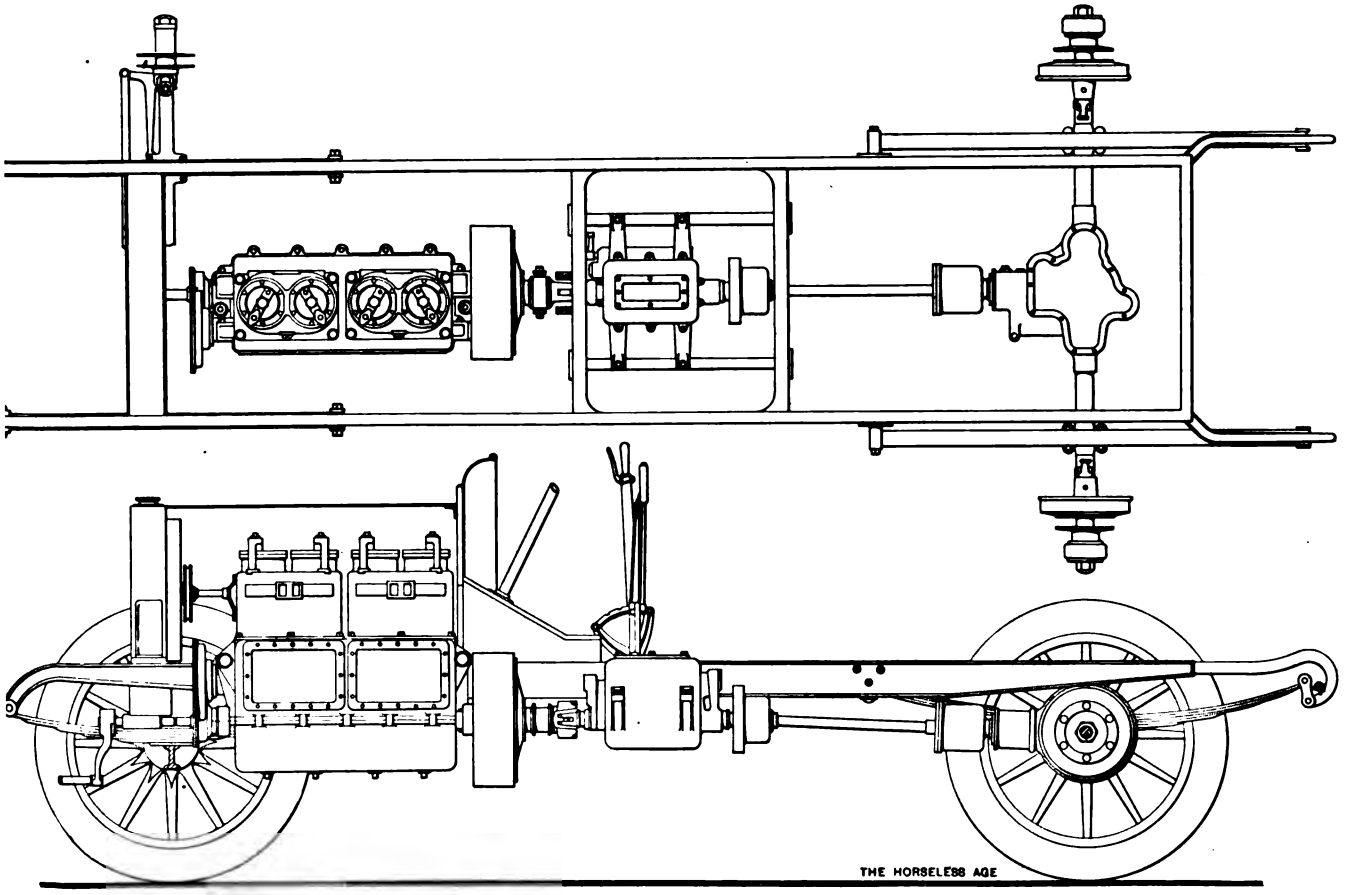
show herewith some drawings of a be marketed this season by Knight lbourne, a Chicago concern, and was exhibited at the Chicago Show /eek. The most interesting part of ır is the engine, a valveless, four cycle which is the invention of Charles Y. .t, of Chicago. The car is the design E. Pfeffer, who has been connected automobile and gasoline engine manırers in Chicago for a number of

the design of this motor the followbjects were aimed at: (1) Intake and ıst controlled positively by registering ler ports actuated by connecting links the crank shaft. (2) A substantially ical explosion chamber, in order to e the loss of heat through the walls minimum. (3) Compression chammachined over their entire surface, insuring absolute equality of the comion in the different cylinders. (4) cing cylinders machined both inside out, to prevent distortion owing to ual heat expansion resulting from unthickness. (5) Rapidly opening ext and intake ports without tortuous ıges which result in throttling of the ge and reducing the weight of mixtaken in per cycle. (6) Noiselessness in operation combined with a separate high pressure, scavenging exhaust obtained without the use of valves. (7) Ready access to the cylinders from the outer end without removing the cylinders or using bolted pressure retaining joints, and having all moving members placed inside the cylinder. We are informed that the greatest difficulty in working out the present design was to provide a suitable cut-off port combination in connection with a simple and positive drive with only a few joints and parts.

ENGINE DETAILS.

The four cylinder engine utilized in the 1906 "Silent Knight" car has its cylinders cast in pairs, the bore being 4½ inches and the stroke 5½ inches. The crank chamber is so made that the bottom half can be removed without disturbing the centre bearing, enabling the end bearings to be inspected with shaft and all revolving parts in place. The axes of the cylinders are placed to one side of the axis of the crank shaft. The detailed construction of the cylinders can best be seen in the vertical end section. The casings have the walls A made with a 11-16 inch water space and are bolted to the top of the crank B. The cylinder head, of ordinary piston construction, sets into the top of the cylinder and is bolted at the top by a flange with vertical bolts to the top of the water jacket casing, which in turn is bolted to the crank case. On this head are compression rings, serving to hold the compression between the head and the inner sleeve. The inner sleeve H is next to the piston, is machined all over and has a wall 3-16 inch thick. It has on the bottom at the left side an integral lug M, by which it is secured to the short connecting rod O, that has its other end attached to the eccentric shaft Q, which corresponds with the cam shaft in the ordinary gasoline engine. The outer sleeve K has a wall thickness of only 1-16 inch, is completely machined and ground, and works between the inner sleeve and the cylinder walls. It, too, like the inner one, has on its lower side a lug N, by which it is secured to the short connecting rod P that joins the sleeve with the eccentric shaft. The eccentric shaft is driven by two to one gears on the front end of the crank shaft, so that it revolves half as fast as the crank shaft. The movement of each of the sleeves is but 1 1-16 inches, while the piston has a stroke of 5½ inches. The sleeves are made from gray iron and are turned on specially made jigs. They are a free fit, the outer one in the cylinder casing and the inner within the outer.

Both of these sleeves, operating with an eccentric throw of 17-32 inch, have three ports or openings in their walls, two on opposite sides near the top and one at the bottom. The latter one is shown at R and is what is commonly known as an auxiliary exhaust, which in this case is the main or high pressure exhaust. This port is made by cutting out of the sleeve a strip of



CHASSIS OF "SILENT KNIGHT" GASOLINE TOURING CAR.

metal five-sixteenth inch wide and equal in length to half of the circumference of the sleeve. This port is so located that it opens when the piston is approximately one-half inch from the bottom dead centre and remains open until closed by the piston on the exhaust stroke, the crank pin thus traveling about 90 degrees, while the port is entirely or partly open. The port R in the illustration is shown as it actually is when the piston is at the bottom dead centre on the explosive stroke, the ports in both the outer and inner sleeves are in full register, and both are registering with the exit opening G through the water casing, from which leads an independent muffler piping.

The ports in the top of the sleeves are operated similarly. The mixture enters at the left side (in the illustration) through the opening E, and in the outer sleeve is shown the port T, considerably above the inlet opening in the water casing, while the port V in the inner sleeve is just opposite or registering with the top part or the intake opening. On the opposite side of the illustration is the scavenging exhaust port F, in the water casing, and in the inner sleeve is the port U and in the outer port S. The piston being just at the end of the explosion stroke and the beginning of the scavening stroke, as the piston rises, the sleeves are drawn down so that the ports U and S in the sleeves will register and both move down opposite the opening F, which is connected by piping with a muffler. As shown, neither U nor S registers with F during the first portion of the exhaust stroke, as long as the lower main exhaust is open, but both are timed to register later and offer a free outlet to the remaining gases, when the high pressure exhaust has been cut off. This divides the low and high pressure exhaust, preventing back pressure from the high pressure port during the scavenging portion of the exhaust stroke.

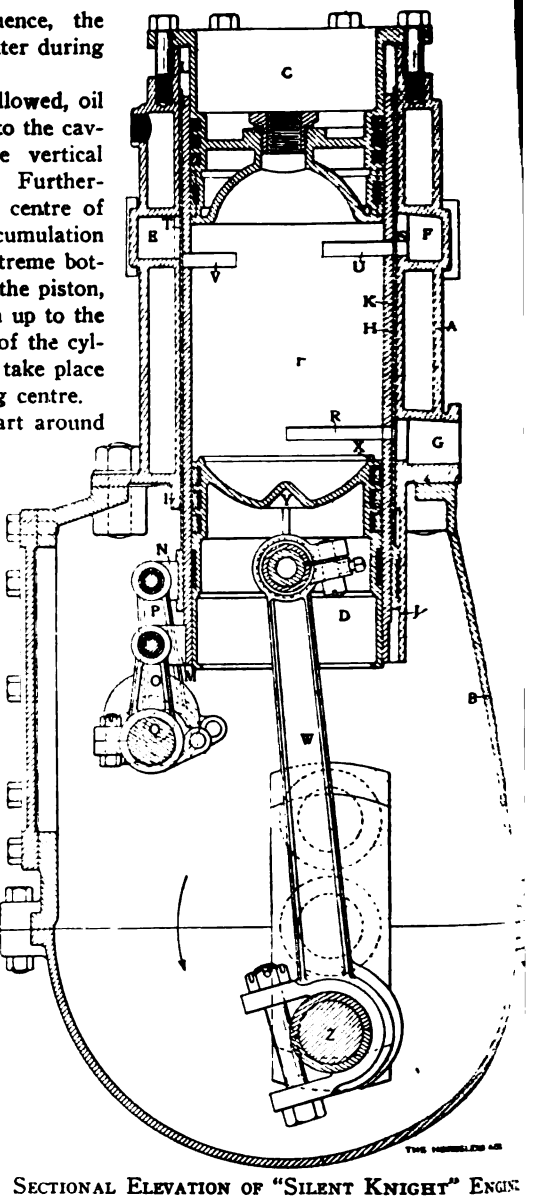
It will be seen that the inlet port is at this moment closed by the thin outer sleeve. The inlet port is not opened until the piston is slightly past the top dead centre after the scavenging exhaust ports have closed and the suction stroke has commenced. When slightly past the top dead centre the inlet ports on both sleeves register opposite the port E and continue to register until the piston is slightly past the bottom dead centre and the compression stroke has commenced. The inlet port in each sleeve is five-sixteenth inch wide, and of ample length for admitting the mixture. The exhaust ports on the top and the intake ports are of the same size, so that the exhaust ports on the right side do not remain open, but are pushed out of the way, as it were, while the inlet ones on the left are in register. It will be noted that the former ports on the inner sleeve are slightly higher than the exhaust. The sleeves are set so that the inner one leads the outer at all times by one-eighth revolution of the eccentric shaft, and the two are so timed as to prevent the inner port being exposed to the cylinder whenever the cylinder contains pressure of any consequence, the outer sleeve acting only as a shutter during extremely low cylinder pressures.

The top of the piston being hollowed, oil would have a tendency to flow into the cavity, which is prevented by the vertical flange X around the piston heads. Furthermore, the conical raise Y in the centre of the piston head prevents the accumulation of oil residue at the centre or extreme bottom of the cavity at the back of the piston, and in turn prevents direct splash up to the spark plug, located in the centre of the cylinder head, causing the splash to take place in ring form around the sparking centre.

The top of the sleeves—that part around the combustion chamber—will be subjected to the greatest amount of heat, and, as can be seen in the end section, the tops of the sleeves pass between two water jacketed surfaces. The reciprocation of the sleeves, one within the other, aids in distributing the heat over a long surface instead of keeping it in one place.

From the illustration it can be seen that the sleeves have a guide on the back side, within the crank case. This is simply a vertical slot guide to keep the sleeves restrained from moving about their axes. The eccentric shaft has 1⅛ inch bearings throughout, three main bearings and eight eccentric rod bearings for the sleeve drives. This shaft is turned from a solid forging. Its end bearings are in the ends of the crank case, the front one being 3½ inches long and the rear and centre ones 2½ inches. The bearings are made from bronze, with a babbitt lining. The sleeve connecting rods are also made from bronze, those working the inner sleeve being 2½ inches from centre to centre, and those for the outer sleeve 3⅝ inches from centre to centre. The attachment to the two lugs M and N on the bottom of the sleeves is by distance sleeves on a cross bolt, and where the rods are secured to the eccentric shaft a hinged cap is used, the cap being held at the side opposite to the hinge by a screw bolt, nut and cotter pin arrangements being provided for oiling from the interior of the crank case.

The crank shaft is a four throw forging and has three main bearings; it is forged from a special steel and has its bearing surfaces hardened and ground. The pistons are fitted with lap compression rings at the upper end and are ground all over. The construction is very light, being machined inside and out. Set screw fastening is abolished and a snap butt joint ring clearing the cylinder is utilized to stay the gudgeon pin and to accumulate oil. The piston is made tapering, being smaller at the top end, to allow for the greater expansion at that end. The connecting rods are I section steel drop forgings bushed with bronze at the crank end and fitted with a hardened steel bushing at the piston end, the crank end being split and provided with adjustment for wear. The wrist pin is hollow and hardened and plays its part in the lubricating system of the engine.



SECTIONAL ELEVATION OF "SILENT KNIGHT" ENGINE

The aluminum crank case is a plain casting, all cast supports being avoided. Shelby steel tubing cross members are employed instead, which pass through the heads on either end of the top part of case without interfering with access to the side of the motor. The flywheel is secured to a flange on the crank shaft by six bolts and radial driving keys. Its rim is turned internally to a taper to receive the aluminum leather covered cone clutch, which is secured by bolts to a flange on the clutch shaft, running free upon an extension of the engine shaft. The clutch is engaged by one helical spring on a [illegible] clutch and forming a part bearing on the engine

ment of the springs admits of quick adjustment and renewal in case of necessity.

Ignition is by jump spark with the batteries, coil and commutator carried in the same box, so that the only portion of the system visible is the four cables with friction clamp to the plugs, and the plugs themselves.

COOLING.

A cellular cooler with fan behind it is carried upon the forward part of the frame. Means are provided for adjusting the tension of the endless belt, by means of which the fan is driven from the shaft. The circulating pump, which is of the centrifugal type, is located on the forward left hand arm of the engine, and is driven by enclosed gearing at a speed twice that of the engine. The water connections are of copper.

The frame is of pressed steel construction, made from twenty to thirty point carbon stock. The side members are 4⅛ inches deep at the centre and taper to 2¾ inches at the ends. The flanges are 1½ inches wide and the thickness of metal is three-sixteenth inch. Semi-elliptic springs are used, the front springs being 40 inches long and the rear springs 52 inches. The front springs are shackled at their rear ends, the shackles being under tension. This arrangement is adopted to prevent the possibility of the spring slipping under the shackles and thereby endangering the steering. The rear springs are positively connected to brackets in front and shackled at the rear ends.

The change speed gear is of the sliding pinion type and gives three forward speeds and one reverse, with direct drive on top speed. The gear casing consists of three parts, a middle part, a top and a bottom, all of aluminum. The gear box contains a single liding set, which is operated by a single hand lever at the driver's right, moving on a notched quadrant. By moving this lever from its extreme rear position forward the reverse, neutral, first, second and third forward speeds are obtained in succession. The change gear lever, as well as the adjoining brake lever, is a steel forging, brass plated. On the top speed the drive is direct, this being obtained by a positive clutch engagement. From the gear box the power is transmitted to the rear live axle by a Cardan shaft and bevel gears, the ratio of the latter being 2½ to 1. The differential gear is of the bevel type, three pinions being used. These are enclosed together with the driving gear in a casing on the rear axle. The rear axle, made of nickel steel, is extra heavy and runs on large ball bearings. The thrust of the large bevel gear is taken by a separate ball bearing entirely independent of the driving axle bearings, so that it is impossible for the bevel gears to be drawn out of mesh by the wear and consequent adjustment of the driving axle bearings. These gears are hardened and run in oil and grease.

STEERING GEAR.

The steering gear is of large diameter, with hand wheel on the top of a considerably inclined tubular steering post. At the lower end of the shaft to which the hand wheel is secured is a multiple threaded screw, with special thrust bearings. The cross steering rod is in front of front axle. The steering column consists of three concentric tubes, the outer of these serving as a standard or support. There are mounted on the steering column two small handles for operating the ignition timer and the fuel supply. These can be operated without taking the hands from the steering wheel. On the left hand side of the steering wheel is a switch button, by means of which the motor can be stopped at a moment's notice.

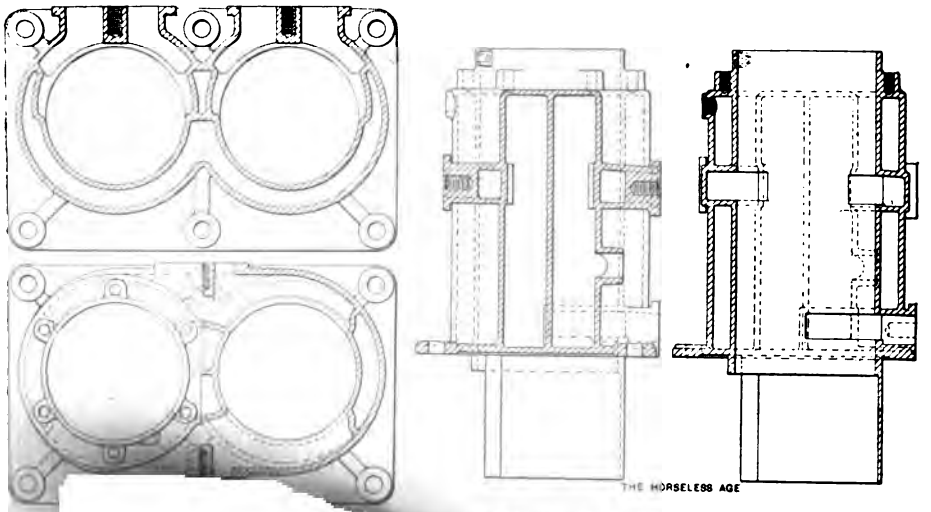
AXLES AND BRAKES.

The front axle is a one piece drop forging of heavy I beam section. The axle forms an inverted arch of large radius, thus avoiding any sharp bends that would tend to weaken it. The steering knuckles are steel forgings of liberal dimensions. The steering pivots are bushed with phosphor bronze, while the front wheels run on ball bearings. Notable are the type of ball joints for the steering rod connections, which automatically take up any lost motion. Wood artillery wheels are used, 34 inches in diameter, fitted with 4½ inch detachable tires.

The rear axle has hubs constructed similarly to the front hubs, with large ball thrust supports throughout. The divided shaft is continuous, of 1½ inches diameter. A long torsion rod is provided to take the reaction of the drive and the hub brakes. The emergency hand lever brakes are integral with the rear hubs, being of the internal dust-proof type, of liberal diameter and constructed to take up wear without interfering with their effectiveness or the sensitiveness of the automatic release. The operating foot pedal brake acts through a steel enveloping band on a large diameter drum placed on the main transmission shaft next to the first universal joint on the Cardan shaft.

BODY.

The car is fitted with a double side entrance body, the side door opening from the front toward the rear. The normal capacity is five passengers. The hood is of the hinged type, and provided with louvres in the sides. Large flaring fenders and continuous running boards are fitted. The wheel base of the car is 112 inches, while the weight is approximately 2,700 pounds.



"NT KNIGHT" CYLINDER CASTING.

The Sturtevant Automatic Control System as Fitted to Stock Cars.

In order to demonstrate the applicability of the Sturtevant system of automatic control (see THE HORSELESS AGE of March 15, 1905) to ordinary stock cars of moderate power, a standard two cylinder Maxwell 16 horse power touring car and a standard four cylinder 12 horse power Franklin runabout have been fitted with the automatic control system. In fact, the arrangement is capable of application to any type of gasoline car, and it is the intention of the Sturtevant Company to license automobile manufacturers to use its patents and build automatic change speed gears in their own shops to fit their own cars.

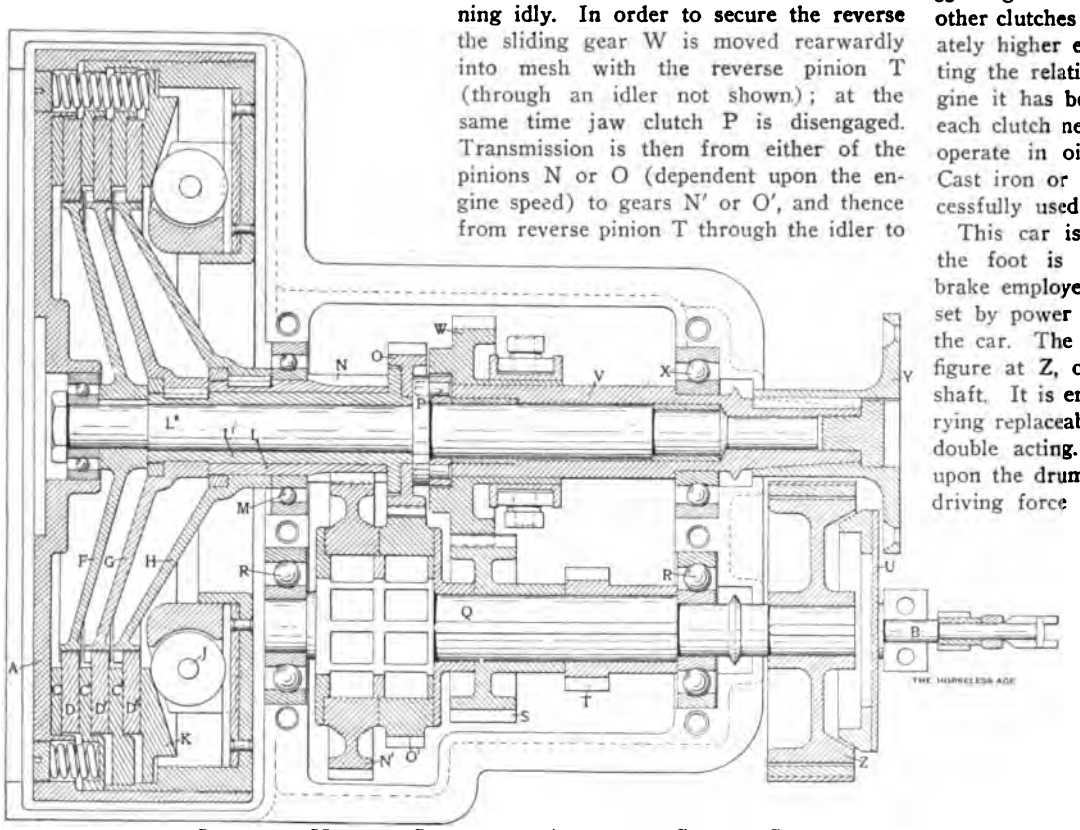
FITTED ON MAXWELL CAR.

The Maxwell car is of the regular type, with opposed motor placed transversely under the hood and arranged with rearwardly inclined crank shaft and bevel gear drive. A new crank case was provided, and to this is bolted the combined flywheel and clutch casing and gear box, which is dust and oil tight and forms a structure integral with the engine—the Maxwell three point suspension being retained. The figure herewith shows a horizontal section of the clutch housing and gear box. A is a shell bolted to the engine flywheel, which is carried upon shaft L″ on a ball bearing. C, C′ and C″ are annular clutch plates fast to the shell A. D, D′ and D″ are other clutch plates, carried, respectively, by the high, intermediate and low gear clutch spiders F, G and H.

J J are the two centrifugally actuated, roller guided operating weights of the low

clutch. The operating weights of the other two clutches are out of the plane of the paper. Centrifugal force of rotation, acting against springs, causes the weight J J to slide outwardly upon a system of rollers running on fixed guides and upon the clutch tightening movable wedges K K, which the outward motion of the weights actuates, to effect clutch engagement.

The high clutch spider F is fast to the shaft L", the intermediate clutch spider G is fast to the sleeve L', which surrounds and runs on shaft L", and the low clutch spider H is fast to the sleeve L, which surrounds and turns on sleeve L'. The sleeve L turns in the ball bearing M M.



SECTIONAL VIEW OF STURTEVANT AUTOMATIC CHANGE GEAR.

Upon sleeve L is cut the low gear driven pinion N, and on sleeve L' is mounted the intermediate driving pinion O. Shaft L" carries at its rear extremity one member of a jaw clutch P. The low gear driving pinion N is in constant mesh with the low speed driven gear N', and the intermediate driving pinion O is in constant mesh with the intermediate driven gear O'. These two gears are mounted upon the side shaft Q, which is supported in the ball bearings R R. The hubs of these two gears contain the roller ratchets already referred to, but not shown in the figure. Fast upon the side shaft Q is also mounted the gear S and the reverse pinion T.

The sliding sleeve V, to which the driving flange Y is attached, is free to revolve upon shaft L" and is carried by the ball bearings X X. Upon this sleeve is slidably mounted the gear W, and upon its forward face is the other member of the jaw clutch previously mentioned.

Under the ordinary operative conditions of this change speed gear, the jaw clutch P is in engagement and the low gear acts through clutch spider H, sleeve L, pinion N, gear N', shaft Q and gears S and W to sleeve V and driving flange Y. On the middle speed transmission is through clutch spider G, sleeve L', pinion O, gears O', S and W to the sleeve V and the driving flange Y, the roller ratchet in N' meanwhile running idly in its reverse direction.

On the high gear the drive is through clutch spider F, shaft L", jaw clutch P and sleeve V to the driving flange Y, the roller ratchets of both the gears N' and O' running idly. In order to secure the reverse the sliding gear W is moved rearwardly into mesh with the reverse pinion T (through an idler not shown); at the same time jaw clutch P is disengaged. Transmission is then from either of the pinions N or O (dependent upon the engine speed) to gears N' or O', and thence from reverse pinion T through the idler to gear W, thus driving sleeve V and driving flange Y in the reverse direction. Sliding gear W also has a neutral position in which the jaw clutch is disengaged, but the reverse combination not meshed. When the elements are in this position the direct drive is cut out entirely, as the high clutch acting through spider F revolves idly the free member of the jaw clutch in shaft L". In traveling very hilly country it might sometimes happen that on account of the high road resistance the car could run only occasionally on the high gear, and then, owing to the great tractive resistance, would not make so good speed as it would were it running on the middle speed with full engine power. By thus disconnecting the high gear, the car becomes practically a two speed vehicle and the full engine speed can be utilized to drive on the intermediate speed.

CONTROL OF CAR.

The engine of this Maxwell car is governed at about 250 revolutions per minute by means of a fixed minimum throttle opening and a centrifugal device which varies the spark time. An increase of engine speed automatically retards the spark and vice versa. When the control button is pressed this governor is cut out of action, and the first effect is to advance the spark to the average effective running position. A further pressure of the button gradually opens the throttle, and after full opening has been attained the effect of further motion of the button is to advance the spark to a "speeding" position. The low clutch begins to drive the car at about 350 engine turns per minute, and the two other clutches come into action at appropriately higher engine speeds. For transmitting the relatively small power of this engine it has been found that the plates of each clutch need not be multiplied, as they operate in oil at low specific pressure. Cast iron or vulcanized fibre may be successfully used for these members.

This car is automatically braked when the foot is taken from the pedal, the brake employed being of novel design and set by power derived from the motion of the car. The brake drum is shown in the figure at Z, on the rear end of the side shaft. It is encircled by a metal band carrying replaceable metal shoes and is strictly double acting. The shoes are constricted upon the drum by power derived from the driving force of a friction clutch plate U mounted and free to revolve upon shaft B, which is brought into frictional contact with the internal surface of the drum Z by the action of the same spring which returns the control button, and a suitable linkage and collar. The clutch plate carries upon its shaft a pinion which is in mesh with a gear sector, which in turn contracts the brake band through the action of a cam. This brake acts exactly the same for stopping forward or backing motions of the car—the clutch plate with its pinion and the sector moving in one direction for forward motions and in the other sense for reverse motions. When the car is moving forward the direction in which the sector moves brings one of its cams into action to tighten the brake band, and when moving backward the other of the two cams acts. The two ends of the brake strap are so mounted that either one may be the fixed end and the other the movable end, dependent upon which cam is acting. The braking leverages are thus exactly identical for forward and backward motion and a strictly irreversible effect is produced. As the control button of the car, when unattended, always springs up to its position of rest, the brake is always applied and the car locked

hen it is left standing. The slightest otion of the car in either direction will rther set the brake. By applying a lock the control pedal, allowing it to move ownwardly just enough to release the ake, but not enough to speed up the ene, the car may be secured against unthorized use, but the brake may still be leased to enable the vehicle to be pushed out by hand.

There are no controlling devices upon e steering column of this car and no opating levers, the engine and ordinary ake pedal, the reverse and high gear cutit pedal and the regular Maxwell emerncy brake pedal being the only three conol devices upon the car.

APPLIED TO FRANKLIN RUNABOUT.

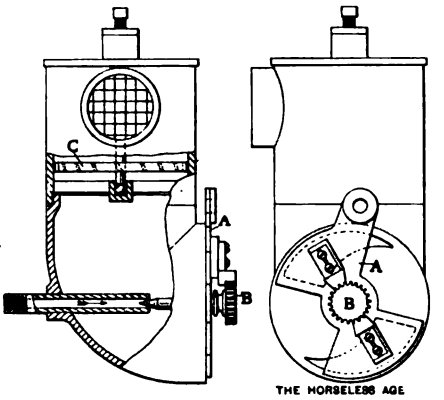
In the application of Sturtevant autoatic control to the Franklin 12 horse ower runabout, the four cylinder air ooled engine has been relocated with its haft lengthwise of the car and to its crank ase, which has been somewhat modified bolted the integral clutch and flywheel asing and gear box, making a structure erfectly dust and oil tight. Shaft drive o the rear axle has been provided. Three utomatic flywheel clutches, similar to hose employed in the fitting out of the Maxwell car, are used, but the gear system s on the Panhard plan, with drive to the ropeller shaft from the side shaft of the ear combination—two gears driving at all imes and both shafts running on Hess-Bright ball bearings. The reverse is secured by the use of a sliding pinion on the side shaft acting through an idler and operated by a pedal.

A governor of ingenious type is used o regulate the idle speed of the engine, at which clutch engagement cannot take place. The variation of the degree of suction in the inlet pipe is made use of for governing purposes. As the motor speeds up the demand for gas increases and the vacuum in the mixture pipe increases, and vice versa. A small copper tube leads from the intake manifold to a small auxiliary cylinder, in which is a tightly fitting piston under the influence of a spring. The position of this piston in its cylinder is thus determined by the degree of vacuum at which the mixture is supplied and hence by the motor speed. This auxiliary piston operates a linkage which, acting upon the commutator, varies the time of ignition, retarding it as the engine speeds up, and vice versa. thus maintaining a reasonably constant speed. Foot button control, arranged similarly to that employed on the Maxwell car, is here used, with automatic braking brought into action when the pedal returns to its position of rest. In order to improve the cooling of the motor in its altered position, a belt driven fan is employed, delivering air upon the sides of the cylinders. Lubrication is effected in a somewhat novel manner. A small pump driven by the motor forces a constant current of oil from a reservoir into the crank case, where a constant level is maintained. The oil is distributed by splash. Considerable pressure is maintained in the system and is indicated by a dashboard gauge. This pressure is made use of to operate the usually employed brake, which is located upon the driving shaft. When the control button is released, oil under pressure enters a brake cylinder, the piston of which acts through a powerful double acting toggle motion to produce the requisite retarding effect. A slight pressure upon the control button relieves the brake cylinder of the oil pressure and removes the braking action. The only control devices upon this Franklin car are the speed button, the reverse pedal and the operating device of the emergency brake, which is unchanged.

Both of these cars operate very smoothly and under most perfect speed control. There is not the slightest jar or shock perceptible to indicate when the gears change. Both cars are sufficiently speedy —the Franklin car exhibiting a speed of 35 miles per hour, by speedometer, when running on the level over a somewhat icy road.



FRANKLIN RUNABOUT EQUIPPED WITH STURTEVANT AUTOMATIC CONTROL.



HEATH CARBURETOR.

The Heath "Dry Gas" Carburetor.

The Heath Company, of Saratoga Springs, N. Y., are marketing a simple form of carburetor without float, for which it is claimed that it develops a uniform mixture under all conditions of motor operation. The device consists of a body in two parts, the lower one being elbow shaped and the upper one cylindrical, with an outlet at the side. The air enters at the side into the lower elbow through throttle openings of horn shape, the section having been determined to correspond with the gasoline nozzle opening for the different throttle positions. The two throttle openings are obturated more or less by the throttle valve A, which carries a pair of blocks with V notches, into which engage the teeth of the wheel B, secured to the stem of the needle valve, which controls the opening of the nozzle. Suppose now the throttle to be opened wide, the suction in the carburetor evidently decreases, and as with decreasing suction the ratio of gasoline to air would ordinarily become smaller, some means has to be provided for increasing the feed of gasoline at full throttle. This is done by connecting the throttle valve with the gasoline valve, as above described, and giving the throttle openings the peculiar form shown in the drawings. Within the body of the carburetor is located a mesh cylinder, with propeller blades C, through which the mixture is forced to pass on its way to the cylinder. The propeller blades revolve the cylinder at high speed, which is claimed to thoroughly mix the air and gasoline and prevents raw gasoline from reaching the cylinders.

Chapman Double Ball Bearings.

The Chapman Double Ball Bearing Company of America have issued a catalogue of their peculiar type of ball bearings in which small balls are used to act as separators for the main, load supporting balls. When applied to automobile hubs the axle is surrounded with a composition sleeve upon which the cones are mounted, producing in effect the standard type of journal bearing, with provision for lubrication, thus insuring the free turning of the wheel even with any possible disarrangement of the ball bearing proper.

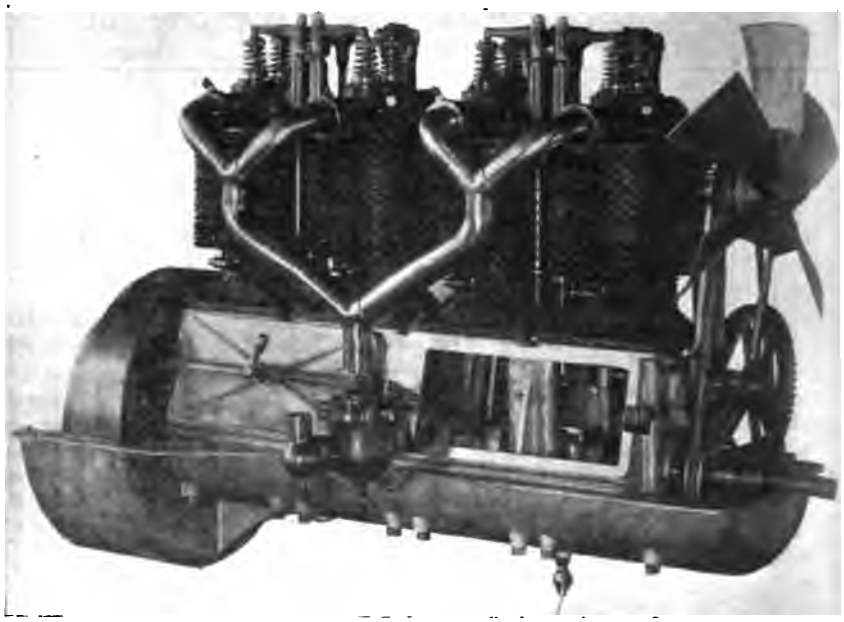
Improvements in the Corbin Cars.

The most important new features of the Corbin cars for 1906 are the manner of supporting the engine and change speed gear from the frame and the design of the universal joints incorporated in the propeller shaft. The distinctive patented air cooling system by means of comb-shaped stampings of sheet steel, inserted into grooves in the cylinder wall, has been retained. The valves are located in the cylinder head in detachable cages. An improvement has been made over the former practice of locking the cages by employing a threaded lock nut which can be removed instantly, releasing the cage. All valves are mechanically operated from a single cam shaft on the exhaust side of the motor. The inlet side of the motor has large hand holes in the crank case, the covers of which can be detached in a few seconds, and access to the crank shaft bearings and connecting rods gained.

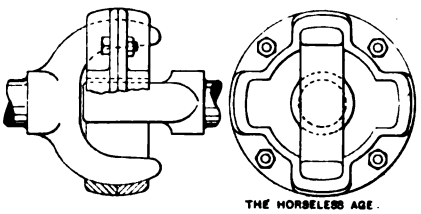
The motor crank shaft is provided with five bearings, one between each throw, the end bearings being of the Hess-Bright construction. Connection is made between the motor and transmission by means of a self-adjusting, enclosed conical clutch.

The transmission has three forward and one reverse speeds, is of the sliding gear type, operated on the selective system with a direct drive on the third gear. The transmission is claimed to be compact and free from all linkages.

A distinctive Corbin feature is the method of supporting the motor and transmission, the main casings of which are bolted together, making a rigid unit. This unit is flanged for its entire length and securely bolted to a formed sheet metal pan, which is in turn riveted to the frame side members, and serves the double purpose of supporting the weight of the power plant and protecting the parts from dirt and moisture.



CORBIN 1906 24 HORSE POWER, AIR COOLED MOTOR, INLET SIDE.

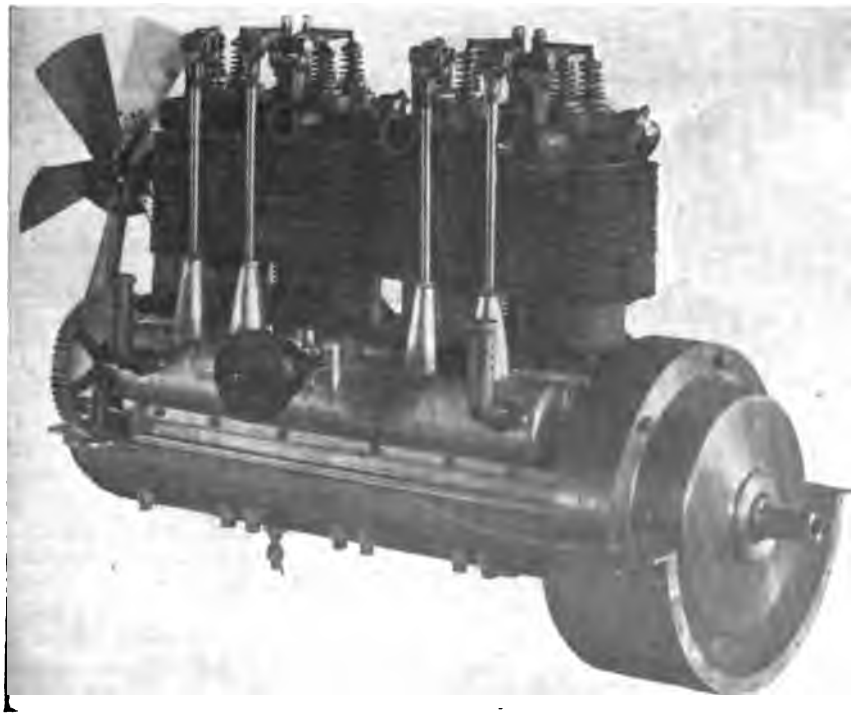


CORBIN UNIVERSAL.

The drive from transmission to rear axle is through a double universal jointed propeller shaft. The joints employed are new in design, and a sketch of same is shown.

Instead of the usual cross, a centre in the form of a double annular ring is employed, the two parts being bolted together and formed with four arc shaped grooves at equal distances on their inner side, which engage the correspondingly shaped "prongs" of the two forks. This construction, it will be observed, gives a liberal bearing surface.

The rear axle is bevel gear driven and of the semi-floating type. The brakes are all on the rear axle, consisting of internal and external brakes on the hub drums. The front axle is of I beam section drop forged in one piece. For a car of so light weight it is said to be especially heavy. The reversible steering mechanism is of the worm and sector type, and the gears are cut by the Hindley system, which has the recommendation of being used exclusively by the United States Government in both war and navy departments on account of its efficiency and indestructibility. All moving parts of the steering mechanism, including the wheel pivots; are ball bearing, which gives great freedom of action. The spark and throttle levers are on top of the steering wheel, but do not turn with same.



CORBIN 1906 24 H. P. AIR COOLED MOTOR, EXHAUST SIDE,

The Sturtevant Double Action Power Actuated Brake.

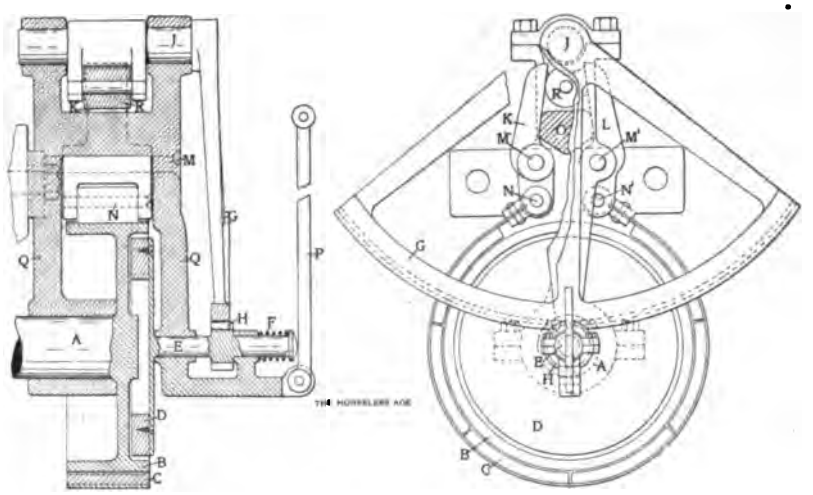
In this brake, designed by the Sturtevant Mill Company, Harrison square, Boston, Mass., the power for applying the brake band is derived from the motion of the car, and the only effort required upon the part of the operator is that of throwing on the power.

The accompanying figure illustrates the arrangement in vertical section along the shaft to be braked and also in elevation. Q is the frame supporting the device from the car body and furnishing a bearing for

A, the shaft to be braked. The brake drum B is carried upon this shaft. Upon a sliding shaft E, also mounted in the frame Q and concentric with shaft A, is carried a friction clutch plate D, provided with replaceable frictional surfaces. This clutch plate is arranged to be brought into contact with the exterior surface of drum B by the sliding motion of shaft E when the latter is moved by operating lever P. Spring F acts to return E and D to their inoperative position. Upon shaft E is fixed a spur pinion H, which is in mesh with the spur quadrant G, which latter is pivoted in frame Q on the shaft J. This shaft bears a projection which carries a roller R.

The brake drum is encircled by the brake strap C, the frictional surfaces of which are replaceable. The ends of the strap are respectively secured by the pins N and N′ in the rockers K and L, which rockers are pivoted in the brake frame Q at M and M′. The upper portions of rockers K and L are so placed as to be rotated upon the pins M and M′ by the roller R, and the stop O limits the motion of the rockers toward one another.

The action of the brake is as follows: Normally, when not in action, the quadrant G rests in its position of equilibrium, to which it automatically returns under the action of gravity, and roller R exerts no pressure upon the operative surfaces of the rockers K and L. The brake strap is therefore loose upon its drum. Now, if the operating rod P is actuated by some means, it forces in the shaft E against the action of the rectractile spring F. The frictional surface of the clutch plate D is thus brought into contact with the revolving brake drum B. Referring to the figure, if the brake drum be moving in a counter clock-handwise direction, the clutch plate will also be carried by friction in the same direction,



THE STURTEVANT BRAKE.

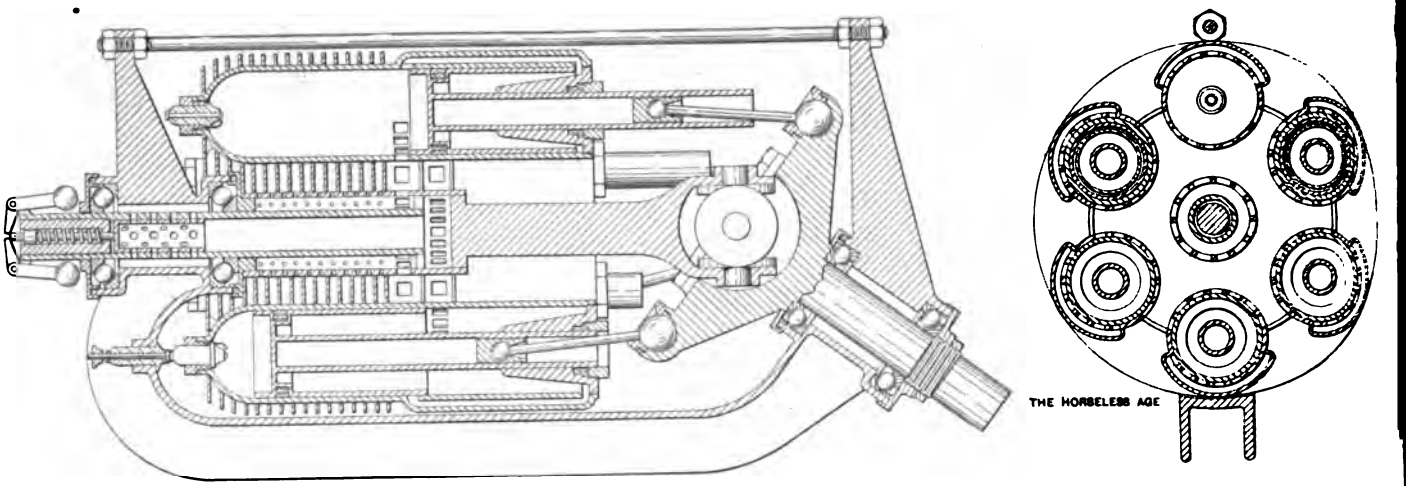
and pinion H, mounted upon its shaft, will have the same direction of revolution. The sector G will be rotated to the left upon its shaft J. This will cause roller R to press upon the surface of the rocker K and revolve it about the pin M in a counter clock-handwise direction, thus drawing the end of the brake strap, which is held by pin N to the right and tightening the band. The pull exercised on the pin N′ by the other end of the strap is resisted by the pressure of the rocker L against the stop O, so that the end of the strap, upon which the tightening action is not being exercised, is as firmly held as if secured on a fixed pivot. If the car is moving in the opposite direction, the motion of the brake drum with be clock-handwise and the quadrant will move to the right, bringing the roller into action upon rocker L and tightening the end of the strap, which is secured by pivot N′. The pivot N then forms the fixed support of the band, as rocker K is held from motion by the stop O. The brake is thus absolutely double acting, the elements having exactly the same mechanical relations for forward and backward motions of the car.

It will be noticed that there is a very good multiplication between the frictional force exerted by the clutch and that causing the movement of the ends of the strap, and the slightest pressure upon the lever P is sufficient to cause a sufficient engagement of the clutch to produce a pronounced braking effect. When the clutch is released by the action of the spring F, a slight jar is sufficient to cause the sector to fall into its position of rest, and the brake is released.

This device is adaptable to any motor car, and the braking action may be applied by a special lever or pedal or by a spring, acting when the clutch is released or when the throttle of the motor is completely closed. All wearing parts are readily renewable, and the arrangement is neither complicated nor cumbersome. If the car is left with the friction plate in contact with the brake drum, the slightest tendency of the car to move in either direction will cause the setting of the brake band.



KANSAS CITY MOTOR CAR COMPANY'S THREE TON TRUCK—DESCRIBED ON ANOTHER PAGE.



TWO SECTIONAL VIEWS OF LOMBARD'S GASOLINE ENGINE DESIGN.

The Lombard Two Cycle, Revolving Cylinder, Air Cooled Motor.

A gasoline motor of radical design has been invented by Levi W. Lombard, of Medford, Mass., which is illustrated in the drawings herewith. It consists of a number of cylinders (six are shown in the drawings), arranged with their axes on the circumference of a circle, in which circle the cylinders revolve. The cylinders are mounted on ball bearings on a framework, which also carries the power shaft of the motor. At the centre of the cylinders there is a revolving member, consisting of two concentric tubes with ports in their walls, and a solid prolongation which connects at its lower end by a universal joint to the power shaft, which is inclined to the axis of the concentric tubes at an angle of about 35 degrees. The concentric tubes serve as the support for the cylinders, to which they connect by the cooling flanges; they also serve as inlet passage and exhause muffler, respectively.

The cylinders are closed at both ends and work on the two cycle principle. The pistons are provided with tubular piston rods, which extend through stuffing boxes at the lower end of the cylinders and connect by rods with ball and socket joints with a disc on the power shaft. The cylinders and power shaft revolve together, owing to the universal joint connection between the cylinder support and the power shaft, and it will be readily understood that during the revolution the distance between the disc on the power shaft and the bottom of a particular cylinder varies continuously, whereby the pistons are caused to move up and down in the cylinders if the power shaft is revolved. In the operation of the motor the effect is, of course, reversed.

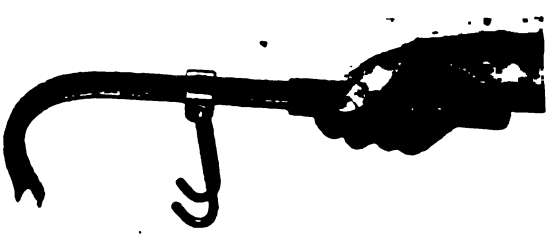
The lower end of the cylinders serves as a compression chamber, into which the combustible mixture is admitted through the central tube of the support, and ports in the wall of same and in the wall of the cylinder, when the piston is at the top of its stroke. During the downward stroke charge is compressed in the lower portthe cylinder, and at the end of this stroke it is transferred to the compression chamber through a transfer port formed in the side of the cylinder. Before the transfer port is opened by the piston the exhaust port is opened by the latter, and the spent gases from the previous explosion flow out into the annular space between the two concentric tubes of the cylinder support, which serves as a muffler, and through small perforations in the outer tube to the atmosphere.

The ignition is effected by jump spark, ordinary spark plugs being screwed centrally into the heads of the cylinders, their outer contact terminals coming in contact with a contact plug mounted on the supporting frame, when the cylinder is at a certain point of its revolution. The speed of the engine is controlled by a governor secured to the end of the cylinder supporting member, and acting on a sliding throttle valve located within the inner of the two tubes forming the cylinder support.

Among the advantages claimed for this construction is, that, owing to the revolution of the cylinders, the air cooling is very effective. The inlet passage being surrounded by the muffler, is kept at a very considerable temperature after the engine has once been started, so that the fuel is thoroughly vaporized, and it is possible to use kerosene fuel after starting with gasoline. The torque of such an engine, seeing that there are six explosions to a revolution, ought to be unusually uniform, and the weight per horse power would probably be very small, as no flywheel is required.

New Tire Iron.

Janney, Steinmetz & Co., of Philadelphia, are manufacturing a tire tool, herewith illustrated, which is particularly useful for lifting and holding the shoe while setting the valves and lugs. It can be adjusted to suit any size of tire and any width of rim. The construction and method of use are evident from the illustration.



THE JANNEY-STEINMETZ TIRE IRON.

Renaults to Enforce British Patent.

Something in the nature of a flutter in the dovecotes has been caused in the British motor industry by the announcement that the firm of Renault Frères, of Billancourt, Seine, has decided to take action against English automobile manufacturers. It was claimed that the capitulation of the French makers to the Renault firm, as already referred to in these columns, was due in part to a desire that the leading French makers might form something in the nature of a limited ring of license holders for their mutual benefit, and shut out would-be applicants by refusing to grant them the necessary permit to manufacture. In the interests of British manufacturers, however, the Society of Motor Manufacturers and Traders has taken charge of the matter, and will fight the claim. If the affair comes into court it will provide one of the most interesting patent struggles of recent years, for the great majority of motor cars are now constructed in a way which brings them within the scope of the Renault claim, if that be upheld. There is no fear, by the way, of the matter not being fought to a finish, as the Society of Motor Manufacturers and Traders has funds at its disposal which will enable it to carry the fight, if need be, to the House of Lords, while, on the other hand, Messrs. Renault Frères have been doing an enormous business for some time past, and have even sold their output for many months ahead.

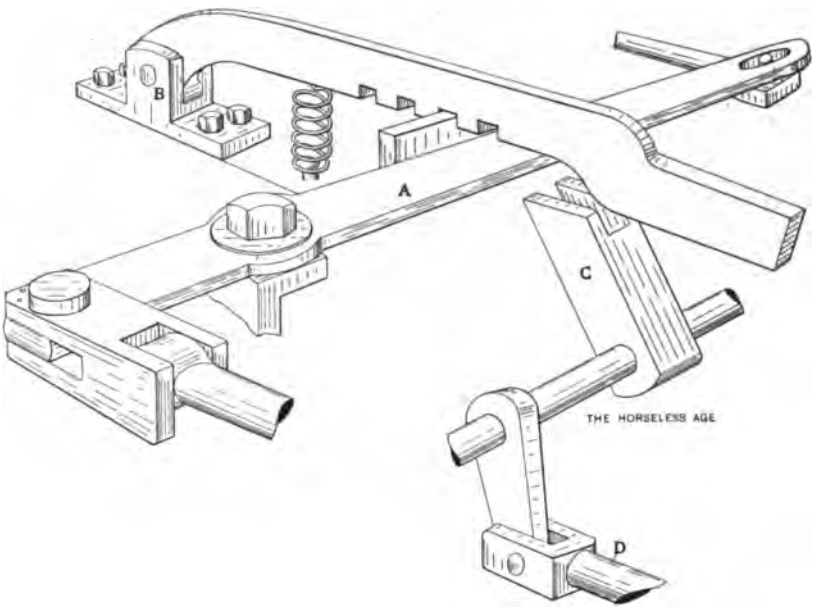
The St. Andrews Ambulance Association has ordered a self propelled ambulance wagon, for use in Glasgow.

Some Exhibits at the Chicago Show.

(Continued.)

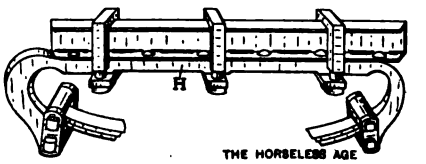
KANSAS CITY MOTOR CAR COMPANY

show a very complete line of commercial vehicles and also two touring car models. Besides this indoor exhibit they have eight vehicles demonstrating on the outside. The commercial wagons are fitted with two cylinder opposed motors, ranging from 15 to 35 horse power, but the machine which attracted the most attention was their large 6 ton truck with its 60 horse power, four cylinder opposed motor. The engine is located under the footboards. The transmission is a two speed and reverse sliding gear. The gears are 2½ inch face and four pitch, and are provided with an interlocking device which prevents shifting the gears when the clutch is in, as shown in the sketch. When the gears are in mesh the gear shifting rod A stands directly under one of the slots in the bar pivoted at B. The bar is held up by the piece C as long as the clutch is out, but as soon as it engages a connecting link D throws C out from under the notched bar, which drops down and locks A in position. The frame is of heavy I section steel, well supported. The rear spring fastening is new. As seen in the drawing, the spring hanger H is all one solid steel forging riveted and clamped to the under side of the frame. Both ends are bent or curved down, as shown at the rear. The clutch is of new design, and consists of four V-shaped hickory blocks working in a groove cut into the rear of the flywheel casting. These blocks are supported on the end of arms pivoted at the extremity of a four armed spider. The rear ends of these pivoted arms are forced outward and the blocks into the groove by a toggle joint action from the usual form of slotted collar on the shaft. There are several new features in the engine, one of which is the



KANSAS CITY GEAR INTERLOCKING DEVICE.

operation of the four exhaust valves from two cams. A sight force feed oiler on the dash is used, and the engine is equipped with jump spark from a magneto, with a storage battery for reserve.

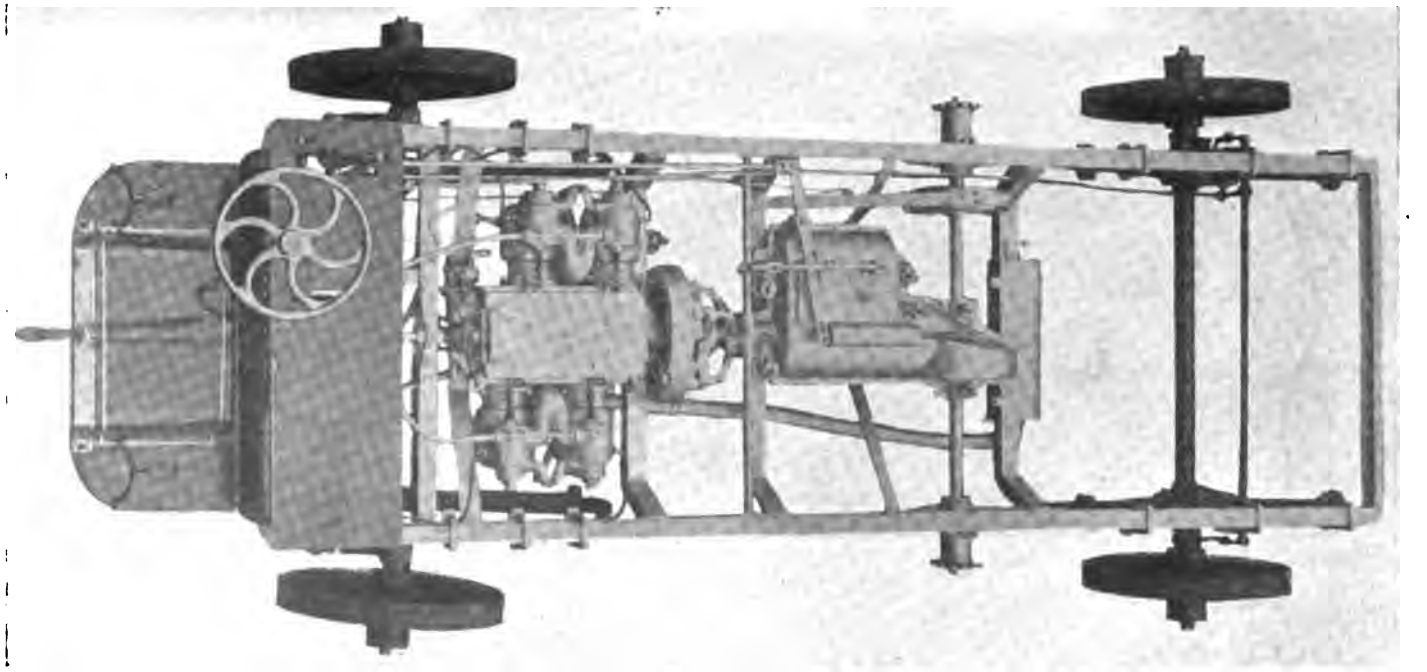


KANSAS CITY TRUCK SPRING HANGER.

The pleasure vehicles are of the two cylinder opposed type under the body, engine 5½x5, which they claim develops 35 horse power. A two speed planetary "all spur" gear is used, and the drive is from the planetary by chain to a jack shaft and then by side chains to the rear wheels. The connecting brakes on the rear wheel drums are operated by a foot pedal. The bands on the planetary are tightened by a toggle joint action, and are held from dragging when disengaged by specially arranged spiral springs. The steering gear is of the screw and nut type, but is at the top of the steering column, where it is accessible and out of the dirt.

THE "PERFECT" KEROSENE MOTOR.

The "Perfect" kerosene motor represents the latest attempt to adapt the "heavy oil" engine to the automobile. Any good carburetor can be used with it, it is claimed, as the vaporization of the fuel is accomplished in a chamber over the exhaust valve and not in the carburetor. The



PLAN OF CHASSIS OF KANSAS CITY MOTOR COMPANY'S THREE TON TRUCK.

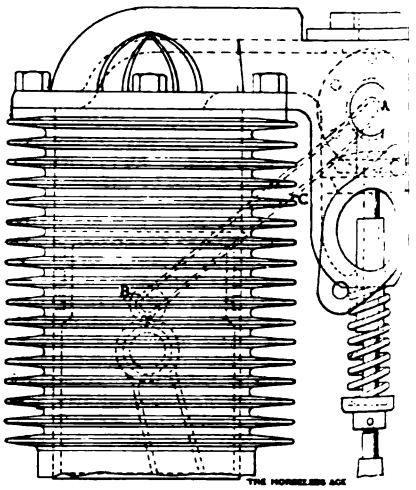


RELIANCE TWO CYCLE, TWO CYLINDER TRUCK (See page 259, issue of February 7).

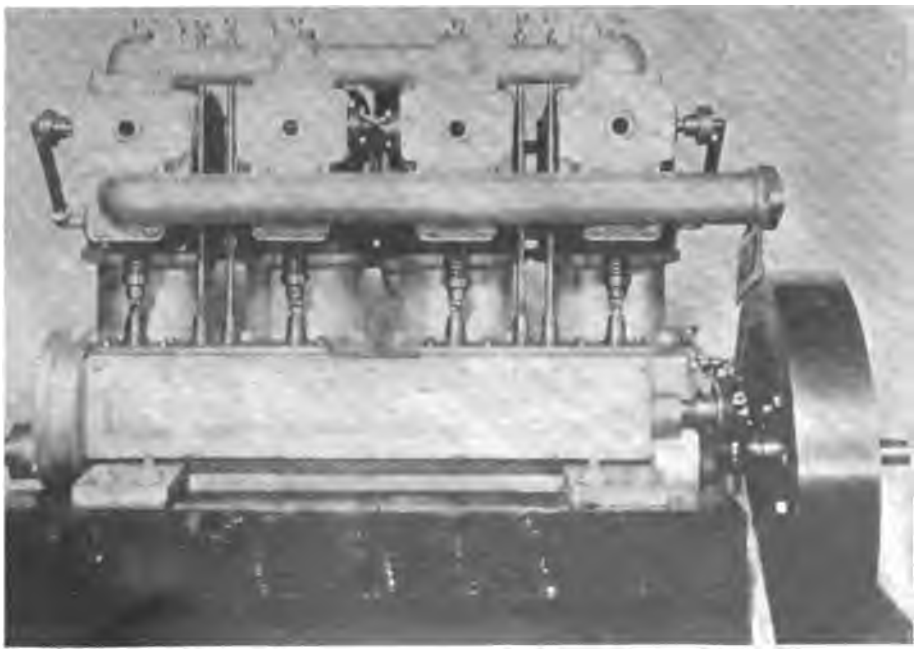
engine is started with gasoline and the kerosene is turned on by a threeway valve after a few revolutions. Two types of motor are built, a four cylinder of 40 horse power and a two cylinder opposed of 20 horse power.

The construction of the four cylinder engine is as follows: The cylinders are copper jacketed and have detachable heads held on to ground joints, no gaskets being used. The jackets are made tight at the top by being spun over and the heads bolted down onto them. At the lower end the jacket is made tight by being leaded into a groove cut in a ring cast integral with the cylinder. The heads are not water jacketed, but have air cooling flanges cast integral, as it is desired to have the head somewhat hot. The engine does not differ materially from any four cylinder engine, but is provided with a vaporizer A (see cut, which shows their air cooled engine) in a chamber just over the exhaust valve. This vaporizer consists of a flanged cylinder, through which exhaust gases pass and over which the incoming oil mist and air from the carburetor pass, for the oil is in reality mixed only mechanically with the air until after passing over the top of the vaporizer into the cylinder, when a gaseous mixture is formed. At the bottom of the cylinder at B is an auxiliary exhaust port, which is uncovered by the piston, thereby allowing the hot gas to pass up the tube C through the vaporizer and out at the end directly into the exhaust pipe.. This serves the double purpose of heating the vaporizer and at the same time gives a quick exhaust, relieving the pressure in the cylinder. This vaporizer, it is claimed, by pyrometer tests shows an average temperature of about 480° Fahr., and there is claimed to be no trouble experienced from clogging by tarry residues.

The cylinders are 5x5, and the engine is rated at 40 horse power. The compression used is only 40 pounds. The crank case is a one piece iron casting with end plates bolted on. Bronze bushed bearings support the crank shaft, which is made of hammered fifty point carbon steel. The bearings are all finished by grinding. The cylinders and pistons are ground, the latter being only .002 inch less than the bore. The wrist pins are hollow steel, ground to a fi and held by set screws which pass through the piston bosses and one wall of the pin and abut against the other wall.



SHOWING "PERFECT" MOTOR VAPORIZER.



THE PERFECT KEROSENE ENGINE.

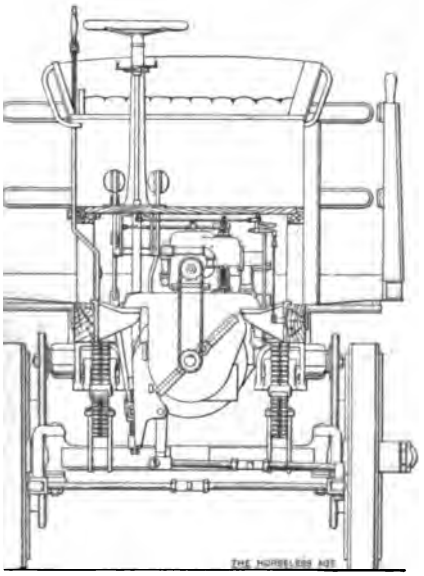
They are held on the outside by lock nuts. There are three diagonally cut, eccentric, pinned rings used above the wrist pin. The rings are also finished by grinding. All the valves are on one side of the engine, are interchangeable and mechanically operated, the inlet valve, on top, by a vertical rod and rocker arm. These valves have gray iron heads, which are screwed and riveted to steel stems. The connecting rods are drop forged of I beam section with split bronze bushings spaced by shims used at the lower ends. At the upper end sleeves of bronze form the bearings. The cam shaft is made of machined steel, case hardened and ground, and carries eight independent hardened tool steel cams which are taper pinned to it. The shaft runs in five phosphor bronze bushings, and is separated from the crank case by a partition and lubricated by having its case packed in grease.

The oiling of the engine is accomplished by the use of a gear pump on the inside

ıe case, driven by a gear direct from ngine shaft. The crank case end cover orms to the shape of the pump and en- s it. The oil is drawn from a reser- at the bottom, forced to the main bear- and through jets to the scoops on the ecting rod ends. Enough is thrown ard and caught on the oil grooves of iston to lubricate the cylinders.

AMERICAN MOTOR TRUCK COMPANY

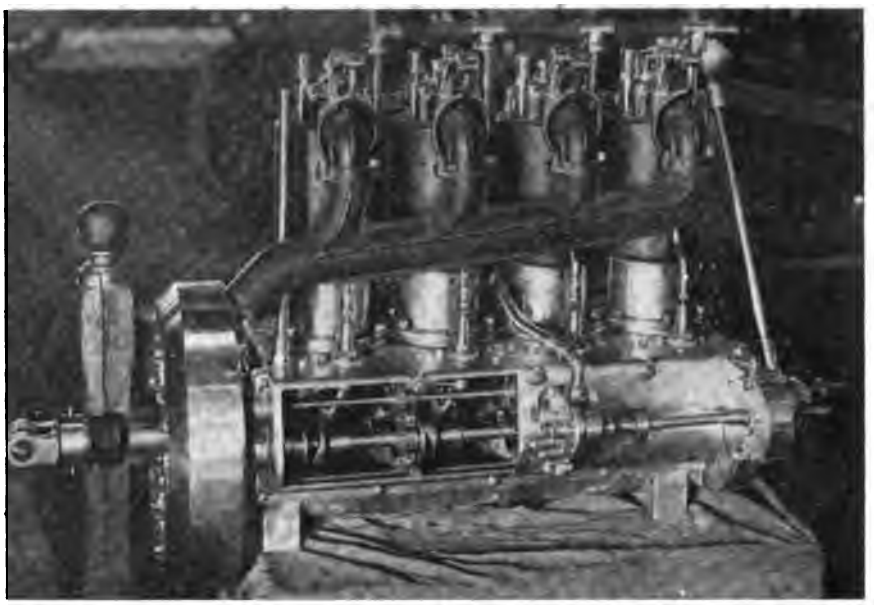
ved their large 3 to 6 ton truck for the time, with a four cylinder 5x6 inch. orse power at 800 revolutions, vertical ne under the front. The seat is raised ver the engine and the footboards are the top of the cylinders. The crank is split on a diagonal, so that by re-



AMERICAN TRUCK, FRONT VIEW.

ving the side all the internal parts are ssible. The cylinders are not over the ık shaft, but are offset sufficiently so the pistons and connecting rods may entirely removed without disturbing cylinder, connecting pipes or the single shaft which operates the valves. The er ends of the valve lifting rods are d with small steel wheels on each side prevent the tendency of wedging or ding the rod. Accessibility is the par- lar feature of the engine. Oiling is by [ill precision oiler.

he control is by spark and throttle rs on the steering post under the wheel. transmission is an enclosed, two speed reverse planetary, running in oil. All rs or spurs 2½ inch face. The high ed clutch is of the multiple disc type of novel design. The discs are l against fibre, the fibre riveted to one coming against the back of the next. means of this construction it is possi- to let the clutch slip while passing ough traffic, and it is also claimed to be sible to start the truck with a 2 ton l on the high gear. The drive is then shaft to the bevel gear drive on the t shaft, all enclosed in an aluminum sing, and from there by side chains. countershaft runs in plain bronze



HARRISON WAGON COMPANY'S ENGINE.

bushed bearings oiled by grease cups. The front axle is of I beam section and the rear is square. The brakes are expanding bands on the rear wheel drums and hold in both directions.

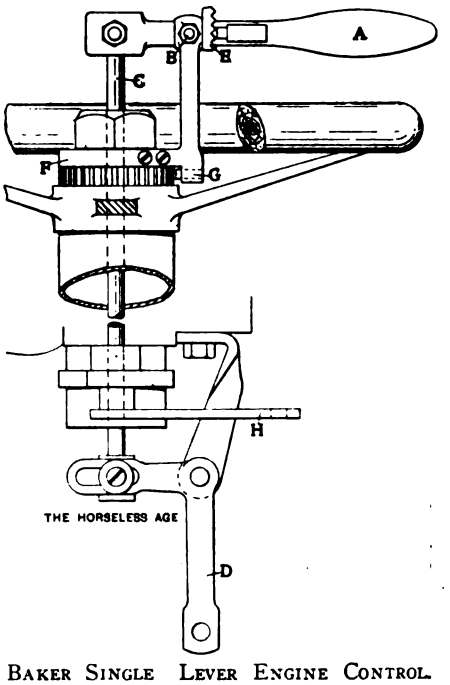
HARRISON WAGON COMPANY,

of Grand Rapids, Mich., show for the first time their new 40 horse power self starting and reversible engine. The cylinders are 4¾x5 inches, and the engine is rated at 40 horse power at 900 revolutions. Many new features are embodied in this machine. The cam shaft is distinctive, and allows of changing the timing of the valves while running so that economical use of the gasoline may be made. The timing of the spark is controlled either by hand or governor. The self starting is accomplished by carrying an ordinary acetylene gas tank, part of the gas is allowed to enter the cylinders just before starting and, by means of a special timer when the switch is thrown on, whatever cylinder is ready on compression fires, and then the other three fire, which starts the motor. An ordinary tank with 100 cubic feet, it is estimated, will start the engine on an average of six times a day for a year. When heavy running is encountered with the engine running slowly, it is arranged that by moving one lever the cylinders can be fired in pairs, which gives more of a jerking action but a much greater torque. The carburetor is so arranged that upon throwing out the clutch, the engine is throttled and does not race.

THE BAKER CAR COMPANY,

of Homer, N. Y., exhibited for the first time their complete steering column and wheel. They also showed the only single lever control of the spark and throttle on the market. This is shown by the accompanying cut.

Lever A by its up and down motion on pivot B moves rod C up and down inside the steering column, and connects with the bell crank lever D to operate the spark. It is held in any position by the ratchet and spring pawl E. The throttle is operated by swinging lever A around, the collar F being the bearing and pawl G holding it in any position. This rotates the rod G, to which at the bottom is splined lever H, which operates the throttle. This whole mechanism is stationary, and does not turn with the steering wheel. The steering gear consists of a hardened steel worm on the end of the column, meshing with a complete worm set on its stud by four keys, so that after it has become worn it can be turned one-quarter turn, and as it exposes new teeth is as good as new. The lower part of the housing is bolted to the upper, and the holes are elongated. By loosening the bolts the upper half carrying the worm wheel can be set over into closer mesh with the worm by a set screw and lock nut, thus taking up any wear. The worm wheel is on a cone bearing, which



BAKER SINGLE LEVER ENGINE CONTROL.



THE CROWN RUNABOUT.

can also be taken up. The whole mechanism is so designed that the wear shall be minimum and an adjustment is provided wherever wear can occur.

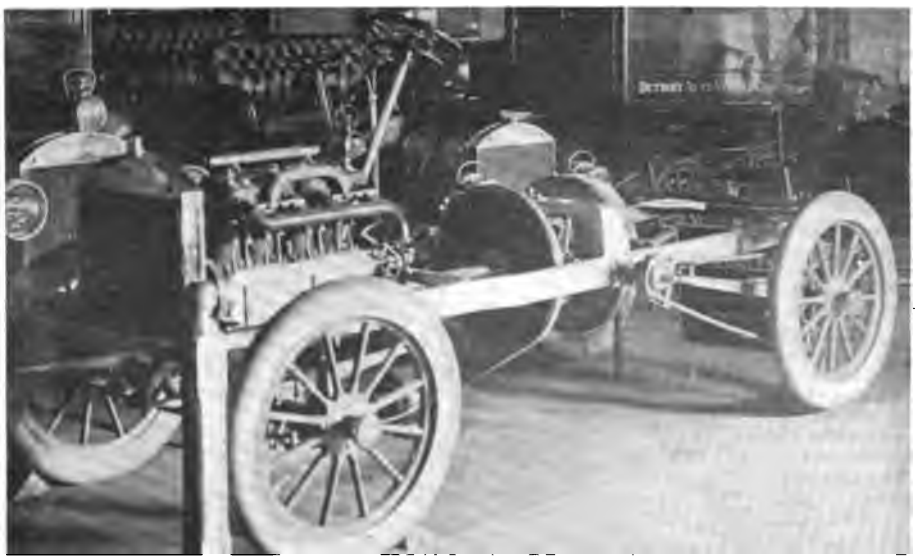
THE DETROIT AUTO VEHICLE COMPANY exhibited their touring car, runabout and light delivery wagon. The runabout is shown for the first time. This car has a two cylinder opposed engine crosswise under the hood at the front. Its bore is 4¼ inches, and stroke 4½ inches, and it is rated at 12 horse power. It has a friction drive, with a direct drive by an internal expanding band clutch in the flywheel on the high speed. The friction is used only for slow speeds, and consists of a large disc run by friction from the beveled edge of the flywheel. Against this and splined to a continuation of the engine shaft is the movable friction change speed wheel. When on the high speed the friction plate is out of contact with the flywheel. The motion of this in and out of contact with the flywheel is controlled by a foot pedal. The drive is then by shaft and bevel gear to the usual rear axle. This car weighs only 1,000 pounds. The light delivery wagon has practically the same l. ·nism as th about.

THE PIERCE ENGIN. MPANY exhibited two models, a t d fo inder touring car. The firs ·s along the same general line · two cylinder car. The large entirely new. The engine h. 4¼x5 inches, and is rated at 28 hor. The drive is by shaft and bevel through a three speed planetary The ignition is jump spark from storage or dry cells carried in a box running board. The control is by and throttle levers just below the wheel, and by a single side lever speeds.

TURNER & FISH, of Chicago, showed at their boot new "indestructible" steel wheel, w made from two sheets of high carb rolled steel. These are pressed and into shape, forming half spokes with between. The two parts are then together, and an ordinary clincher

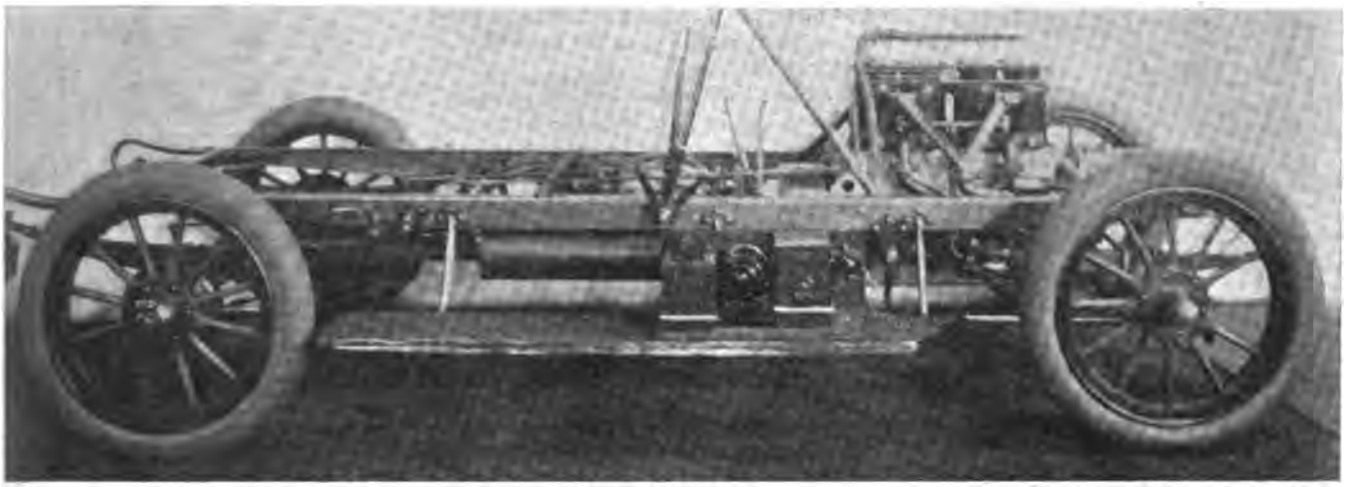


THE POPE-TOLEDO RUNABOUT—A NEW MODEL.



shrunk on and riveted. The hub are fastened with bolts, as in an wooden wheel. These wheels are the same weight as the wood whee monly used, but are claimed to hav times the strength. The makers s in tests made at Armour Institute sure of 35 tons was required on end to buckle the wheel support around the rim. This was one heaviest truck wheels made of gauge metal, but weighed only 19 which, they point out, is much ligh any wood wheel on the market buil same work. Other claims made wheel are that it will remain true less resistance to the air, is not affe the weather, does not collect as mu as a spoked wheel, and is easier to

YOUNG'S ROTARY CARBURETOR was shown at the stand of the



CHASSIS OF "SILENT KNIGHT" CAR DESCRIBED EARLIER IN THIS ISSUE.

ers below a copper diaphragm, and lifts it t each suction stroke, opening an ordinary eedle valve. The passage leading from he needle has a small hollow shaft in it, ith two fan bladed copper wheels mounted a ball bearings and oiled by a cup and he through the hollow shaft. At the cen- e of this shaft is a cup from which the feeds into the shaft through a hole. ese wheels rotate in opposite directions m the air current, and assist in mixing e air and gasoline. The rotary throttle the valve regulating the flow of gaso- to the needle valve are moved in unison as to preserve the proper mixture. For y high speeds air is admitted by suction ugh holes at the top, which are covered a light spring pressed disc.

THE HANCOCK VALVELESS LUBRICATOR

a device shown by its makers, the Han- k Manufacturing Company, of Chicago, r the first time. It is arranged to run sub- erged in oil in a case either on the dash r engine. A sight feed attachment can be laced either directly on the lubricator or n the dash.

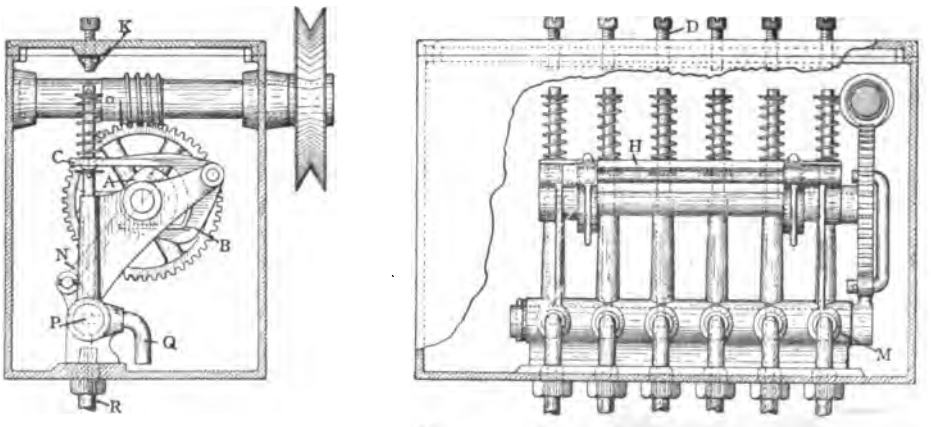
This oiler can be driven from the top, ottom, sides or ends to suit, and is built ith as many leads as desired. It is pecu- ar in that it has no valves, as they are ommonly known; no screws, nuts or bolts the working parts, and no stuffing boxes. ery heavy oil or oil filled with flake graph- e may be used, it is said. In the usual orm the mechanism is driven by a belt and ulley, although chain or ratchet drive can e had if desired. A worm and wheel are n the inside of the case, as may be seen in he accompanying cut. Around the worm haft is a long sleeve arrangement to scrape ff the oil which gets upon it, so that it rops down into the box again and does ot work out at the ends. The shaft of the orm wheel carries a cam at either end, hich works between connected V-shaped ocker arms B. The ends C of these ockers are connected by a bar H (seen in ront view), which raises a row of 3-16 nch plungers which lift to the full stroke unless their upper ends strike the set screws D in the top of the case, in which case they stop at the desired point, and the light steel piano wire springs are compressed. These adjusting screws are locked by passing through a strip of brass K, the turned-in edges of which bear against the threads. Inside of the casting M is a steel shaft ground and lapped to a fit which is rocked back and forth by a strap N pinned to a spoke of the worm wheel. This steel shaft, as shown in the end view at P, is drilled so that a series of T shaped holes are formed. In the position of this shaft shown in the cut the oil is drawn in at Q on the up stroke of the plunger, and on the down stroke the cross hole becomes vertical and the oil is forced out at R. It will be noticed that on the up stroke the pipe R is closed and all pressure therein is retained in case of an obstruction, until it is opened for the next pumping stroke, which increases the pressure, as does each succeeding stroke until an enormous pressure is produced which will either force out the obstruction or burst the pipe. When a sight feed attachment is used a double set of plungers is employed, the first set to force oil to the sight drips and the second set to draw it from there and force it to the bearings.

THE ELECTRIC RUBBER MANUFACTURING COMPANY,

of Rutherford, N. J., showed at their stand their inner tubes for clincher tires made from pure rubber with an expansible cover made of special fabric permanently applied, and their heat cured wrapped tire. This is a one cure tire, and is not made in a closed mold, only the head at the edge is molded and the entire tread is free to take its own form, and is simply wrapped and held by coarse fabric. This method of manufacture is said to do away with difficulties such as getting in too much rubber, in which case the fabric of the tire squeezes or crinkles, and will soon wear out or cut, or putting too little material into the mold, in which case the tire will be defective. It also leaves the fabric and rubber smooth and in good condition, as the heat applied is moist and only one heat is used.

THE ELLERSLIE CARBURETOR.

This carburetor is notable chiefly for the reason that it has no nozzle, yet is of the float feed type. In the accompanying cut it is shown in section. The gasoline enters the float chamber at the top and maintains the same level in chamber A as in the float chamber. A removable frame consisting of three partitions, each of which is composed



HANCOCK VALVELESS OILER.

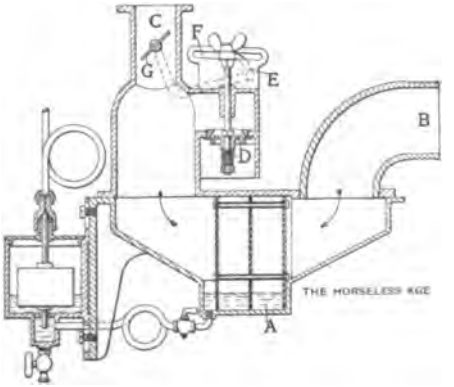


VIEW OF THE CHICAGO STEAM CAR CHASSIS.

of layers of linen cloth placed between fine copper wire screens, is placed in chamber A resting on the bottom. The air entering at B through a dust screen is drawn, as shown by the arrows, through the gasoline saturated partitions and through tube C to the engine. D is an auxiliary air valve which is moved up and down by a right or left motion of the lever E which slides in the inclined slot F. This lever moves in unison with the throttle valve G, to which it is connected by levers shown in dotted lines. As the mixture in the tube C and chamber leading to it may be made very rich, the effect of priming is obtained by opening the throttle valve without correspondingly opening the auxiliary air valve. This is made possible by a coil spring and a slipping arrangement in one of the rods connecting the two valves.

THE "HENSEL" STORAGE BATTERY.

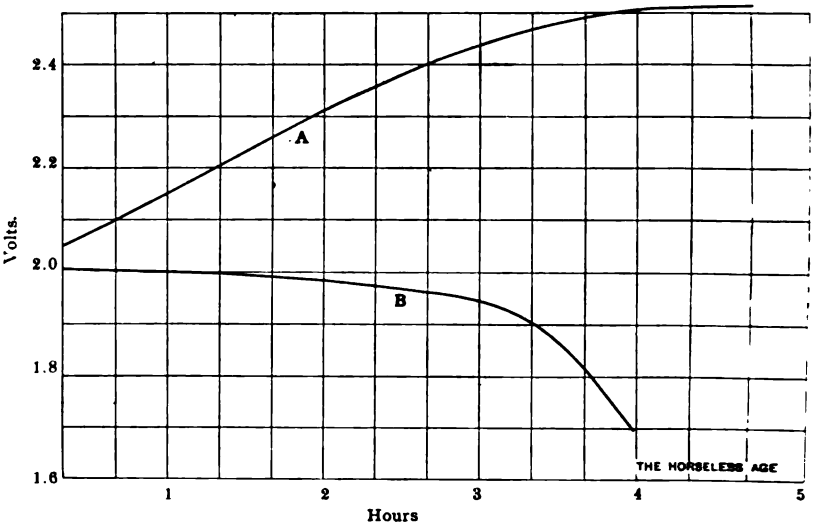
The peculiarities of the battery which is shown by the Hensel Storage Battery Company, of Chicago, are the method of forming the active material so that it can-



THE ELLERSLIE CARBURETOR.

not crumble and fall between the plates, the method of building up the plates from strips or sections, and the fact that no separators are used, owing to the form of the plates.

In the sketch is shown one strip or section before pasting. It is in the form of a trough with the side walls A and B supported on small cross partitions. These strips are of lead cast in one piece, and twenty-eight of them piled one on top of the other from a plate. The paste or active material is laid in on top of a strip of cellulose paper, filling the trough from the top of the partitions to the upper edges of A and B. The piled up strips are then laid on their sides in a suitable frame and metal is run around the edges, which adheres and fills the dovetail groove which is formed by the shape of the ends of the strips, thus forming the whole into a plate with the paste enclosed. The spaces between the partitions now form square holes passing through the plate. Three small strips of vulcanite act as separators of the plates. This is said to be sufficient separation, as the active material cannot fall out of place against the next plate and set up a local action which would run down the battery. The makers of this battery claim that this battery, occupying the same space and weighing 25 per cent. less, will give an output 20 per cent. greater than batteries of the usual form. Curves of charge and discharge are shown in the cut. It will be seen that the discharge curves show a well sustained voltage from the start.

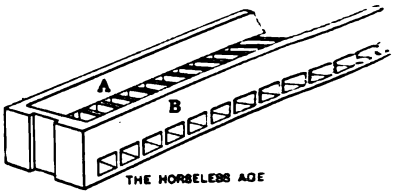


Curves of sixty-third charge and discharge at 25 amperes. Test made on Hensel Type 5B cell by Frank B. Kamarke on February 1, 1906. Total charge, 110 ampere hours; total discharge, 108 ampere hours.

CHARGING AND DISCHARGING CURVES OF HENSEL BATTERY.

LEON RUBAY,

agent for J. Lacoste & Cie., of Paris showed the latest development of the Lacoste high tension magneto to be run in connection with a single coil and storage battery. The battery can be used for starting. The new feature consists in the use of the timer and distributer arrangement of the magneto for the current of the battery when the magneto is not in use, and by a two-throw switch the magneto current can be used entirely independently of the



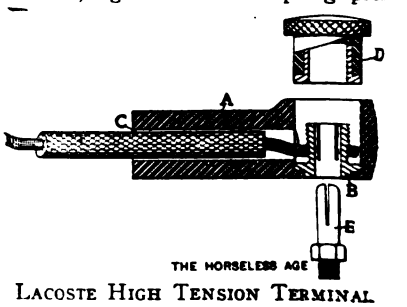
SHOWING CONSTRUCTION OF HENSEL G

battery and coil. This permits of the of only one set of high tension wire the plugs and yet have two distinct syste

Another new feature shown was t terminal especially designed for secon wires. This consists of a vulcanite p A, as shown in the drawing, into wh metal piece B is set. The cable is inse at C, and the end of the wires bent aro the upper part of B, which is split, as sho and slightly tapered. The cap D is screwed over and binds the wires. whole thing is then slipped over the s and slightly tapered piece E, which is the end of the plug or other device which the current is to pass. This ma a device which can be instantly disc nected and handled without getting shock; it also tends to prevent breaking wires.

Another new device shown at this s is a combined timer and distributer. general arrangement is such that the

strument is only 2¼ inches in depth, a the secondary contacts are rotated i spark advance together with those of t primary. In general it consists of a cyl drical piece of fibre mounted on a shaft a brass primary contact pieces set into front end; against these a spring press

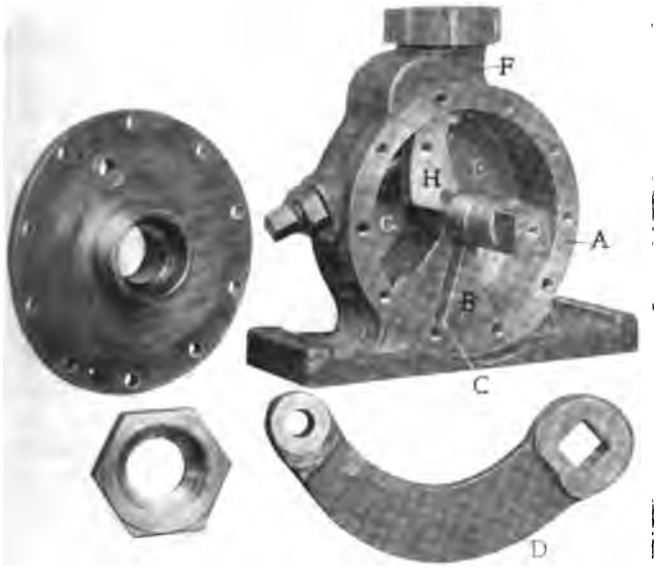


LACOSTE HIGH TENSION TERMINAL

·ass plunger or primary brush rubs. his constitutes the spark timer. On the ıtside of the fibre cylinder is a V groove, ith a continuous metal strip set in the ɔttom. Upon this a similar plunger rests r the contact of the secondary from the il. This metal strip extends backward to rm four arms or segments which are ısh with the surface of the rear end of the ɪre cylinder where it is turned somewhat ıaller in diameter. Upon these four set- arms rub the four brushes or contacts ɔm which wires lead to the four plugs.

P. M. HOTCHKIN,

4021 Lake avenue, Chicago, exhibited e Hotchkin anti-jolt device, which con- ɪts of a circular chambered piece A filled tirely with glycerine. A sector B packed a leather strip C to make a tight joint th the case is rotated by an arm D at ch downward motion of the car body, to ıich the link D is attached. This forces ɛ glycerine from chamber E through the eck valve F and into the side G. On

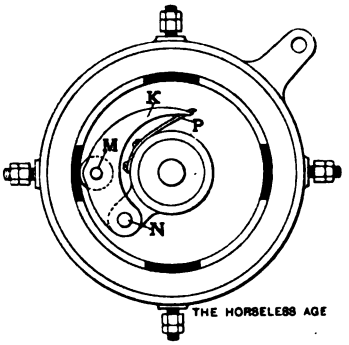


HOTCHKIN ANTI-JOLT DEVICE.

recoil the glycerine cannot go back ɔugh the valve F, but is forced to pass ɔugh an adjustable hole in the partition This hole being small, the motion is ɛssarily slow and the recoil is checked. : size of the opening can be adjusted to the car and load. The accompanying ɪrds, furnished us by the manufacturer, w the action of the device in actual ɪtice. This record was obtained by a ɪial recording pencil attached. The car t over the same ground in the same di- ion, first without the shock absorber the second time with it.

THE NEW KINGSTON CARBURETOR.

his carburetor of the Byrne-Kingston ıpany has an annular ring float of either : or copper, which, when the level is depresses the end of a long pivoted r, and raises a weighted needle valve.



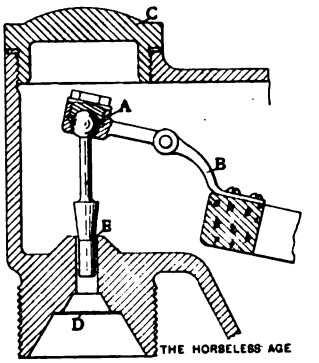
THE KINGSTON TIMER.

The nozzle is centrally located, and the walls around it are somewhat cone shaped to increase the speed of the air, which enters at the bottom. This opening is adjustable and supplies sufficient air for low speeds. For high speeds the auxiliary air which does not pass over the needle opens the auxiliary valve of light bronze, which rests upon a leather seat, and maintains the proper mixture. The auxiliary valve is adjusted by a screw. The throttle is of the balanced piston type, with a small passage which allows the pressure on opposite sides of it to be equalized. The carburetor is made with either a vertical or horizontal outlet.

This company also showed their new roller timer, whose peculiarity consists in the method of supporting the roller contact. In the sketch K is the arm supporting the contact roll M. This arm is pivoted at N, and forced outward by a flat spring P against the inlaid contact pieces. At ordinary speeds the centrifugal force holds the wheel to its contact, which the spring K does at slow speeds and in starting. It is claimed that with this arrangement the contact pieces are always held together even after long use and when they are pitted.

THE NEW SCHEBLER CARBURETOR.

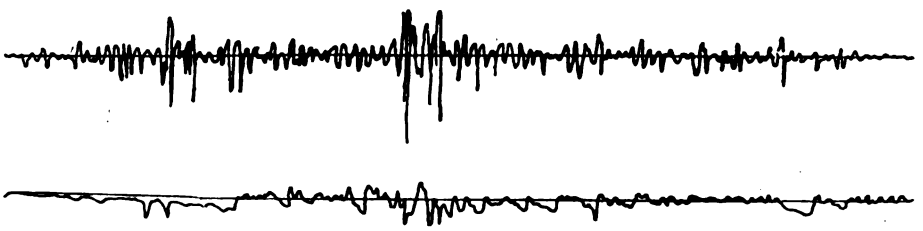
was shown by F. H. Wheeler. The valve into the carburetor has been changed to the form shown in the sketch. A is a ball joint at the end of the lever B, which is pivoted as shown, and operated by the horseshoe shaped cork float. The screw cap C has a small cork gasket to keep it tight. A screen is located at D to keep out dirt and the valve seat E is sharp, so dirt cannot lodge there. The fixed air draft opening, instead of being just under the auxiliary, is now placed around the central nozzle with a special outside pipe. This arrangement places the draft around the nozzle, where it will be effective.



SCHEBLER CARBURETOR IMPROVEMENT.

THE INTERNATIONAL NON-EXPLOSIVE TANK COMPANY

exhibited several of their non-explosive tanks. The safety device employed consists of a perforated sheet metal tube with a concentric tube of gauze inside, and in this another perforated sheet metal tube. At the top of this tube is a sort of safety valve. The device is inserted in a tank and forms the filling tube. The action of the device is as follows: Heat around a vessel filled with gasoline converts part of it into a vapor; if the heat is continued the vapor exerts pressure and will finally explode the tank, throwing gasoline on all the surrounding objects. The idea involved in the construction of this safety tube is that when the pressure rises sufficiently the safety valve opens, and the gas shoots out and ignites, burning with a blue flame somewhat like a blow torch. If the pressure is great, the actual flame may be several inches from the mouth of the tube. When the heat subsides the spring cap automatically closes, shutting off the flame. In case the cap is entirely blown out, when the pressure subsides, the flame at the mouth of

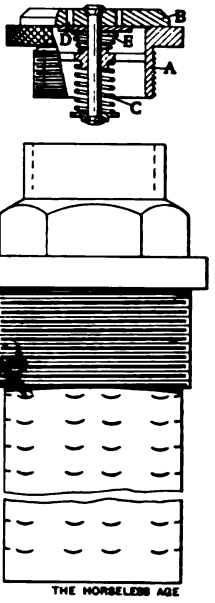


VIBRATION DIAGRAMS.

Both diagrams were obtained with a Model L Packard car driven on October 29, 1905, over a macadam pavement in fair condition on Lake avenue, Chicago, at 25 miles per hour—the upper without, the lower with the Hotchkin anti-jolt device fitted to the car.

the tube can be put out by slipping a cord or handkerchief over it.

In the drawing the escape valve is shown at the top of the tube. A is a screw cap, the top being closed by a disc B held on its seat by the spring C. This valve relieves the pressure in the tank. In the case of automobile tanks air must be admitted as the gasoline is draining to the carburetor. This is permitted by another small disc D held to its seat over a circle of holes in the disc B by means of the small very light spring E. If a pressure feed on the tank is used this spring can be so arranged that it serves to maintain the artificial pressure in the tank.



TUBE OF SAFETY GASOLINE TANK.

Armored Motor Wagons at the Berlin Show.

At the Automobile Show which opened in Berlin on February [illegible] were shown a number of armored [illegible]biles built to the order of the General [illegible] of the German Army. The principal [illegible], intended for the use of the commanding general, was an Opel Darracq [illegible] to hold maps, telescopes, [illegible] letter racks, electric lights and other necessary accessories. The armor is of 4 millimeter Krupp steel, which is considered sufficiently thick to withstand any modern rifle bullet. This armor is as high as the driver's shoulder, but the wheels are unprotected. The armament of the car consists of two Maxim guns, swords and pistols.

There are at present two companies operating motor omnibuses in Cairo, Egypt, the Société des Omnibus du Caire and the Automobile Transport Company, of Cairo, the former running a number of De Dietrich buses. It is reported that the two firms are about to be amalgamated with a capital stock of $500,000.

OUR FOREIGN EXCHANGES.

The Crystal Palace Show.

The fifth annual Crystal Palace Automobile Show, one of the several non-recognized shows that are held in London, opened on Saturday, January 26, and remained open for a week.

For two years the Crystal Palace Automobile Show was to England what the Paris Automobile Salon is to France. Patronized by the Society of Motor Manufacturers and Traders, it was the one great show of the year. In February, 1903, the Crystal Palace was packed to the utmost with the enormous total of 442 motor vehicles, while in February, 1904, the number of cars shown was only one less.

After that date the prosperity of the Palace show received a severe check, for the Society of Motor Manufacturers and Traders, dissatisfied with certain regulations, which prevented them having complete control of their own part of the show, and believing the train journey to it kept many buyers away, separated from the Palace organization, and on February 10 last year produced their first Olympia show. Undetered by this split, the Palace authorities gamely held their February show as they had advertised, but owing to the clashing of interests and of dates the number of cars displayed was only ninety-nine.

This time an interval of a couple of months has separated the Palace show from the Olympia display of November last. The clashing of interests, therefore, is but small, and the Palace secured as exhibitors not only the many firms who were shut out from Olympia but many others who were dissatisfied with the principle by which space was distributed at the latter show; that is, who objected to the ballot in which the older supporters, known as the bond signers, have prior claims.

Prominent among the improved features of the show were the stands and their arrangement. Situated so as to occupy the greater part of the north and south naves and the central transept, they appeared more [illegible]ous than last year; and the effect was greatly enhanced by the elaborate nature of the stands and of the displayed signs. The Automobile Commercial Syndicate, of Long Acre, for example, had brought over its turntable, which was a feature at the Salon in Paris last November. By its aid visitors were able to see all sides of the "dustless" Spyker car on the turntable in a few seconds of time. The Itala, Vinot and Fiat firms also had signs of a highly decorative nature.

Among the actual cars and chassis shown were many which had come from the Paris Salon, among them the big Pilain which was shown there last December, and also a somewhat similar model in the year previous, its particular claim to notice being that there are three concentric bevel p in the differential casing, each one p nently engaged with a small pinion. latter can turn free on their shaft o also be made to turn with it—in thi the gear box is done away with, a drive is direct on all three speeds.

Among the other cars not yet well k in England was the De Salvert, stantially constructed chassis of whic exhibited. It is a live axle car with semi-elliptical springs replacing the rear dumb irons of the frame. A R riveted honeycomb radiator is emplo

Improvement in Steering De for Motor Tractors.

The Neue Automobil Gesellscha Berlin, who have made a specialty of mobile tractors and trailers, and sc whose products in this line are used German army and in the German col have found that the trailer has a te to turn the front wagon round more is desired when the vehicle is turn corner at any speed or turning on a gradient. To overcome this a cylinde piston pump containing oil are empl A passage having a check valve unite two ends of the cylinder together, an piston is connected by a lever to th portions of the vehicle in such a wa any deviation of the fore part cause liquid to be displaced from one side piston to the other, and, the check being controlled by the movement o steering mechanism, controls the pa of the fluid and therefore the resista

Automobiles and First Cla Railroad Travel.

According to the reports of several ish railroads, the receipts from first railroad fares have been very adverse fected by the automobile. Almost railroad terminating in London has suf a decline in its first class passenger se and the effect is particularly marke the lines to Newmarket and other sp centres, the conclusion being that persons who would otherwise have tra to these places by railroad, first class, in their automobiles. The Great Nor and Great Western lines are said to suffered particularly.

Special Motor Road Bil Withdrawn.

The London and Brighton Motor Bill on February 1 came before the iners of private bills for proof of o ance with standing orders of Parlia At the opening of the proceedings Wilde, solicitor for the promoters, that it had been impossible to come to as to the form in which the Parliam monetary deposit would be made. these circumstances the promoters ha cided to withdraw the bill for the p session.

The "European Circuit."

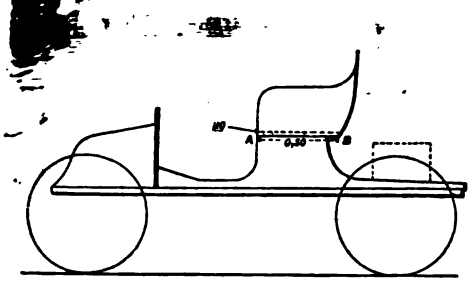
a meeting of delegates of recognized au-
iobile clubs was held at the meeting
ms of the German Automobile Club in
lin on January 20, to discuss the con-
ons under which the 5,000 kilometer
urance contest proposed by the Auto-
bile Club of France is to be held. The
)s of France, Germany, Austria, Hun-
y and the Netherlands were represented,
l the meeting was presided over by the
ke of Ratibor. Marquis De Dion, who
s the first to suggest the contest, made
first address, in which he laid stress
)n the fact that it was the desire of the
tomobile Club of France to make the
nt a thoroughly international one. The
:nch Club had so far organized speed
itests o[illegible]t the object now was to
the German Government was not to be obtained for a contest of that sort. He, therefore, proposed that the speed should not be allowed to exceed certain limits. To this Marquis De Dion answered that it was also the desire of the Automobile Club of France to avoid speed excesses, but great difficulties were encountered in effectively limiting the speed without a very comprehensive and expensive system of timing controls. He thought, though, that the speed would be limited by the fact that there would be no advantage in exceeding the average speed prescribed.

To this it was objected by the German delegates that drivers would try to make up lost time by speeding, and would fail to reduce their pace at dangerous points. If this rule of average speeds was to be retained, it would at least be necessary to place the responsibility for the speed in built up districts upon the official observers who are to accompany each vehicle. Marquis De Dion said that great difficulties would always be met in this respect in a contest extending over 5,000 kms. Official observers had been provided in the first touring contests held in France, but it had been found that they became partial to the vehicles which they accompanied. They should have been assigned to a different vehicle every day, but this, too, would have been a source of difficulty. It was his idea to ask the governments of the different countries passed through to furnish official observers from their respective armies, and if these observers could wear their regular uniforms it might add a very attractive feature to the run.

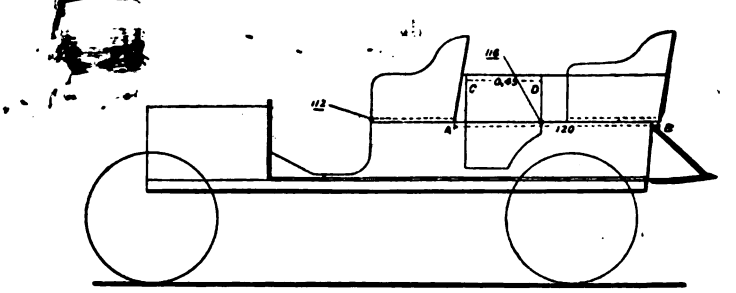
A delegate of the German Automobile Club then proposed that the rules of the contest relating to the classing be so altered that the time actually consumed in involuntary stops on the road be taken by the official observers, and that the performance of the car be judged according to the time thus lost, and not on the basis of average speed made. This change he thought to be necessary in order to obtain the consent of the Government. A similar view was taken by the delegate of the Austrian Automobile Club, Count Kolowrat, who said it could hardly be expected that the Austrian Government would sanction a contest in which an average speed of 45 kms. per hour was required. After some further discussion the system of classing proposed by Dr. Levin-Stoelping, of the German Automobile Club, was agreed to by all of the delegates present, and the following rule substituted for Section 3 of the original rules:

"The vehicles will be classed according to the time consumed by involuntary stops, one point being counted for each minute thus lost. In order, however, to limit the speed to that prescribed in the rules, the total running time will be increased by that of the involuntary stop, as well as stops occasioned by tire troubles, which latter, however, will not be penalized."

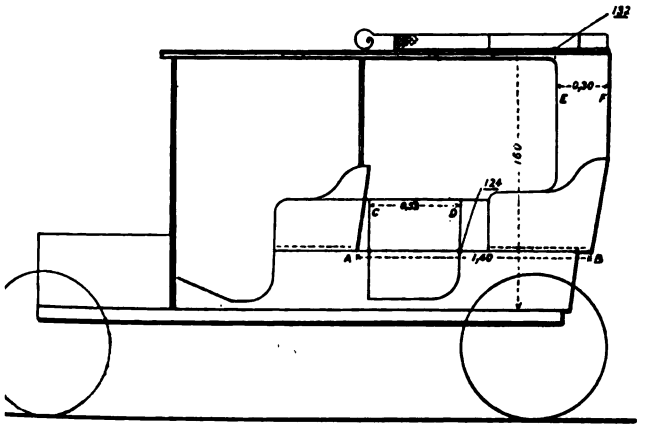
Other points of the rules were considered also at length, and it was finally decided to appoint an executive committee for the general organization, which committee is to have full power to carry through the preliminary work and to decide all disputes during the contest. This committee consist of one member and one r



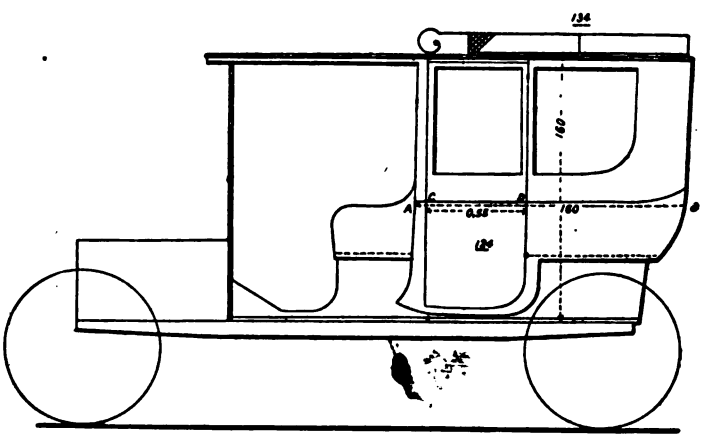
CLASS I BODY.



CLASS II BODY.



CLASS III BODY.



CLASS IV BODY.

the regularity of operation of the cars,
s encouraging the practical development
design. The next speaker, Count Sier-
rpff, said that, in his opinion, Section 3
the rules, relating to the classing of the
icles, would be the cause of the greatest
iculty so far as Germany was concerned,
ause it would tend to make the contest
ace, instead of a regularity contest. It
s to be expected that this method of
ssing the competitors would lead to
ater speeds than the German Govern-
nt would allow, as each contestant
o had lost time through involuntary stops
uld try to make up for it by driving his
to the limit of its speed. With an
rage speed of 45 kms. per hour, as pro-
ed for the fourth class of vehicles, actual
eds of 60 to 70 kms. would be attained,
l it was to be feared that the consent of

member from each of the recognized national clubs through the countries of which the contest will lead. Every member of the committee is under obligation to accompany the competing vehicles over the whole circuit. The prize jury will be composed of members of the recognized automobile clubs of those countries through which the contest leads, and all others which are interested on account of entries. Each country will have one vote in the deliberations of the jury. Vehicles entered must be in Paris three days before the start of the contest, in order to allow sufficient time for the weighing in, stamping, sealing, etc.

The start in the first stage will occur in the order of entries, and in the following stages in the inverse order of arrival. The official observers will be changed in each country, and only persons will be chosen for this post who are acquainted with the language and the automobile regulations of the country passed through.

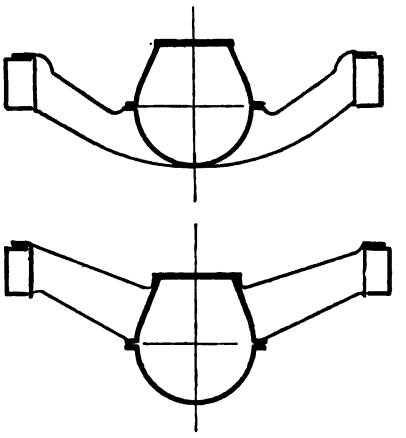
The certificates that will be awarded to contestants which have arrived in all end controls within the time limits will be issued jointly by the recognized automobile clubs of the countries through which the run leads, and will bear the seals of these clubs. In order that the contest may take place, a sum of 200,000 francs must be raised by means of entry fees, and the executive committee reserves the right to cancel the event and return the fees. The itinerary was finally arranged as follows: July 29, Paris to Limoges; 31, Toulouse to Puy de Dome; August 1, exhibition in Puy de Dome; 2, Puy de Dome to Aix les Bains; 3, exhibition in Aix les Bains; 4, Aix les Bains to Milan; 5, exhibition in Milan; 6, Milan to Trieste; 8, Trieste to Klagenfurt; 8, Klagenfurt to Vienna; 9, exhibition in Vienna; 10, Vienna to Prague; 11, Prague to Breslau; 12, Breslau to Berlin; 13, exhibition in Berlin; 14, Berlin to Hanover; 15, Hanover to Cologne; 16, exhibition in Cologne; 17, Cologne to Mezieres; 18 Mezieres to Paris.

The competing vehicles in this touring contest will be divided into four classes, and the vehicles of each class will each be fitted with the same form of body. Vehicles in Class I will have what is known in France as the Petit Duc Spider body for two passengers, the body, including the four mud guards, steps, searchlight bracket, side lamp brackets, rear lamp bracket and baggage carrier, weighing 330 pounds. The vehicles in the second class will have a body of the double phaeton type with side entrance, seating four persons and weighing complete 440 pounds. The vehicles in the third class will be fitted with double phaeton side entrance body closed at the rear and covering also the front seat. These bodies seat four persons, and weigh complete 825 pounds. The vehicles in the fourth class will be fitted with the limousine body, weighing 990 pounds. All the principal dimensions and the general form of the bodies are shown by the outline drawings herewith.

Methods of Supporting Automobile Motors.

In a report on the Frankfort Automobile Show by August Bauschlicher in *Der Motorwagen* the different methods of supporting motors on automobile frames are discussed. Fig. 1 represents the well known Daimler chassis, the characteristic feature of which is the development of the lower half of the crank case as supporting member of the motor. The lower half of the case, which is fitted with sheet metal panels between the arms, also forms a dust excluding shield. The change gear case, however, is supported at three points directly upon the frame, without any special dust pan arrangement. With this method of support outside shocks act rather harshly on the parts of the motor and change speed gear.

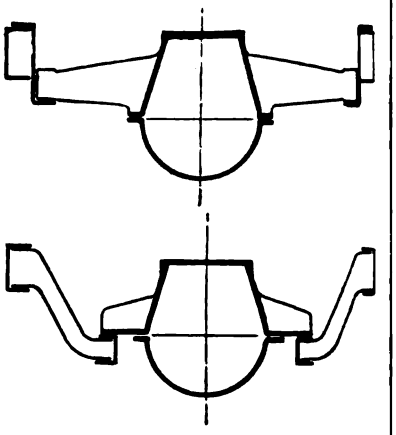
Figs. 2 and 3 represent the method of a support employed on the Benz and the older Adler models. In both cases the motor is supported by arms cast on the upper half of the crank case. In this case, too, road shocks are transmitted directly to the motor and change gear, while, on the other hand, the vibration of the motor is transmitted without material reduction



FIGS. 1 AND 2.

to all other parts of the car. A more flexible suspension is obtained by means of the sub-frame as shown in Fig. 4.

Although the construction shown in Figs. 1 to 4 is very common, and renders all parts readily accessible, it is by no means perfect. It is handy for the designer and the manufacturer, but the protection against mud is usually very incomplete. The methods of support shown in Figs. 1, 2 and 3 are open to the objection that they are designed to be rigid and not elastic. The supposition that the frame forms a rigid foundation for all the parts of the driving mechanism such as motor, gear case, etc., is quite erroneous. On the contrary, a channel steel frame is very flexible and twists under very light loads. There is, therefore, a very good reason for the provision of tubular cross members, as used by Benz, which in the case of a twisting of the frame oppose considerably greater resistance to its deformation than channel cross members. A tubular frame

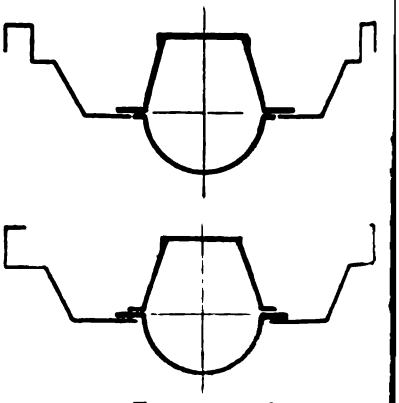


FIGS. 3 AND 4.

does not twist nearly as easily as a channel steel frame, the latter is only superior to the tubular frame with respect to vertical loads.

If the motor and gear case, with the arms, are secured to the running gear frame, the latter is appreciably stiffened but it loses at the same time all elasticity, and the first result of such a method of support is that, in case of a front end collision in which the frame is bent, the aluminum housings are usually also affected, often even broken. Conditions are much improved by supporting both motor and gear case at three points. This theoretically unobjectionable method of support is closely approached by the methods represented in Figs. 5, 6, 7 and 8, and from the engineering standpoint this type of chassis must be considered superior to that represented in Figs. 1, 2, 3 and 4.

Fig. 6 represents the Decauville construction. In this case the lower portion of the motor and change gear housing forms one piece shell which serves as a supporting shell for the entire superstructure of motor and change speed gear, and rests in a pan-shaped depression of the frame. This method, however, is open to the objection of inaccessibility, and in case of serious breakdowns the dismounting of the machinery would be rather troublesome. Fig. 7 represents the Opel frame, which avoids the objection of troublesome dismounting due to placing the superstructure upon the frame depression. Besides, motor and change gear are here separate, and the fairly long coupling shaft possesses consid-

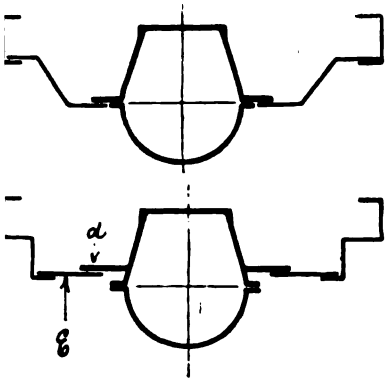


FIGS. 5 AND 6.

able elasticity, compensating for longidinal disalignment. The protection is wever, not as perfect as in Figs. 3 and 6, hough the advantages of the elastic susnsion are fairly well secured. Recently has become the custom to rivet the pan the side frame, making a modification the old Darracq frame, which was essed from a single piece of steel, and own as a seamless frame.

The seamless frame did not survive in actice, although two years ago it figured the leading attraction at the Paris Show. d excellently executed samples of it were own, particularly by Decauville and Darcq. It has not been able to hold its own. cause, aside from the difficult and exasive construction due to the great outfor special dies, even for small lots, it open to the objection that unequal ength is often caused by defects in the ocess, and that it is not possible, as with ordinary channel steel section frame, to oduce frames of different width by comuing suitable cross members with the side mes.

A substitute for the seamless frame, with excellent protection from below, which



FIGS. 7 AND 8.

nits of cleaning the under side by means a hose from a hydrant, is represented Fig. 5, which shows the Adler frame h this construction, in spite of the rigid nection between motor and gear, it is possible to dismount separately either the two under pans, the entire motor hanism, or the motor alone. The upper of the crank case is provided with a icularly broad flange, to which is bolted supporting pan, which at its ends is ed to drop cross members of the frame.

ventures of Automobile Thieves.

he police department of Paris is now so ient, says a Parisian contemporary in a cal mood, that automobiles are being n here in plain daylight with the greatfacility. It is true that in a few cases thieves have been apprehended. This is happened to the two brothers Arfeuille, and Eugene, who specialized in the of automobile thievery and who find by being caught in the country after rather amusing adventures.

ne exploits of the two brothers began on November 19 last. They were strolling down the Rue Lauriston when they noticed a superb limousine belonging to M. Labourdette drawn up at the curb, the chauffeur having absented himself for a moment. Leon and Eugene Arfeuille did not hesitate a moment, but cranked up the motor and drove off in the stolen vehicle. M. Labourdette, of course, notified the police that he had been robbed, and had the satisfaction in a few days to be put into possession of his vehicle again, which the detectives had recovered at a machinist's shop in the Rue Ramey, where the thieves were trying to sell it. But the Arfeuille brothers managed to escape, and it was impossible to find them.

The failure of this first attempt did not discourage the brothers and they resolved still more firmly that they would get into possession of an automobile without expense. Having associated themselves with a friend named Thellier, they succeeded in stealing a double phaeton belonging to an American, M. Rigswalter, valued at 20,000 francs. Taking a lesson from their former experience, the three friends came to the conclusion that they would find it easier to dispose of the vehicle outside of Paris, and so they left for Versailles as the first stage of their trip.

On the way there the three accomplices found that the gasoline was running low in the tank, and that they didn't have a sou between them to purchase a supply, but they were nothing daunted by a little thing like that. Upon arriving in front of a store where gasoline was sold, they filled their tank, loaded quite a number of cans into the vehicle and then drove off at full speed, leaving the merchant gaping in front of his store.

Thus they arrived at Tours, and their supply of gasoline having run low again, they made another attempt to replenish it without expense at a grocery store. This shopkeeper was more attentive, however, than the one they had dealt with before, and when they drove off he grabbed hold of the vehicle and was dragged along a considerable distance, crying at the top of his voice "Stop thief!" In order to get rid of him the thieves struck him on the hands until he fell on the road exhausted.

Meanwhile the trio became hungry, and their pockets were still empty. Between Tours and Chatillon they noticed a farmer of prosperous appearance. They invited him into the vehicle, stole his pocketbook, and then threw him out on the road without bothering about him any further. At 2 o'clock in the morning, while not far from Poitiers, the three adventurers entered a road house and had champagne served to them. When the landlord presented the bill they asked for another bottle. He opened the trap door of his wine cellar, and went down to get the bottle ordered, when the three thieves closed the door after him, placed on it a large rock and drove off.

While entering Portiers, the vehicle being driven at great speed, crashed into a telegraph pole and was considerably damaged. An attempt was made to effect repairs, but without success, and then it was decided to push the car. This, however, had also to be given up, as it was too difficult. The trio then took all the gasoline cans that were still full, as well as the empty cans, and sold the whole for 39 francs. Abandoning the vehicle at a street crossing, they made directly for the railroad station and took the first train for Tours. The police at Tours, however, were notified and they were arrested upon the arrival of the train. Thus ended the adventurous career of the brothers Arfeuille and of Thellier.

A Light One Passenger Car.

Motor vehicles designed to carry a single passenger only have so far been mostly of either the two or three wheeled type, because a reduction in the number of road wheels admits of a considerable saving in the weight of the vehicle and of simplification in the construction. If only a single steering wheel is used, for instance, the steering mechanism is much simplified, while if only a single driving wheel is used the differential gear can be dispensed with. Both the motor bicycle and tricycle, however, leave much to be desired from the standpoint of comfort. An attempt to produce a four wheeled single passenger vehicle that should offer all the advantages of the ordinary motor bicycle and tricycle, and eliminate their defects, has been made by a Swiss inventor, M. Fischer, of Zurich. The car is constructed with a frame of such small width as to allow of the car passing through doors of ordinary size and up staircases, and it has small wheels of equal diameter, while to increase the stability the hindmost point of the driver's seat is at a height of not more than 18 inches above the ground, the seat being sloped upwardly toward the front of the car. The car is steered by means of the feet acting upon shoes attached to, or connected with, the steering axles. The driver places his feet in steering shoes, so as to press against and operate a lever pivoted to the fixed axle and connected to the swiveling stud axles on which the steering wheels are mounted by a rod forming part of the ordinary steering connections. The steering axle may be pivoted at its centre to the vehicle, so as to swivel as a whole, the steering shoes being then attached directly to the axle. In order to allow of easy play of the front axle frame in a transverse vertical plane, it is connected to the main frame by a horizontal pivot pin carried in an extension of a sleeve mounted on the front axle frame. The frame is connected to the sleeve by means of a vertical bolt and spring.

There were 258 motor omnibuses in use in London on January 29, not making any allowance for those under repair. The increase has recently been at the rate of day. More than half of these are man make.

COMMUNICATIONS.

Laws of Friction.

Editor HORSELESS AGE:

I would like to be enlightened in regard to whether the amount of friction varies with the area of surface or the pressure brought to bear. On page 5 of your January 3 issue reference is made to a certain disc clutch which uses a large number of discs and a light spring, from which one would infer that the friction increases with the surface. There is a law to the effect that friction increases as the pressure increases, regardless of area of surface.

In the recent description of a 1906 car, it is stated that the diameter of the brake drums has been increased in order to get a greater braking effect, due to the increased surface which would not result if the above law were true. Those who have had the experience know that the harder you pull or push (according to whether it is hand or foot brake) on the lever, the sooner the car will come to rest, owing to the greater pressure brought to bear. W. E. T.

[Ordinarily, when two plates are pressed together, the friction to motion between them depends only on the pressure and not on their surface area. This law is substantially true, but not absolutely. The friction can always be found by multiplying the pressure with which the plates are pressed together, by the coefficient of friction for the materials out of which the discs are made. In calculating the torque or turning effort that a disc clutch can transmit, account must be taken of the average diameter of the discs, as a certain amount of friction is twice as effective at 10 inches from the centre of rotation as at 5 inches. In a multiple disc clutch the clutch power is proportional to the number of discs employed, all other things being equal, as explained in our reply to Joseph A. Anglada in our issue of January 31.

If brakes are increased in diameter they become proportionally more effective even with only the same amount of friction at their surface. If one considers that the friction at the brakes is limited by the strength of the driver, then the power of brakes would not increase with the surface, if the diameter remained constant. This, however, is not quite correct, for if the brake drums are very small and the rest of the brake mechanism is also made very light, the driver would most likely not put his whole strength on the brakes, which he could safely do if they were of substantial construction. The main object usually in view in increasing the size of brakes is to reduce the wear. A numerical example will probably serve best to make clear the effect of increasing the size of brakes. Suppose a car has 8x1½ inch brake drums and these are replaced by 12x2 inch drums. Evidently the new drums are one and one half times as large in diameter and have twice as much frictional surface area as the old drums. If the total friction between the brakes and the drums remained the same, the braking effect would be 50 per cent. greater, owing to the greater diameter, while the wear would be 50 per cent. or more less, as the friction is distributed over twice the area. If the same friction per unit surface area were used in both cases, resulting in equally rapid wear, the big brakes would be three times as powerful as the small ones, as the total friction would be twice that in the small brakes, and the leverage through which this friction acts one and one half times as great as in the small brakes.—ED.]

Steam Versus Gasoline.

Editor HORSELESS AGE:

The queries of Elmer G. Griese and your answers to them in your issue of January 31 were of interest to me and no doubt to a large number of your readers. This question is occupying the minds of a good many automobilists, especially those who are contemplating the purchase of automobiles and are halting between two opinions. Since a steamer at Ormond Beach, Fla., smashed all or nearly all world's records for any power, running against gasoline cars of three times its own power, men have begun to investigate before deciding to place their orders for cars, as to which is the better and the more reliable power, steam or gasoline.

To the mind of the writer gasoline cars are much overrated in horse power. I may say that gas engines are usually also overrated. The writer once purchased a new gas engine from a prominent maker which was claimed to give 12 horse power, but under actual tests the best it could do was to develop 7 2-5 brake horse power. I do not think your answer to Mr. Griese covers the whole question. You say you understand that racing steamers may start with 1,200 pounds of steam pressure. Granting that this is true, is it not also true that this energy (I mean surplus energy) is gone by the time the car has traveled a mile? If this is the case, then after the first mile has been covered the car must be running the remainder of the distance travelled normally, and the boiler must make every pound of steam as the engine uses it up.

According to the official report from the race at Ormond a steamer made the run of 15 miles in 13 minutes 46 2-5 seconds, beating all other cars of any power in this race. What amount of steam pressure this car started with the report does not state, but granted that it was 1,200 pounds, surely it would have to depend upon the steam generating power of the boiler during at least 12 of the 15 miles it traveled.

Last summer three cars made the run from this city (Newark, N. J.) to Morristown, N. J., a distance of 20 miles. Two were gasoline cars and the other a reconstructed steam car of the 1901 model. One of the gasoline cars was rated at 12 horse power and the other at 6 horse power. The time consumed by the three cars in making the trip was as follows: The steamer 55 minutes; the 12 horse power (so called) gasoline car, 1 hour 20 minutes, and the 6 horse power gasoline car, 1 hour 40 minutes. The steamer ran under a pressure of 250 pounds per square inch. Now there was no extra stored up energy in the steamer and yet without a hitch in the car's running the little 4 horse power steamer beat the 12 horse power gasoline car by 25 minutes and the 6 horse power gasoline car by 45 minutes. The steamer used steam at nearly 500° F., superheated, there are some stiff grades on the road—one especially heavy grade is that known as Hobart's Hill. We have been taught in technical schools that 1 horse power is equal to 33,000 foot pounds per minute, or that power which will lift a weight of 33,000 pounds 1 foot in one minute. If this rule is correct it must hold for both steam and gasoline engines.

Each of the three cars carried two people of about the average weight of 150 pounds each. At the start the weight per horse power for the steamer was 22 pounds and 160 pounds of water was evaporated, leaving a net weight for the car at the finish of 840 pounds. I do not know the exact weight per horse power of the two gasoline cars, but I do know that it was less than 200 pounds per horse power. Now, Mr. Editor, can you explain why these two gasoline cars made such a poor showing compared with the steamer? Surely there must be some cause for it. Can it be possible that neither of the gasoline cars developed 4 horse power, or did the little steamer gird up its loins and suddenly develop into a flying monster of unknown power? Let us know more on this subject of horse power.

An automobile agent once told his prospective customer that the car he was then looking at was of from 15 to 25 horse power. Now if this was really a 15 horse power car, from what source was the surplus 10 horse power to come when it might be required? If this unlimited horse power rating continues who knows but that we will see runabouts of 1,000 horse power or more in the near future.

STEAM OR GASOLINE.

"Power with Different Systems of Ignition."

Editor HORSELESS AGE:

We have noted the editorial on "Power with Different Systems of Ignition" in your issue of January 31, and we have found as you state, that there is more heat in a make and break than in a jump spark with the same current consumption, for the reason that the loss caused by the transformation in the coil is not present. If the

: amount of energy were used in pro-
ıg the jump spark as is put into the
: and break, it would be much better
it is now in common practice.
ıe trouble now is that the coil builders
:utting down the current consumption
e lowest possible limit, in order to get
isfactory number of miles from chem-
batteries and to see how cheaply they
build the coils to produce a spark that
jump a certain air gap. These things
encouraged by the car manufacturers
ıselves, and we think it is a great mis-

It is possible to build a jump spark which, with a reasonable amount of :nt, will give a very hot spark.

THE DAYTON ELECTRICAL MFG. CO.,
Per V. G. Apple, Mgr.

Ignition Expense.

or HORSELESS AGE:

own a three cylinder, air cooled car, use four dry cells for ignition. My bat- lasts about two weeks, running the ma- e about 12 miles daily. Would it be e economical to replace the dry cells by orage battery—the cost of recharging is 50 cents—or could I install a mag- igniter?

ıe only lubrication of the cylinders in car is by splash, the oil being pumped the crank case. Is this sufficient or ıt I provide other lubrication?

NEW SUBSCRIBER.

We presume the four dry cells cost you ıt $1.40, and as a charge of the storage :ry should last at least as long as the cells, they ought to be cheaper. You of course, also fit a magneto and thus rid of the bother of charging the bat- :s.

here are many motors that depend en- y on splash lubrication and are satis- ›ry.—ED.]

Ignition Terminology.

or HORSELESS AGE:

THE HORSELESS AGE of December 20, , you very kindly wrote up our spark rator, giving your readers a very good impartial idea of our instrument. There ne criticism that you make, viz., that name "spark generator" is rather in- opriate.

e have given this matter of name con- able thought, and I wish to give you reason for calling it such. The article h you wrote after the New York Show equally as good, and the writer un- ıtedly understood the machine thor- ily. He, however, made the same crit- ı regarding the term "generator." We no reason why our machine does not rate the spark, as it contains all the ratus necessary for so doing. It does enerate electricity nor does the name y that it does. A dynamo, a magneto battery is an electrical generator. A ry transforms the energy of chemicals electrical energy. The dynamo or magneto transforms mechanical force into electrical energy, while our machine transforms the electrical energy into the spark. Electric current is not a spark until it is transformed, by some apparatus, into a spark. A gas generator transforms a liquid or solid into a gas; the gas generator has to be fed materials for making the gas. The same could be said of a heat generator or a steam generator. To "generate" means to "produce." All of these generators produce what the name signifies. Our spark generator produces a spark, but electricity has to be furnished to produce this spark.

An ordinary vibrating spark coil could very easily be called a spark generator; it might also as well be called a spark box, and several other names could be given it.

Our machine is something apparently new in the automobile field and had to be given a name, so, after considering several, we decided upon "spark generator" as the most suitable name.

We certainly thank you for honest criticism, and trust that you will see our reasons for naming it as we did.

ATWATER KENT MANUFACTURING WORKS,
A. A. Kent, Manager.

[Our objection to the term spark generator was due to the fact that the term "generator" suggests at once a dynamo or magneto. Our correspondent's reasoning is quite logical, so far as it goes, but he makes no mention of the fact that the apparatus includes a device which has nothing to do with the generation of the spark, namely, the high tension distributer. We believe that "ignition set" or dashboard ignition set would have been a more appropriate term. —ED.]

Temperature of Self Ignition.

Editor HORSELESS AGE:

Will you kindly inform me through the columns of your paper at what temperature a mixture of gasoline and air as used in an automobile engine ignites, and what is the corresponding pressure per square inch, absolute or gauge? I mean when the ignition is caused by the pressure and the consequent temperature of the mixture.

IGNITION.

[The only information we have on this point is that in the Diesel engine, which employs this form of ignition, 550 pounds compression is used, which, according to "compressed air" tables, corresponds to something like 1,100 degrees Fahrenheit. The Diesel people, however, use mostly heavy fuel. Gasoline vapor will sometimes ignite by compression when no more than 100 pounds per square inch compression pressure is used, if the cylinder is unusually hot for any reason, or if there are interior projections on the surface of the compression space, or the cylinder wall is covered with a heavy layer of carbon. In trying to make use of this system it must be kept in mind that the temperature of ignition varies with the richness of the mixture, and if reliable ignition is desired under all conditions, a much greater compression will have to be provided for than would cause spontaneous ignition under ideal conditions.—ED.]

Repairing Cracked Cylinder Jackets.

Editor HORSELESS AGE:

I enclose a clipping from the February issue of *Machinery* on repairing frost cracked water jackets. Reading this article reminded me of a similar repair made last winter on a runabout engine that was suffering from this malady, although the job was not such plain sailing as the one described in the clipping. The crack in question was located just at the lower end of the jacket where it joined the crank case, and a most troublesome job it was to patch it. I could not use a band, as the shape of the cylinder and the position of the crack prohibited. I was about to give it up as a hopeless job, the owner objecting to putting on a patch, as that would detract from its appearance (the motor is under a hood, and is noted for its trim appearance). In fact, I had already written an order to the manufacturers for a new cylinder and piston (the old cylinder had been rebored), when a happy thought struck be and I proceeded to carry it out.

I procured some sheet wax, a small quantity of plumbago, a blow lamp and some plaster of paris. I thoroughly cleaned and smoothed the surface of the cylinder about two inches on each side and around both ends of the crack. Then I applied a little plumbago to the already polished surface, and by heating the wax formed it with the fingers to conform to the exact contour of that portion of the cylinder. Then more wax was added until the form was about one-half inch thick, finishing the edge so as to allow for drilling four screw holes to hold the affair in place. To remove the wax form was an easy matter owing to the coating of plumbago on the cylinder. The inside of the form was now scraped hollow to the depth of one-quarter inch, leaving a rim one-half inch wide all around the edge.

Next I made a mold of plaster of Paris, using the wax form as a pattern. After the mold was dry I made a casting of white metal, which when filed up I sent to the foundry and had an iron casting made from it. The iron casting was now cleaned and filed to fit the cylinder nicely and secured in place by means of four screws, the holes for which were drilled and tapped into the cylinder. The use of clamps was awkward and impracticable, so screws were resorted to.

The course of procedure was now exactly the same as described in the clipping; the cavity in the form was filled with a mixture of equal parts of fine iron borings and quicklime, and the affair was screwed into place; the water jacket was filled with water, which penetrated through the crack into the cavity filled with the mixture, the

sequent expansion of which forced it into the crack, effectually sealing it. The water was left in the jacket an hour or two, then was drained out, but the form was allowed to remain in place several days, then was removed, the screw holes plugged with screws which had previously been dipped in a solution of sal ammoniac and water; these were cut off flush with the surface of the jacket and the whole finished smooth by filing. A coat each of filler and paint finished the job, which absolutely defies any attempt to locate the leak. I was dubious at first as to its being permanent, but it is still holding, having survived all of last and two-thirds of this winter, which is noteworthy, as the car is owned by a physician and is in daily use. JULES OUVRIER.

Patent Law.

Editor HORSELESS AGE:

Suppose A got a patent in 1895, and if B could get one on the same article in 1900 why shouldn't B's patent be just as valid as A's? Another thing I do not understand is, how could B get his patent when A was before him?

I have heard of several cases like the example, each party claiming to have a patent. I will be very grateful to you if you will make matters clear. FRED. W. KISER.

[If a thing has been patented once it cannot be patented again, as an invention to be patentable must, according to the patent law, be "*new* and useful." Even if the article had been actually reinvented without knowledge of its earlier invention the second inventor would not be entitled to a patent on it. The patent examiners are supposed to make a search as to the originality of inventions on which patents are applied for. It is, of course, possible to obtain patents on improvements of earlier inventions, and if the earlier invention is covered broadly by a patent the patent on the improvement is subsidiary to it and cannot be exploited except with the consent of the owner of the basic patent.

Patents are sometimes talked of rather loosely or indefinitely by inventors. An inventor may say, for instance, that a certain automobile is made under his patent, when, as a matter of fact, his patent covers only the particular snap lock on the bonnet or some such unessential part. It may be that the misunderstandings you refer to may be due to this cause.—ED.]

No Monopoly on Good Ideas.

Editor HORSELESS AGE:

In an interesting article in your issue of January 31, describing the 1906 Mercedes, a number of changes in this well known car are pointed out. A noticeable proportion of these have already been in use on one of our best American cars, some of them for four years. I refer to such changes as the following:

Placing of timing gears at the front of the motor and enclosing same in a metal

Stuffing boxes on valve rod guides and igniter rod guides.

Ignition cams located on inlet valve cam shaft and made integral with the same.

Location of igniter plugs at the corners of the valve boxes to facilitate ready removal.

Passing the governor rod through the mixing chamber.

Method of supplying air to the carburetor and mixing valve for adjusting proportions of hot air and cold air.

Priming of carburetor from seat.

My object in writing is not so much to call attention to the fact that all good ideas do not come necessarily from the other side, but to show that some of these ideas have been in use in this country for a considerable number of years. The first gasoline Locomobile of 1902, for instance, had all of the timing gears located at the front of the motor and encased, no fibre being employed. It had a gear driven electrical generator, cam shafts with all cams integral, and other features standard at the present time. The installation of the make and break system on the Locomobile car last year was accompanied with the use of a one piece admission cam shaft, the valve cams and ignition cams being integral with the shaft. Also the use of stuffing boxes on the lifter rods and the location of the igniter plugs at the corners of the valve chambers to facilitate ready removal, together with other details.

J. A. KINGMAN.

The Doctor's Automobile.

Editor HORSELESS AGE:

Enclosed find a copy of an article written for local use, but there is no objection to its being published to open the eyes of people to the needs of the doctor. We want a motor carriage which will do our work; there is no machine now made which will fill the bill. Do not dispute me, I am posted, and I have given this subject much study. A. D. HARD, M.D.

(*Inclosure.*)

THE DOCTOR'S AUTOMOBILE.

(Read before the Southern Minnesota Medical Society by request.)

BY A. D. HARD, M.D., M.E.

In response to the request of your president I have prepared for your consideration a description of such an automobile as I consider the average practicing physician wants for use in doing his work. You will ask why such a machine has not thus far been put on the market for the doctor to buy, when so many want them, and it offers so many valuable improvements over those now offered for his use. My reply is that so far the manufacturers have found all the customers they want from among those who use an automobile solely for pleasure and luxury, and are not asking for a utility machine. The wants of the doctor, the rural mail carier, the livery barn and the traveling salesman are not yet provided for. Being a mechanic and mechanical engineer from previous training, and having used automobile ever since the Mobile Company of America shipped to me the fifty-second machine produced in their factory, in 1[illegible] I think you will see why I profess to speak with some understanding of the subject [illegible] this evening.

The doctor wants a comfortable motor carriage which will take him without [illegible]ure over any condition of ordinary country roads with reasonable speed in any kind of weather to his patient. Can such a vehicle be made? Can it be sold for a price that will bring it within the reach of [illegible] whose income is not over $1,200 per year? Yes, to both questions.

Some of the most intricate, expensive and troublesome parts of the present type of automobile can be dispensed with altogether. Water cooling, the differential gear, the transmission gear, and pneumatic tires may all be dispensed with, resulting in great advantage for a utility motor carriage. These modifications give us lighter weight, less machinery, less care, greater durability, greater strength in vital parts, less first cost, and more reliability. You will no doubt be amazed at these assertions, but the work of the mechanical engineer is to solve such seemingly impossible problems, and to secure results without regard for that [illegible] little word "can't."

Let me explain my ideas for securing these results. Air cooling is already a practical achievement and needs no explanation. The differential gear is that part of the rear axle by means of which the rear or [illegible] wheels adapt themselves to the distance to be traveled in making turns. This mechanism is intricate, weakens the rear axle, is cumbersome and expensive. It has many objectionable features and is the cause of much trouble. It reduces the clearance from the middle of the road to eight inches in most of the automobiles now in use. This is not sufficient to clear many of the stones and other obstructions found so frequently in the middle of our country roads. To strike one of these means disaster to the machine, with great delay and expense. When a differential gear is used the axle is made in two pieces, greatly reducing its strength, while it augments the weight and structural difficulties. The tendency to skid on slippery roads is largely due to the uneven thrust of power on the drive wheels produced by the differential. The differential makes the traction of one wheel depend upon the adhesion of the other driving wheel to the ground. In other words, if one drive wheel requires but twenty pounds of force to make it slip in the mud, the other drive wheel will not exert over the same amount of force on the dry ground to help the machine out of the mud hole. The excess of power is wasted in making the slipping wheel spin around. This depends upon the fact that each drive wheel depends upon the opposition of its fellow for traction power from the motor. My ideas for obviating the differential gear are as follows: Have the drive wheels run free [illegible]

axle, and get their power by independ- chains from small sprockets engaged one clutches on the ends of the main . In turning a corner or curve, deflec- of the front wheels from straight-away ie extent of 12 degrees by the steering ianism results in automatically releas- one of the clutches, so that one drive l runs free while the other propels the age around the corner. As the front ls straighten the clutch again engages, both drive wheels act equally to propel arriage. This is a very simple arrange- , and provides for all the advantages ie differential without any of its trou- or presence.

ie transmission is another complicated e, both cumbersome and expensive, h we do not need. The object of the smission, be it planetary or sliding gear, provide means for reversing the direc- of power application so as to back the ine, and to get different degrees of er and speed to meet varying conditions ad. In a vehicle weighing not over 700 ds the reversing function is not needed, t least it is less important than the ad- ages to be derived by omitting the smission mechanism. The different ds and degree of power can be obtained ore simple and effective manner. The or should be two cylinder, so arranged one cylinder can be cut out at pleasure. 1 cylinder should be seven brake horse er, as usually rated. The sprockets on drive wheels and on the main shaft ld be so related that when the motor nning at a maximum speed the vehicle make not over 20 miles per hour. is not much over one-half the speed arranged for by most automobiles. At speed one cylinder will serve to run vehicle on all ordinary roads, making necessary to cut in the other cylinder pt to climb very steep hills, or to go ly through deep mud, sand or snow. improved throttle now in use will pro- for all variations of desired speed of vehicle.

eumatic tires can be easily dispensed by simply using very flexible springs, g wheel base, and high wheels.

ie changes which I have indicated in present plan of construction would re- in reducing the weight of the machin- one-fourth, and the cost of it to one- . It would give greater strength with weight, greater power with less speed, ter efficiency with less troubles, greater e of usefulness with less liability to fail s duty. It would make 15 miles per average speed on common roads, h is all that any doctor requires. It d run in all kinds of weather, and l be provided with an enclosed top, h would make it exceedingly comfort- in winter or stormy weather. Such a le would be just what thousands of rs are now waiting for, and will wait as this vehicle is bound to come to meet persistent demand for a utility motor age.

The Situation in Bermuda.

Editor HORSELESS AGE:

At present Bermuda is unfortunately almost devoid of all kinds of motor cars. There are just five old steam cars on the island, and I understand that only one of these cars can be made to go at all. There are no gasoline machines here, and the only gasoline motors on the island are in two very small motor boats owned by American visitors. I am personally an ardent automobilist, having had two machines, a 12 horse power and a 30 horse power, up to the present time, but I could not get up my courage to bring one here, on account of the antagonism of the natives and the many narrow roads along cliffs where untrained horses might cause no end of trouble. The horses, by the way, are, one and all of them, total strangers to the automobile, and you, of course, know what that means. The roads, if they were not quite so narrow, would be ideal for short trips. There are about 125 miles of good roads with a fine hard surface—all made of coraline limestone; they are practically always in fine condition, as even after a day's hard rain they are dry after less than an hour of sunshine. Taking for granted the people here, as well as the horses, could be gotten used to the machines, there would still be one more bad drawback to the use of motor cars, namely, the difficulty of getting repairs done. There is absolutely not one person here that could tell you the difference between a spark plug and a cylinder. The five little old steamers referred to in the first part of this letter are very hard to find, since only one can run, and that one has scared so many horses that the man who owns it is almost afraid to take it out. Last year several Americans wanted to bring their cars down here, but were persuaded not to do so, on account of the many difficulties that would be met with here. This year the island government has actually passed an automobile law. It is rather a strange one, as I think you will see when you look it over. I send you a copy of this law under separate cover. I would most strongly urge people coming here not to think of bringing a machine, as I am perfectly sure they would have no end of trouble. I have spent, off and on, seven winters in Bermuda, and I must say the people, the place and the climate are delightful in their way, but they are still a good many years behind the times, and anything as modern as an automobile on this island would make a lot of trouble for the brave man that drove it, I feel sure. The average ten year old boy in any of our small towns at home would know much more about the auto than anyone here.

CLAYTON E. DIXON.

[The automobile law is a very comprehensive one, and evidently based on the British motor vehicle law. Its main provisions are as follows: Every vehicle weighing more than 5 cwt. must be provided with a reversing gear, and all cars must have two independent brakes, each capable of locking the vehicle wheels. Between one hour after sunset and one hour before sunrise each vehicle must carry two white and one green (in the centre) lamps showing in the direction of travel, and two red lamps showing in the reverse direction. In the two principal towns of the islands and on certain narrow roads, bridges, etc., the speed is limited to 6 miles per hour. Owners and drivers of automobiles must register with the registrar of the islands; fee, 20s. The registrar forwards a list of the licensed owners and drivers to the inspector of police, and the latter keeps these lists on exhibition for public inspection at all police stations of the islands. All cars are required to carry rectangular license number plates, carrying the license numbers in figures 3½ inches high by ⅝ width of tsroke, in white upon a black background, one plate to be attached to the front and one to the rear of the car. Any violations of the law are punishable with a fine not exceeding £20.—ED.]

Some Inquiries Replied to.

Editor HORSELESS AGE:

We notice you have an inquiry under the heading of "What Car Is It?" on page 256, of your February 7 issue, in which R. L. Selden wants to know what car has a double opposed horizontal engine in front, of 20 horse power, with vertical valves. Will you kindly advise Mr. Selden that the Model "D" Jackson is the one he is looking for; in fact, it is the only car manufactured that we know of built in this way.

On the same page of your paper a H. O. Hyatt wishes to know the maker's name of the "Nomrah" tire covering. They are manufactured by Harmon Manufacturing and Distributing Company, 285 North Carpenter street, Chicago, Ill.

HAYMARKET AUTO STATION,
E. P. Blake, Manager.

Calendar of Automobile Dates and Events.

February 3-10.—Chicago Show, Coliseum Building.

February 5-10—Washington Automobile Show.

February 12-17.—Detroit Automobile and Sporting Goods Show.

February 19-24—Cleveland Show.

February 24-March 3.—Philadelphia Show.

February 26-March 3.—Portland, Me., Show.

March 5-10.—Buffalo Show.

March 10-17.—Boston Show.

April.—Denver Automobile Dealers' Show.

April 2-7.—Toronto, Ont., Automobile Show.

June 10.—Herkomer Cup contest, Ger

ail Carried a Hundred Miles By Motor Car.

By Percy Evans.

Although the start was made amid great dships and discouraging circumstances, auto mail route from Roswell to Tor- ice, N. M., covering a distance of 111 es, is now declared to be a great suc- s. The mails are carried every day be- en these towns, and not once in three eks has the motor car been "behind time," ich is more than any of the railroads of Southwest can say. The other day the o from Torrance rounded into Roswell h two passengers and a big load of mail m Kansas City, Chicago and the East, hour ahead of time and seven hours lier than the railroads could possibly e brought the mail. By the bad combi- ion of railways, the auto brings mail to swell from the other New Mexico cities nty-four hours quicker than it could ne by rail. So everyone concerned has ided that the auto mail route is a suc- s.

ast December, when the word came that Roswell automobile route had been en a contract to carry the mails to and m Torrance for a period of four years l six months, dating from the first of the r, the company at once set out to take e of the contract in a satisfactory man- . For this is the first long time con- t for long distance mail service ever wed by Uncle Sam and the first in the rld, except for one in South America, so as the postal officials are informed. en the news came Manager Stochard and assistant went East and purchased three s to add to the service of three that had n used in the passenger business of the te.

Everything was in readiness by January and the first trip was made on that day. d such a trip as it was. The snow was nches deep in Roswell and the Pecos ley, but nothing was thought of that. o machines made the start sputtering of Roswell with great gusto. For 50 es the running was fairly easy, but after troubles grew thick and fast. The w grew deeper and deeper. It was soon eet deep, and the machines had to stop. y puffed and puffed, but the weight was much for them. The midway house the route had just been passed and the hines were backed to shelter for the t. The mails were not allowed to wait, ever, the chauffeur on one of the cars ked to a ranch house, several miles y, secured a horse and rode the re- ing 61 miles to Torrance in the snow ts.

he second day the machines tried the te again. They ran out several miles, again they were stalled. One of the cars a breakdown and had to be deserted ts tracks and the other was returned to midway house. There they waited for e days, and in that time the snows ted and the way was made easy. From that time on the route has been covered daily each way, and the mail service of New Mexico railroads has been surpassed in every way by the automobile line.

The company naturally takes much comfort in the fact that all the time they were "tied up" by the snow all the passenger trains of the Rock Island Railroad were unable to pass through the snow drifts of mountainous New Mexico, and that Capitan, N. M., a little town on a branch railroad, was for there weeks without train service. The success of the pioneer automobile route of New Mexico has induced E. C. Sperry, of Raton, to start a passenger auto stage between Raton and Dawson, a mining town 25 miles to the southwest from the "Gate City." Mr. Sperry has two cars in service. He runs from Raton to Dawson in an hour and forty-five minutes and makes the return trip, which is up a stiff grade, in two hours. It is a very mountainous country. The two towns are very poorly connected by rail and the wagon route is unsatisfactory.

Commercial Vehicle Notes.

A. D. Belton, of Detroit, who has a rural mail route of 30 miles in length, has purchased an Olds runabout for use in the delivery of his mail.

A project is being discussed in Baltimore for the connection of Carroll, Gwynns Falls, Druid Hill, Wyman, Clifton and Patterson Parks by a motor car line.

The St. Paul Park Board will place a sightseeing automobile service in operation next summer in Como Park. Two cars will be used at first, one of which will accommodate twenty passengers.

The Tully Farms, of Syracuse, N. Y., have purchased an electric delivery wagon, which they use for the delivery of milk about the streets of the city. The route covered is from 25 to 30 miles long. Eighty cases of bottled milk constitute a full load.

Russian Peasants Strike to Prevent Introduction of Motor Trucks.

It is in the nature of things that new inventions breed antagonism, as every stride forward in the province of mechanics means an attack on some vested interest of hand or animal power. This was again demonstrated in the Russian town of Shepetovka, in which Count Josef Potoki recently introduced a 20 horse power German Daimler motor truck for conveying the products of his sugar factory to the neighboring railway station, the sugar having been previously carried in carts belonging to local peasantry. The peasants rose to a man in defence of their menaced interests, but instead of destroying the motor truck they adopted up to date means—almost as effectual—to reduce the innovation to impotency: they struck in a body. As the manager of the Potoki estate could not dispense with the peasants, there was no help for it but to come to a compromise, which took the form of an agreement to use the lorry only for consignments which they cannot get to the station with their horse drawn carts.—*Commercial Motor.*

The Canadian Market.

Practically all of the automobiles now running in the Dominion of Canada are of American manufacture, although British made cars enjoy a preferential tariff. Lately the British automobile press has called attention to the opening for British cars in this important colony of the empire, and the British trade has been formally invited to take part in the automobile shows that are to be held in Montreal and Toronto shortly. As to the type of car best suited to conditions in Western Canada, A. Emmett, secretary of the Winnipeg Automobile Club, gives the following specifications: Detachable tonneau car, side entrance, four passengers, four cylinder, 10 to 20 horse power. Wheel gauge, 56 inch centre to centre. Wheel base, 90 to 100 inches. Road clearance, 10 inches or over. Tires, 3 inches to 4 inches (pneumatic). Wheels, 30 to 36 inches. Shaft drive. Speed, 4 to 30 miles per hour. Weight, 1,200 pounds to 1,800 pounds. Cooling: Combination air and water cooled, the water jacket being made removable to overcome the freezing difficulty in the winter, when the thermometer registers down to 40 below zero at times. Ignition, magneto; this would be an essential feature, owing to the difficulty in procuring new batteries when on tour. Price, $1,000 to $1,500 retail.

Cutting Tubes With Blow Pipes.

At the recent congress of metallurgy at the Liège Exhibition a new method of connecting metals by an oxyhydrogen blow pipe attracted much attention. According to *Commercial Intelligence,* tubes of a remarkable thickness were cut into sections by this process with wonderful rapidity, and manholes let into boilers with the greatest ease. The principle on which the blow pipe works is to direct two convergent jets of gas upon the metal to be operated on—one of oxyhydric gas, which brings the part to a red heat, and the other, distant about an inch from the first, of pure oxygen, which is darted out in a very thin stream under violent pressure. The oxygen cuts the red hot metal through at once without fusing it, and the edges of the cut present the same appearance as would be observed after the working of a saw. Soft iron and extra hard steel yield to the double blow pipe with the same facility. The width of the cut is not more than 2 millimeters (1-12 inch) for sheets 15 mm. (3-5 inch) thick, nor more than 3 mm. (3-25 inch) for those of 100 mm. (4 inches) thickness.

The Society of Motor Manufacturers and Traders (of Great Britain) at its last meeting decided to form a committee of twenty members to look after the commercial vehicle branch of the industry, and is said to be negotiating with the proprietors of the Olympia Show building, with respect to a separate commercial vehicle exhibi-

LEGISLATIVE and LEGAL

Two More Alleged Basic Patents.

Dyer & Dyer, patent attorneys of New York, filed suits last week in the United States Circuit Court for the Southern District of New York against the Lozier Motor Company and the Auto Import Company of New York for the alleged infringement of patents Nos. 657,650 and 662,401, granted on September 11, 1900, and November 27, 1900, respectively, to Leonard H. Dyer. The first was filed on June 8, 1898, and the second on April 26, 1899. The first is held to cover the H slot system of gear changing, and the second the sliding type of change gear. The ninth claim of No. 657,650 is that upon which the greatest interest centres. It reads as follows:

"In an automobile vehicle a transmission gearing therefor, the operating handle therefor, the fixed guide plate having recesses therein, substantially as set forth."

The drawings show what is claimed to be essentially a slot arrangement fitted to a belt driven car.

Claim No. 12 of the other patent reads as follows:

"In an improvement in gearing, two shafts parallelly arranged, a gear rigidly fastened to one shaft, a second gear in mesh with the first gear, but free to rotate about its supporting shaft, a clutch member upon said gear, a third gear rigidly supported upon one of the shafts, a loose gear adjacent thereto, normally inoperative intermediate mechanism interposed between said gear and its supporting shaft, a gear keyed to the other shaft but capable of lateral or endwise movement thereon, a clutch member upon one face of the fourth gear, and a protection or hub *n'* upon the opposite face, substantially as set forth."

A Bill to Provide a State Motor Vehicle Commission in New York.

ALBANY, N. Y.—A bill to create a State Motor Vehicle Commission and incidentally to provide for the imprisonment of offenders against automobile speed laws was introduced in the Legislature by Assemblyman Stanley, of New York, on February 12. It repeals the present automobile law and provides for the appointment by the Governor of a commission of three members to serve without compensation, who shall supervise the operation of motor vehicles in this State.

The commission shall have the service of counsel and a secretary, the main office to be in Albany and branch offices in New York and Buffalo. The bill provides that all motor vehicles shall be approved by the ...ission, and that all chauffeurs must be at least eighteen years of age and shall pay a license fee of $5. The commission is to regulate the speed of motor vehicles on the highways of the State, with a fine and imprisonment for any violations.

Crusade Against Violators of Gasoline Ordinance.

NEW YORK, N. Y.—The fire department has started a crusade against infractions of the laws regulating the storage and handling of gasoline. George E. Murray, superintendent of combustibles, has sent letters to the owners of about 48 garages notifying them that he will not reissue licenses permitting them to store gasoline in their places. In most cases the cause for refusal to reissue licenses is due to the fact that the proprietors of the garages have violated that section of the law which requires that buildings in which gasoline is stored be heated from apparatus in an adjoining building. In many cases the garages are heated by stoves. Another cause for refusal to grant licenses is violation of the law requiring that all gasoline tanks be placed under ground.

The charter provides a fine of $50 for violation of the law and an additional fine of $5 for each day the violation continues. It also provides a fine of $500 for any insurance company that insures a building in which these violations occur. Refusal to reissue licenses, it is said, nullifies any policy issued on either the building or the automobile in it.

Hearing on the Frelinghuysen Bill.

TRENTON, N. J.—A hearing on the Senator Frelinghuysen's automobile bill was held in the Senate Chamber of February 6, but was attended by an assembly composed mostly of speakers and friends of the bill. The motorists were not prepared, and it was therefore agreed that the hearing be adjourned until February 20, when they will be heard. Clarence E. Case, of Somerville, presented a petition in favor of the bill signed by 150 citizens of his neighborhood, which asks for proper legislation and the enforcement particularly of the speed law. That section of the bill providing that no motor vehicle may be fitted with a chain or other metal tire grip device when used upon a macadam or other roads of similar character received the indorsement of the Association of County Engineers of New Jersey.

FREEHOLD, N. J.—In the case of Dr. R. S. Bennett vs. Alfred Busch, whose automobile ran down the doctor's carriage last fall, Dr. Bennett was awarded a verdict for $1,292 damages Suit was brought for $20,000. The Bennetts were driving along Bond street when the physician's horse took fright at an automobile and began to prance. The Busch car, driven by William A. Harse, was speeding up Monroe avenue. Harse applied his brakes, but could not prevent a collision. The occupants of the carriage were flung to the road and severe... injured.

OAKLAND, Cal.—By the decision of Jud... Samuels in the case of Walter G. Mar... accused of exceeding the speed limits, ... ordinance limiting the speed of automob... to 8 miles an hour is unconstitutional a... void, as it is in conflict with the gen... law of the State which permits a speed ... 10 miles an hour in passing through t... corporate limits of a city. The ju... further stated that laws of a State prov... that all ordinances enacted by a city m... be in harmony with the general State la...

Gasoline Storage Regulations Abroad.

Although the garages of Paris have b... fairly free from fires caused by the ex... sion or burning of gasoline, the munic... authorities of the French capital h... learned the dangers of motor fuel too w... to allow the taking of any risks under t... jurisdiction. Very stringent regulations ... being made governing the amount w... may be stored, and for this purpose ... different garages in Paris are cla... under different heads, according to ac... modation, structure and provision a... fire. A garage of the second order, ... example, is to be allowed to contain ... litres at the maximum—that amount to ... clude the contents of the reservoirs o... the cars in the building. A garage o... third order is restricted to 1,500 litre... gasoline.

The limitation of the amount of gas... which may be stored in garages in E... land is indefinite, and at the discretio... the local licensing authorities. Very ... cise regulations, however, exist as t... manner of storing, and the quantity allow... is defined by the Petroleum Acts, by t... Secretary of State, and in London by t... London County Council, in all such ... stances where there is the slightest pos... ity of danger. Thus, for example, by ... regulations of the Secretary of State, ... under Section 5 of the Locomotives ... Highways Act, 1896, not more than to ... lons may be kept for private use in ... one store except under license, and if ... in 20 feet of any other building and ... otherwise than in a car, the local author... have to be advised periodically of the ... None of this gasoline so stored may be ... except under license, when other regul... at once come into force. Under the L... don County Council license, for ins... gasoline has to be kept in approved u... ground tanks—except for quantities no... ceeding 10 gallons, which may be ke... special outdoor sheds. The effectiveness ... the London County Council regulations ... very thoroughly tested on the occas... the great Long Acre fire on Februar... last year, for when, weeks afterwar... débris was cleared away, and the u... ground tank was opened, the 40 gall... gasoline in sealed cans were discover... tact.

t Against Parts Manufacturers.

e are informed by A. M. Andrews, ago, secretary, that the Manufacturers ıutomobile Parts, Appliances and Ac- ıries Exhibition has brought suit ıst the directors and members of the ır and Accessories Association for oo damages, alleging trespass and con- cy. Mr. Andrews writes: "Before ıre persuaded to take sides in this mat- we wish to advise you that our ex- ors represent an aggregate capital of $200,000,000, and this suit is brought heir protection. We mention this fact, ıse it has come to our knowledge that tain group of men have busied them- s in circulating reports to the effect our exhibitors are not of a sufficiently sentative standing to warrant consid- on."

Agency and Garage Notes.

rkins & Corliss are about to erect a ge on School street, Gloucester, Mass. garage is being erected on Westmin- street, Bellows Falls, Vt., by C. S. ;.

ob Schiemer & Son have sold their ge and repair shop in Detroit to Peters ılavey.

e Standard Garage Company, of Buf- N. Y., have acquired the agency for eot cars.

e Central Garage, of Indianapolis, Ind., ıct as agents for the Chicago Steamer g 1906.

ın J. Gibson, 401 Franklin street, Buf- N. Y., will act as agent for the Frank- r this year.

garage is being built for the accommo- ı of the guests of the Van Ness House ırlington, Vt.

ring the coming season the Ford car e sold in Butt County, Cal., by Head ynn, of Chico.

gh Brothers, of Providence, have d a branch automobile salesroom at : Centre, R. I.

: Little Rock Auto Company, Little Ark., have opened a garage at 1003 Markham street.

automobile garage and repair shop is to be erected by John T. Ellis on Tre- street, Kewanee, Ill.

: J. A. Hinman Telephone and Electric any, Oshkosh, Wis., have opened a e at 326 Main street.

: Aerocar will be represented in De- y the Maxwell-Briscoe McLeod Com- 243 Jefferson avenue.

Waltham Orient cars will be handled veland by the Ohio Motor Car Com- 392 Ninth street S. E.

man C. Althoff will build a garage corner of Clark and La Salle streets, a, Ill., in the near future.

W. Sears and O. R. Nattinger, of Des s, Ia., have opened a garage and will agents for the Ford and Reo cars.

Newport Engineering Works, of ort, R. I., will erect a new garage in front of their present shop on Thames street.

The Somerville Automobile Company, of Somerville, Mass., are erecting a garage at the corner of Bonton avenue and Broadway.

The Aerocar Company, of Detroit, will be represented in Minneapolis, Minn., by Oscar M. Bergstrom, whom they have just appointed agent.

The Rainier and Frayer-Miller cars will during the coming season be handled in Cleveland by the Paxson Motor Car Company, Huron road S. E.

William Newman will soon open a garage and salesroom for the Soules motor truck, the Welch car, and Baker electric vehicles on Woodward avenue, Detroit, Mich.

On March 15 Theo. Randolph will open a garage at 68 Burd street, Nyack, N. Y., under the name of the Nyack Auto Garage. He has secured the 1906 Maxwell agency.

The Holmes-Booth Motor Company, of 636 Fifty-fifth street, Cleveland, Ohio, have secured for the coming season the agency for the Pope-Hartford and Pope-Tribune cars.

The Maxwell-Briscoe agency for Lorain, Lake, Cuyahoga and Geauga counties, Ohio, has been placed with the McGeorge Manufacturing Company, Caxton Building, Cleveland, Ohio.

Rudolph Hokanson has opened a new three story garage at the corner of Pinkney and Doty streets, Madison, Wis., where he will have the agency for Winton, Mitchell, Buick and Cadillac cars.

H. B. Groves, of Fort Dodge, Ia., has leased the Garmoe Building on North Sixth street, where he will represent the Cadillac Motor Car Company, of Detroit, Mich. He will also conduct a general garage and repair business.

George W. Bender has been appointed sales agent for the Crawford Automobile Company, his territory to take in the counties of Franklin, Cumberland, Adams and York, in the State of Pennsylvania; Frederick County, of Maryland; Frederick County, of Virginia, and Berkeley County, of West Virginia.

The Wayne Automobile Company, of Detroit, have appointed the following agents: The Troy Carriage Works, of Troy, N. Y.; the Commercial Automobile Storage and Supply Company, 1715 Thirteenth street, Washington, for District of Columbia and Maryland, and the Beard Automobile Company, Wabash street, St. Paul, Minn.

Trade Literature Received.

The Imperial Brass Manufacturing Company, Chicago.—Their latest catalogue.

R. E. Hardy Company, 225 West Broadway, New York City.—Booklet on Sta-Rite spark plugs.

Premier Motor Manufacturing Company, Indianapolis, Ind.—Catalogue of their air cooled cars.

The Wells Light Manufacturing Company, 44 Washington street, New York City.—Circular showing and telling about Walworth's patent non-skidding and retreading tire covers.

The Carpenter Steel Company, Reading, Pa.—Illustrated catalogue of special automobile steel.

Louis Dusenbury, 86 Worth street, New York City.—Leaflet "Consider the Matter of Upholstery."

The Winkeley Company, Hartford, Conn. —Latest catalogue of oiling devices and brass specialties.

The New England Motor Company, Lowell, Mass.—Pamphlet containing a talk on the Peerless igniter.

Pope Motor Car Company, Indianapolis, Ind.—Catalogue of the Pope-Waverley electric commercial vehicles.

The Orswell Ignition Company, 102 Pearl street, Boston.—Folder describing the "Hot Stuff" spark plug.

A. S. Comstock, 1311 Dempster street, Evanston, Ill.—Bulletin No. 14, describing Comstock's air compressor, etc.

The Milwaukee Rubber Works Company, Cudahy, Wis.—Leaflet illustrating and describing the 1906 Fawkes clincher tire.

H. H. Franklin Manufacturing Company, Syracuse, N. Y.—1906 illustrated catalogue of the H. H. Franklin air cooled cars.

American Motor Truck Company, Monadnock Building, Chicago.—Folder describing the new model American motor truck.

The Reo Motor Car Company, Lansing, Mich.—First issue of *Reo Echo*, a magazine published by the sales department of the company.

Auto Lock Plug Company, 31 Nassau street, New York City.—"Save Your Automobile," title of a leaflet telling about the Auto Lock plug.

Timken Roller Bearing Axle Company, Canton, Ohio.—Catalogue of Timken roller bearings, axles, steering knuckles and other products of the company.

The Diamond Rubber Company, Akron, Ohio.—Booklet, "A Million Miles on Diamond Tires," containing testimonial letters.

New Incorporations.

The St. Anne Kerosene Motor Company, St. Anne, Ill.—Capital, $100,000. Incorporators, B. H. Pomeroy, A. Sutton and W. A. Quertin.

The Stoddard-Dayton Automobile Compan, Chicago.—Capital, $5,000. Incorporators, W. E. Harvey, H. L. Babcock and A. S. Joslin.

The Excelsior Supply Company, Chicago, Ill.—Capital, $10,000. Incorporators, H. Musgrave, James B. Gascoyne, John A. McKeever.

Mack Brothers Manufacturing Company, Brooklyn, N. Y.—Capital, $300,000. Directors, Otto Lears, Augustus F. Mack and James R. Pitcher, Jr.

The Ducro Manufacturing Company, Buffalo, N. Y.—To manufacture gasoline motors. Directors, Louis C. Ducro, Emma S. Ducro and Charles Jempson.

MINOR MENTION



The Crawford Automobile Company, of Hagerstown, Md., have increased their capital to $100,000.

An automobile club is being formed at Washington, Pa., and will start with about twenty members.

It is reported that Roy D. Chapin has tendered his resignation as sales manager of the Olds Motor Works.

The Empire Rubber Company, of Trenton, N. J., are placing a new inner tube for automobile tires on the market.

The Pittsburg Motor Vehicle Company, of Pittsburg, Pa., have moved into their new factory on Ellsworth avenue.

The Winkley Company, formerly of Hartford, Conn., have opened their new factory at 226 Abbott street, Detroit, Mich.

The Automobile Club of Hawaii was formed recently at Honolulu with a membership of 70. The president is J. A. McCandless.

The name of the De Mars Electric Vehicle Company, of Cleveland, Ohio, has been changed to the Blakeslee Electric Auto Company.

The Chamber of Commerce of Zanesville, O., are said to be endeavoring to secure the location in that town of an automobile manufacturing company.

The St. Anne Kerosene Motor Company are a newly incorporated concern of Kankakee, Ill., who will engage in the manufacture of automobile motors.

The Sullivan Auto Company, 27 North Capitol avenue, Indianapolis, Ind., have begun the manufacture of an automobile horn known as the "Auto Chimes."

The Krueger Manufacturing Company, of Milwaukee, Wis., are erecting a factory on Biddle street, near East Water street, for the manufacture of automobiles.

The stock of the Sterling Motor Car Company, of Binghamton, N. Y., has recently been transferred to L. L. Heller, Ward Decker, Fay Spawn, and J. S. O'Neill.

According to statistics, 320 automobiles were registered at Albany, N. Y., during the month of January; 272 of these were domestic cars and the balance of foreign manufacture.

It is said that the Rev. Jacob Kurtz, of York, Pa., will make use of an automobile on his preaching tour through the middle Western States which he anticipates making in the near future.

The Kirkham Motor Company, of Bath, N. Y., lately organized, elected the following officers: T. W. Gould, president; M. E. Shannon, vice president; C. B. Kirkham, secretary, and C. A. Ellas, treasurer.

The Standard Garage Company, 1114 Main street, Buffalo, N. Y., of which John G. W. Knoll is president, H. N. Croft secretary, and W. C. Schultz manager, are conducting a general repair and reconstruction business.

The Aerocar Company, of Detroit, are erecting another building, 30x150 feet, in addition to their recently completed plant. The new structure will face on Mack avenue.

The Winkley Company, Detroit, Mich., have brought out a type of their Garlus carburetor which combines a throttle, the stop of the gasoline valve being link-connected to the throttle valve.

Owing to the fact that a building of proper size for the accommodation of the number of machines that would be exhibited cannot be obtained, it is said there will be no automobile show held at Indianapolis this spring, as was planned.

An employee of the Capital Automobile Company, Trenton, N. J., has devised a card rack for holding road maps on the steering wheel directly in front of the driver, on which he has applied for a patent.

Charles Goldschmidt, a graduate of one of the leading Paris electric schools, has taken a large interest in and charge of the factory of the A. R. Mosler Company, who moved on February 10 to 163 West Twenty-ninth street, New York city.

A school for the instruction of automobile owners desirous of learning the operation of their machines has been opened at Pittsburg, Pa., by Banker Brothers, at the East End Garage. A course of instruction in driving and repairing cars will be given.

H. W. Alden, formerly with the Electric Vehicle Company and the commercial vehicle department of the Pope Manufacturing Company, of Hartford, has joined the engineering department of the Timken Roller Axle Bearing Company, of Canton, Ohio.

Fourteen chauffeurs arrested in Chicago last week charged with operating cars without licenses in demonstrating for visitors to the Automobile Show were discharged by Justice Prindilville, on the suggestion of Sergeant Ward, of the vehicle department of the police, who said the men were attending the automobile show and did not know that they were required to have such license.

The mechanical branch of the Association of Licensed Automobile Manufacturers met at the association's headquarters, 7 East Forty-second street, on February 9. "Brakes and Brake Shoes and the Best Material for Their Construction" was the topic under consideration. The test committee handed in a report which detailed a number of practical experiments with various alloy steels made by Henry Souther with an alternate stress machine.

The Walter Auto-Car Company have been incorporated for $1,000,000, and will establish, in the near future, a factory at Trenton, N. J., where they will manufacture the Walter car, now made by the Walter Automobile Company, of New York city. The New York factory will be discontinued. Those interested in the new venture are William Walter, Colonel A. R. Kuser, R. V. Lindabury, John L. Kuser, V. Kuser, Fred Kuser, Gen. C. E. ray, F. W. Roebling, W. A. Roebling, Reeves, Mahlon R. Margerum, Unger, Christian W. Stengle and King.

In a cablegram from France, William Vanderbilt, Jr., announces that as the Automobile Club of France have decided to port only one race during the coming and as Joseph Tracy driving a Locomobile came in third in the Vanderbilt Cup held in America last year, they have sented to the race being run again this in America. The event will probably place on either October 6 or October Long Island over the same course and der the same conditions as last year.

At the annual meeting of the American Automobile Association held in on February 7, the following officers were elected: John Farson, president; G. Gorham, secretary; Wm. H. Hotchkiss first vice president; Dr. Milbank Jo second vice president; L. R. Speare, vice president, and George E. Farrington treasurer. A. G. Batchelder retired as retary, but remains a director of the ciation.

The export of rubber from Ceylon increased from 30,000 pounds three ago to the rate of 150,000 pounds a at the present time. At the last general meeting of the Ceylon Planters' Association, William Forsythe, the chairman stated that when the period of overproduction came round Ceylon would be well the front both by reason of its cheap and the excellent way this class of was worked by the agricultural committee.

Touring Europe in American Motor Cars.

"Probably the first American motor tourist of the season arrived in London yesterday," says the *Standard* of January 25. "He is Mr. Maxwell Norman, of Boston, who landed at Liverpool two days bringing his 30 horse power Packard car the steamer with him. He is making a ried trip through England, but expects spend considerable time touring the tinent.

"So far there have been but few American machines brought over by motorists use on Continental tours, the majority rich Americans having one or more stored in Paris, which they keep exclusively for use on this side of the ocean. With invasion of the London market by American makers, however, there has been a corresponding effort on the part of the British trade to exploit the advantage of London against Paris as a place for visiting ists from the United States to make purchase of cars for European travel to leave them between tours. The of octroi duties is a great advantage buyer here, while the fact that he business in the English language is point in his favor."

...THE...

Horseless Age

JME 17 FEBRUARY 21, 1906 NUMBER 8

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WINTON MODEL-K

It lakes ny ifference o You



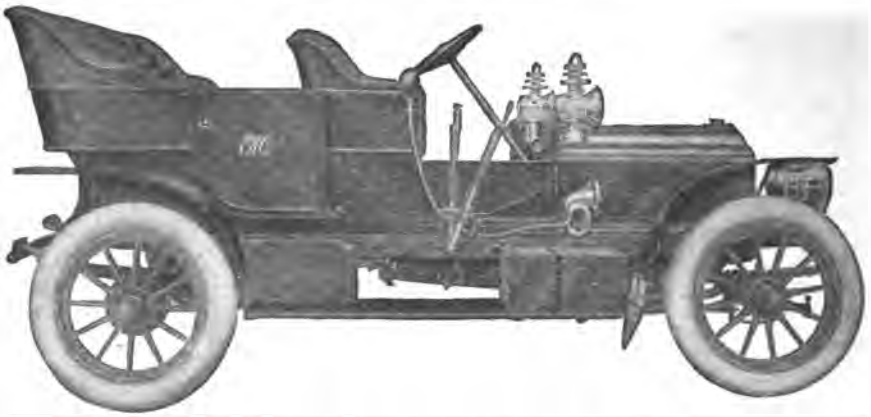
whether you get your money's worth in an automobile, you'll make it your definite purpose to know all there is to be learned about the WINTON MODEL K before you spend a cent for your next car.

The big shows are over, and all the "surprises" have been "sprung." We freely admit that there are other good cars on the market, but not even the best of them gives you, dollar for dollar, as much real automobile value as the $2,500 30-H. P. WINTON MODEL K.

Some of the 400 motorists who are already riding in their own MODEL K WINTONS value this car as high as $5,000.

Detailed information as to this car can be secured at Winton branches in New York, Boston, Philadelphia, Chicago and London, at Winton sales agencies in all important cities, or by addressing

The WINTON MOTOR CARRIAGE CO.,
CLEVELAND, OHIO, U. S. A.



THE WISDOM OF SIMPLICITY

Up-keep, cost of maintenance reduced fifty per cent.

Actually fifty per cent. of moving parts done away with.

From 18 to 20 parts on every cylinder, and all inlet and exhaust valves eliminated.

Runs quietly and smoothly without jarring over rough roads and climbs steep and difficult grades without strain or effort. These are a few of the cardinal points which have made the Two Cycle Elmore a power in the automobile world. The difference between a two cycle and the four-cycle is the difference between the strong and weak heart.

A faint heart and a weak engine are always in danger.

The two-cycle engine produces a rhythm of motion, with no interval between the impulses, which has reduced the cost of operation to a minimum.

The expansive force of one explosion is only half way through when another begins.

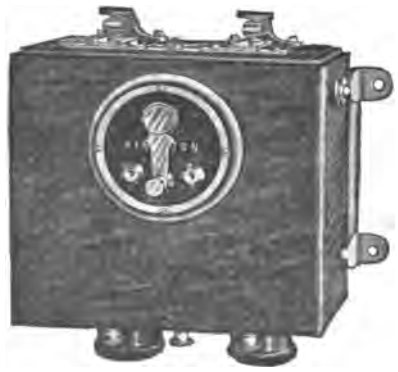
To understand and know a machine well it is necessary to study it. We have special booklets explaining the two-cycle principle more clearly which we would like to send you. Write for booklet and catalogue describing the Four Cylinder, Two Cycle Elmore at **$2,500**, and the Three Cylinder, Two Cycle Elmore at **$1,500**.

THE ELMORE MFG. CO. ***1004 Amanda Street, CLYDE, OHIO***

Members Association Licensed Automobile Manufacturers.

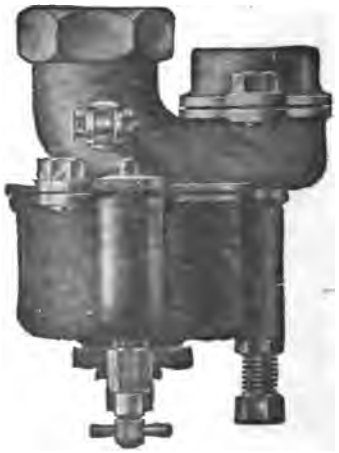
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he Three Port, Two Cycle Engine Patent Situation.

By F. W. Barker.

The following summary of the respective erits and deficiencies of the Sintz and ock three port, valveless engine patents ill, it is hoped, in view of the threatened igation, be of benefit to those manufacrers who are in doubt as to whether they fringe either or both of said patents.

The Sintz patent, No. 509,255, was isued November 21, 1893, on an application ed October 27, 1892. It is now owned James Whittemore, of Detroit. It exres in 1910.

The Cock patent, No. 544,210, was issued ugust 6, 1895, to Joseph Day, of London, n an application filed March 10, 1894. It pires October 15, 1906.

The Sintz patent is really a four port enne, having exhaust *f* and air inlet *g* on ne side of the cylinder, and two ports, h^1 , at the opposite side, affording commucation between the cylinder and a mixing amber *h*. Attention is drawn to the fact at Sintz, in his specification and claims, bitrarily styles these latter ports the "dict supply port h^1," and "indirect supply ort h^2."

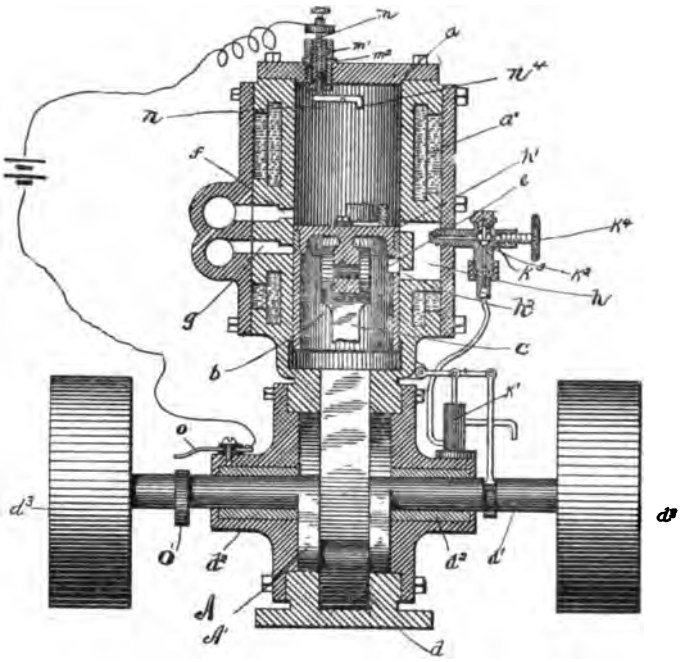
The ports h^1 h^2, chamber *h*, and an aperre *e* in the wall of the piston trunk, hich enables said ports to communicate ith the combustion chamber, constitute a arked feature of differentiation as comared with the Cock patent. The upward roke of the piston, due to inertia of the ywheel, creates a vacuum behind said ston, whereby, when the inlet *g* is uncoved, at the end of this stroke air rushes to fill the space. In the return or power roke this air is compressed. Port *f*, beoming uncovered near the limit of this roke, permits the burnt gases to exhaust, mediately whereafter the piston uncovs direct supply port h^1, and (through perture *e*) indirect supply port h^2, by hich means—the pressure in combustion amber having been relieved—the comessed air behind the piston escapes rough chamber *h* into said combustion amber, carrying with it a quota of gas, hich, by the eccentrically operated pump , is at this moment forced into chamber

Hence, it will be observed, the air ken in behind the piston during the up roke has not mingled with the gas during compression under the power stroke, and that the gas and air first enter into association in the chamber *h*—when port h^2 is opened—passing together through port h^1 into the combustion chamber.

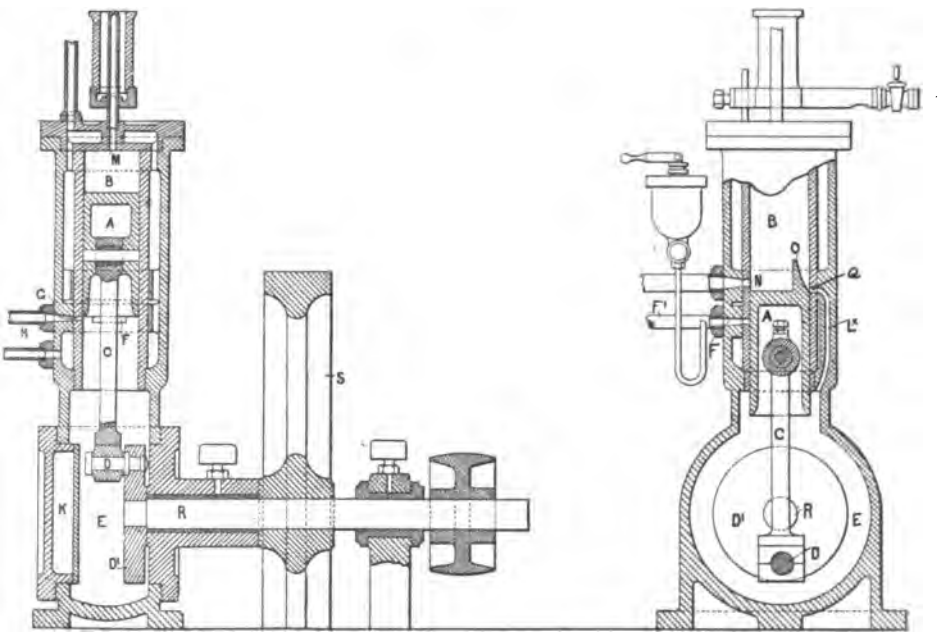
In the Cock patent the air inlet port F and gas inlet port G are near together, in the same horizontal plane, and adapted to be uncovered by the piston when at the limit of its upward stroke, permitting a simultaneous inrush of gas and air to supply the vacuum behind the piston. Admitted in this manner, these elements mingle together during the subsequent piston power stroke, when the mixture is compressed.

As will be noted, there is no separate mixing chamber to correspond with the chamber *h*, of the Sintz patent; in fact, the entire crank case or rear compression chamber forms the mixing chamber, and the mixture enters the combustion chamber by way of passage L as soon as port Q is uncovered at the end of the piston power stroke. The exhaust through port N occurs just prior to the introduction of the new charge, as in the Sintz device, although this feature is neither described nor claimed by Cock.

Theoretically the Cock patent drawings show a better engine than the Sintz patent drawings (1), because the Cock engine is not dependent upon the performance of a pump for its fuel supply, but receives the gas simultaneously with the air, both by the action of vacuous induction; (2), because

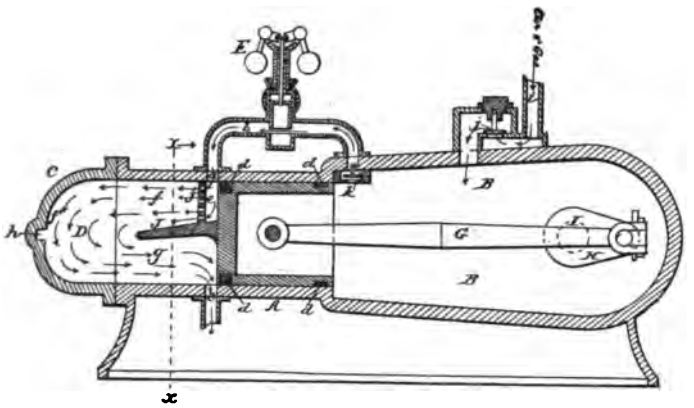


Sintz Engine—Patent No. 509,255.



Cock Engine—Patent No. 544,210.

[A couple of months ago the announcement was ade (and created considerable stir in automobile rcles), that the three port, two cycle engine, hich is now being adopted by several automole manufacturers, was covered by a basic patent sued to Joseph Day, of Bath, England, in 1895. ater it was claimed that the Day patent (or ock patent, as it is more correctly named, after e inventor) was antedated by a patent issued to lark Sintz, of Springfield, Ohio, in 1893. In der to give its readers an idea as to the relave merits of these two patents and information garding any possible earlier patents on such enes, The Horseless Age sent F. W. Barker, a ew York automobile patent lawyer, to Washgton, D. C., to make a search of the records. [r. Barker's article is given herewith. Ed.]



NASH ENGINE—PATENT NO. 381,211.

the air and gas mingle from the moment of entering the rear compression chamber, and are compressed as a mixture before passing into the combustion chamber.

From the foregoing it is evident that the two patents constitute distinct engine structures, having, however, certain fundamental features of simplicity, to wit: an air inlet port controlled by the piston, and adapted to admit air to fill the vacuum formed by the piston up stroke, and exhaust and mixture inlet ports adapted to be uncovered in succession by the piston at the end of its power stroke.

Had the Sintz patent included claims broadly covering these features its owner would stand a fair show of sustaining them, the records of the United States and foreign patent offices disclosing very few earlier patents including such features, and they not qualifying as anticipations, for reasons which will be given later on.

The Sintz patent has ten claims. Claim 1 reads thus:

"1. In a gas engine cylinder having supply and exhaust ports, and a moving piston in said cylinder adapted to alternately open said supply and exhaust ports to opposite ends of said cylinder, and a communicating chamber, adapted, by the movement of said piston, to be opened simultaneously to the opposite ends of said cylinder, and thus form a communication from one end of the cylinder to the other, substantially as specified."

This claim is badly phrased, and is limited by the inclusion of the "communicating chamber." Claim 2 has a similar limitation. Claims 3 and 4 are limited by the "communicating chamber, having ports h^1, h^2." Claim 5 relates to the ignition.

"Claim 6. In an explosive engine and in combination, a piston, and a cylinder having a direct supply and an exhaust port, both arranged to be closed by the piston on its upward or compression stroke, and to be opened by the piston at the limit of its power or downward stroke, the said ports being opened and closed successively by the movement of the piston, substantially as described."

This is probably the claim under which [illegible] be brought. In it can be read [illegible]gine having supply Q and ex-[illegible]th arranged to be closed by the piston on its upward or compression stroke, and to be opened by the piston at the limit of its power or downward stroke, the said ports being opened and closed successively by the movement of the piston.

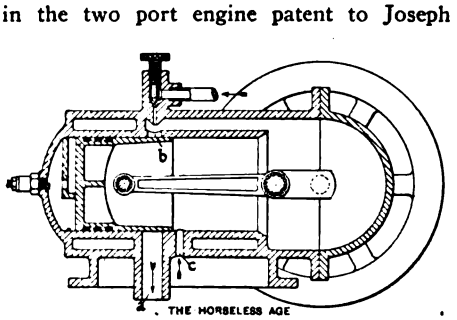
But in said sixth claim Sintz refers to the supply port as "direct supply," and this, read upon his patent, means the port h^1, which leads from the mixing chamber h.

Claims 7 and 8 specifically include the indirect port h^2. Claim 9 is narrowed by the piston aperture e, and Claim 10 by chamber h and indirect port h^2. It, therefore, appears that builders of engines like the Cock patented structure need only consider the pertinency of the Sintz sixth claim, and the likelihood of its being upheld by the courts.

The United States patent to Lewis H. Nash, No. 386,211, of July 17, 1888, furnishes a very close reference to the exhaust and inlet means, the only difference being that the exhaust port c and mixture inlet port a are adapted to be opened simultaneously to the combustion chamber by the action of the piston, instead of opening successively, as done by Sintz.

Swiss patent to Julius Söhnlein, No. 4,395, of November 27, 1891, has the exhaust port a located to be opened in advance of the mixture inlet b, and also corresponds exactly with Sintz in the location of air inlet c. The printed copy of this patent was not received in the United States Patent Office until January 14, 1893, three months after the Sintz application was filed, and therefore does not affect the validity of the Sintz patent. It was published in Switzerland in the latter part of March, 1892. This Swiss patent simply proves the three port engine to have been devised in Europe at least thirteen months before Sintz filed his application for United States patent. The patentee, Julius Söhnlein, also secured patents at different dates in England, Germany and Sweden, and probably elsewhere.

The feature of exhaust port opening in advance of mixture inlet port is also shown in the two port engine patent to Joseph



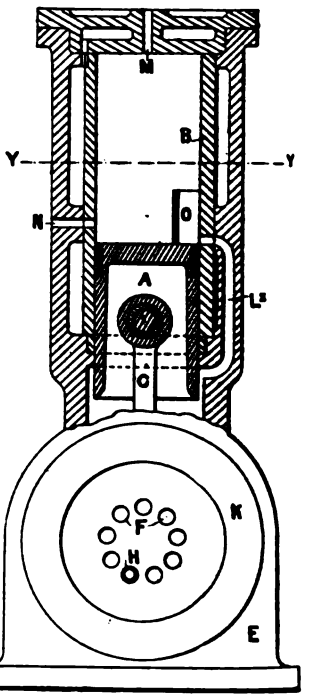
SOHNLEIN ENGINE—PATENT NO. 4,395 (SWISS).

Day, No. 543,614, of July 30, 1895. This patent, filed May 21, 1892, expired April 14, 1905, having been based on British patent No. 6,410, of April 14, 1891. Sintz, however, filed an affidavit during the pendency of his application, to overcome Day as a reference, and said he had built his engine before May 1, 1892.

The claims in the Cock patent are as follows:

"1. In a gas engine the combination of a cylinder and piston therein, the cylinder being divided by the piston into a combustion chamber and a compression chamber, and a passage connecting the two chambers, the said passage being opened and closed by the piston, with air and gas inlet ports opening into the compression chamber, the said ports being covered and uncovered by the piston itself, substantially as set forth.

"2. In a gas engine, the combination of a cylinder, a compression chamber at one end thereof, a piston adapted to reciprocate within the cylinder, and to compress the ex-



DAY ENGINE—PATENT NO. 543,614

plosive mixture in the compression chamber during its downward or outward stroke, a port or passage leading from the compression chamber into the cylinder, the lower end being adapted to remain constantly open, and its opposite end adapted to be closed by the piston from near the beginning of its inward stroke until the piston has nearly reached the limit of its outward stroke, and to be opened when the piston is completing its outward stroke, air and gas inlet ports leading into the cylinder and adapted to be closed by the piston from near the beginning of its inward stroke until near the completion of its return or outward stroke, and an exhaust port communicating with the cylinder and adapted to be closed by the piston from near the beginning of its inward stroke until near the end of its return

ward stroke, and to be opened while l piston is terminating its outward ke and during a portion of its inward ke, all substantially as described, for purpose specified."

hese claims appear to be valid for an ine having separate gas and air inlets he rear or compression chamber, and a sage and inlet communicating with the ibustion chamber, all controlled by the on, the second claim also including the on controlled exhaust port.

lthough the Cock drawings show the aust port as adapted to be uncovered the piston before the mixture inlet port ncovered, no reference to this peculiar- occurs in either the specification or ms.

f said ports in the structure used are pted to be uncovered simultaneously. a structure will undoubtedly be clear n the Sintz patent, but if arranged to opened in succession and closed in suc- ion, they will fall within the terms of tz's claim 6, provided the courts con- e the somewhat ambiguous wording of l claim to mean that the exhaust and ply ports are opened successively and ed successively. Then, if the owner of Sintz patent can prove the service of improved function by opening said ex- st and supply ports in succession, and maintain Sintz's title to invention eof, he will undoubtedly be able to re- in others from using this feature with- his permission.

he owner of the Cock patent appears e master of the situation as regards the on controlled dual inlet of air and gas he rear compression chamber in an en- of this character. The Cock patent ires on October 15, 1906, by reason of being based on British patent No. 18,513 d October 15, 1892. Consequently, r October 15, the Cock engine may be ufactured by anyone, subject, however, he sixth claim of the Sintz patent, if able of enforcement. If the Cock en- be constructed with its exhaust and ture inlets arranged to be simulta- usly uncovered by the piston, such cture will be free from patent restraint r October 15 next.

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al Combustion in the Gas Engine Cylinder.

By T. H. Reardon.

he ideal in anything is a standard or a ree of perfection that is attainable only he conception. While the ideal cannot reached when dealing with things ma- al, still in many instances it can be ely approximated. It is the purpose of present article to deal with the condi- s that tend toward more perfect com- tion in the gas engine, treating the mat- from the standpoint of chemistry.

ome time since the writer happened to into conversation with a friend who is enthusiastic automobilist, and, further- more, a man who takes particular pride in improving processes and obtaining the high- est efficiency that can be reached. Upon making a remark relative to the objection- able odor of gasoline which generally fol- lows the vehicle, the question was asked: "What does this odor from the exhaust in- dicate, and how can it be eliminated?"

The question was answered by saying that it indicated imperfect combustion—un- burnt gasoline in the exhaust—the products of hydro-carbon combustion being water (H_2O) and carbon dioxide (CO_2), both absolutely odorless.

It was suggested that great pains should be taken to have the proper relative pro- portion of gasoline and air, and it was further suggested that the air might pass through a heater before entering the cylin- der, and enter in such a manner that very thorough admixture of the air and gasoline would result before ignition occurred. Much stress was laid on the importance of having a very energetic spark, it even being suggested that three sparks, equidistant from each other, spaced on the circumfer- ence of the cylinder or head, and delivered at the same instant, would furnish a more prompt explosion, as the flame would be propagated from three points instead of from one.

The ideas set forth were made the sub- ject of experiment, except the three spark matter, which has been deferred for a later date. The results obtained were very grat- ifying, the odor of gasoline in the exhaust being almost imperceptible with an engine running indoors, considerable economy in the use of gasoline being noted at the same time.

Gasoline being a petroleum product, sep- arated from the other components by the process of fractional distillation, is not a compound having a definite chemical com- position, but, as it consists almost entirely of hexane (C_6H_{14}), for all ordinary pur- poses it may be regarded as hexane. Gaso- line of 74° Baumé density has a specific gravity of .6889 and weighs 5.72 pounds per U. S. gallon. All densities and weights throughout this article are understood to be at a temperature of 60° Fahr., and, fur- ther, in the matter of volumes, when of air and gasoline vapor, the barometrical pres- sure is understood to be 30 inches of mer- cury. Volumes can be compared at other ordinary temperatures, but when making comparisons air and gasoline vapor should always be considered at the same tempera- ture.

A cubic foot of 74° gasoline vapor weighs .2266 pound, and as the 76° article has practically the same composition, there will be no material difference in the weight of equal volumes of the respective vapors. The reader will probably note the relatively high density of gasoline vapor, the density of aqueous vapor under the same conditions being very much less, viz., .0474 pound per cubic foot. Other liquids, notably ether and alcohol, exhibit the same peculiarity, viz., a low liquid density and a high vapor density.

We come now to a consideration of the theoretical quantity of air that is required for the perfect combustion of gasoline, which will be shown by a chemical equation, together with the quantity and character of the products of combustion, remembering, however, that the equation is not to be re- garded as an inflexible rule, but as a gen- eral rule and as a limit toward which we should strive to approximate.

The following equation expresses the re- action:

Gasoline vapor + Oxygen = Carbon dioxide + Water.
1 vol. + 9.5 vols. 6 volumes + 7 vols. as vapor.

$$C_6H_{14} + 9.5\,O_2 = 6\,CO_2 = 7\,H_2O.$$

(RELATIVE WEIGHTS)

$$86 + 304 = 264 + 126$$
$$390 = 390$$

As we are using air in the combustion of gasoline, instead of oxygen, as shown in the equation, and as air only contains about 20 per cent. of oxygen by volume, we may state in general terms that 1 volume of gasoline vapor requires 47.5 volumes of air for its combustion under ideal conditions, and under the varying conditions that ob- tain in practice it may require much more. The extreme difficulty in obtaining ideal results is very well exemplified in the de- portment of gunpowder in its explosion, which is nothing more than combustion that is practically instantaneous. Here we have a compound in which the combustible and the supporter of combustion are intimately mixed and united in the exact proportions which chemical laws have demonstrated to be correct, and yet most any sportsman will tell you that not over two-thirds of the powder burns, and he will point to the black deposit on the freshly fallen snow to verify the correctness of his statement.

The writer was much interested at one time in reading the analysis of the products of nitro-glycerine, yielded on its explosion; this compound contains an excess of oxygen over the amount required for complete com- bustion, and yet, strange to say, owing to the suddenness of its action, combustion was far from being perfect.

Another matter that appeals to the gas engine operator is the fact that the heavier petroleum products, while costing less per gallon than the 74° and 76° grades, are actu- ally worth more for power than their high priced competitors. One engine operator went so far as to confide to the writer that he could use 50 per cent. of kerosene in his mixture and have no trouble—his mixture is heated, his air is heated and he figures on a spark that can always jump the gap.

There is one thing in connection with the above reaction formula that may require a word of explanation to those not familiar with chemical reactions. It will be noticed that the equation shows that 10½ volumes enters into the reaction and 13 volumes ap- pear in the products. The explanation is, that in the combination of gases either an augmentation or a diminution of vo' may appear in the final result.

ELECTRIC IGNITION

General Electrical Principles.

Electricity is a form of energy that makes itself manifest to the senses by its mechanical, thermal and chemical effects. For most practical purposes it may be regarded as a fluid that flows through bodies of certain materials called conductors as water flows through pipes. Just the same as water in flowing through pipes encounters a frictional resistance, so an electric current in flowing through a conductor encounters a resistance. The frictional resistance of a certain pipe to the flow of water through it depends upon the length and diameter of the pipe and upon the relative smoothness of its bore. Similarly, the resistance of a conductor to the flow of electricity through it depends upon the length and cross sectional area of the conductor and upon the material from which the conductor is made. The best conducting material is the precious metal, silver. Copper, however, in its pure state is nearly equally conductive, and is the best conductor from a commercial standpoint. Iron offers about eight times the resistance of copper, and is used to some extent in practice where the greater bulk of the conductor is of no consequence and the greater tensile strength of iron is an advantage, as in telephone and telegraph lines. The conductivity of a material is the inverse of its resistivity; that is, if a material has a high conductivity, it has a low resistivity, and vice versa.

All materials conduct electricity to some extent, and all are, therefore, conductors in one sense. However, some are such poor conductors that their conducting power is entirely negligible for all practical purposes. These very poor conductors, which are of as great importance in the industrial application of electricty as the very good conductors, are called insulators. Among the best insulating materials are glass, porcelain, hard rubber, ebonite, mica and silk.

In the present articles electrical phenomena will be explained by hydraulic phenomena—that is, phenomena of flowing water—which are familiar to everyone. Almost every electrical phenomenon can be thus explained in simple language easily comprehended by the lay mind.

Water flows under the influence of the force of gravity from a higher point to a lower, provided there is an unobstructed path for the flow between these two points. The flow is then said to be due to a difference of level between the two points. Similarly, an electric flow or current in a conductor is due to a difference of electrical level or a difference of potential, as it is known technically. In nature water is continually raised by the process of evaporation, and in a similar manner high electrical potentials are occasionally created by meteorological processes. In practice, however, if we want water at a high level in order to create a flow, we usually find it necessary to raise it there by means of a pump. Similarly, if we desire to produce a high electrical potential in order to obtain an electrical current, we must make use of an apparatus capable of creating a difference of potential. Such an apparatus is ordinarily called a source of electromotive force. The terms "difference of potential" and "electromotive force" are almost synonymous. They bear to each other about the same relation as "difference of level" and "pressure" in hydraulics. As is well known, a certain difference in water level corresponds to a certain definite pressure per square inch, so that for many purposes "difference of level" expresses the same thing as "pressure per square inch," although fundamentally these terms express different things. This difference between the two electrical terms is particularly to be noted: If there is simply a difference of potential between two points, this is wiped out as soon as the points are connected by a conductor; but if there is an electromotive force active between them, the difference of potential will be maintained between the points, even if they be connected by a conductor.

The two factors which control all hydraulic phenomena are the pressure of flow and the rate of flow. In a waterfall, for instance, the power depends upon the number of feet of fall and also upon the number of gallons or tons of water per minute passing through the fall. Similarly the power in an electric circuit depends upon the pressure (electromotive force) and on the rate of flow (current) in the circuit. In order that an electric current can flow at all these two conditions must be fulfilled: (1) there must be a complete or closed circuit of conducting material; (2) a source of electromotive force must be incorporated in this circuit.

Electricians generally distinguish between static electricity and current electricity. There is in reality only one kind of electricity, the distinction being based upon the fact that phenomena in which extremely high electric pressures and very small quantities of electricity are involved are rather different in their manifestations from those in which both the pressure and the current are of normal value. Electrostatic effects are really effects of extremely high electrical pressures. As the quantities of electricity involved in electrostatic phenomena are extremely small, the power involved is small, and these phenomena can be produced by means of frictional electric machines and induction machines as used by physicians and for experimental work, these machines being generally turned by hand. Sparks produced by such frictional machines were used for ignition by some of the early gas engine experimenters, but as these machines are not now used for this purpose, we need not consider them any further.

Every conductor has a certain capacity for storing electricity, as every vessel has a certain capacity for storing a liqu[illegible] electrical capacity of a conductor, h[illegible] does not depend upon its cubical c[illegible] but upon its surface area. The am[illegible] electric charge that can be stored o[illegible] tain conductor depends also upon t[illegible] sure at which the charge is supp[illegible] conductor and upon the surroundings conductor. When it is desired to comparatively large charge—such a for instance, as is involved in an spark—use is made of what is know[illegible] electric condenser. A condenser in plest form consists of two thin sh[illegible] conducting material separated e[illegible] thin layer of air or of some other i[illegible] material. The capacity of such a co[illegible] depends upon the surface area of th[illegible] on their distance apart (the closer t[illegible] they are the greater the capacity; the nature of the separating materi[illegible] is called the dielectric. Among t[illegible] dielectrics are mica, glass and p[illegible] Commercial condensers are built u[illegible] large number of sheets of conduct[illegible] terial (usually tin foil) separated f[illegible] the other by a sheet of insulating m[illegible] (usually paraffined paper), alternate[illegible] of conducting material being conn[illegible] gether to the same terminal post of t[illegible] denser, so that all the even sheets a[illegible] nected to one terminal post and all t[illegible] ones to the other. The capacity of [illegible] condenser is proportional to the num[illegible] plates. If the two terminals of such [illegible] denser are connected to the two t[illegible] of a source of electromotive force, a[illegible] flows into the condenser, the amount charge being directly proportional t[illegible] pressure of the source of electr[illegible] force and to the capacity of the denser. When the source of electr[illegible] force is disconnected from the con[illegible] the charge remains in the condenser, a[illegible] the pressure of charge was sufficient [illegible] by connecting a conductor to one t[illegible] of the condenser and bringing its o[illegible] near the other terminal of the conde[illegible] spark will pass at this gap and the c[illegible] will be discharged. Detailed descript[illegible] condensers will be given later on.

Care of Universal Joints.

The propeller shaft joints, in t[illegible] many cases, do not receive the amo[illegible] attention due to them at the hands [illegible] responsible for the good running of th[illegible] The universal joints get a far [illegible] amount of work to do than they ar[illegible] erally credited with, and owing to [illegible] generally inaccessible position they [illegible] but little attention. The chief point[illegible] keep the joints well lubricated an[illegible] from grit and dirt, which is so dis[illegible] to their long life and sweet working[illegible] simple way of accomplishing both [illegible] is to encase the joints in a flexible [illegible] covering filled with grease. Such a [illegible] ing is easily made, and its shape is be[illegible] certained by cutting a pattern in pa[illegible] cloth, as may be most convenient.

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...EVERY WEDNESDAY...

Devoted to Motor Interests

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Automobile Taxation for Road Maintenance.

A determined effort to impose a special heavy tax on automobiles is being made by Senator L'Hommedieu, of New York. After the defeat of the bill introduced by him late last year, which provided for a tax on automobiles of $1 per horse power, he has reintroduced it again this season, with the change that the amount of the tax is to be based upon the weight of the cars. The Senator explains that the object in imposing this tax is to raise funds for maintaining the good roads of the State. He figures that with the number of cars now in use in the State, as shown by the registration lists, and the proposed tax rate, enough money could be raised to keep the system of good roads which the State will possess at the end of this year in perfect repair without placing any burden on counties—in other words, on the general taxpayer. Hence, the automobile tax would be of benefit to the general public.

The so called public roads have always been regarded as a general public utility, and the funds for their construction and maintenance have been raised by general public taxation. All make use of the roads at some time or other, all are free to use them, and those who do not have much occasion to personally travel on the highways often largely benefit indirectly by their existence. There is absolutely no reason why the cost of maintenance of the roads should not be defrayed in the same manner as the cost of their construction, and the present method of raising the funds for road building gives, therefore, an indication how the money necessary for the road maintenance should be obtained.

At any rate, if it is decided to raise the funds by special taxation, it would only be fair to impose a special tax upon all classes of road users, in proportion to the destructive effect upon the roads of the means of locomotion employed by them. That the automobile has arrived upon the scene last is no reason for singling it out to bear the burden of road maintenance, for it has repeatedly been held by the highest authorities that it has as much right to the use of the highways as any of the older means of road travel. Neither can it be claimed that the State is building its improved highways specially for the convenience of automobilists, as the foremost consideration which led to the adoption of the Higbie-Armstrong Good Roads law was the value of a system of improved highways to the farming community.

Leaving entirely aside the very harmful effect of such a tax upon a young and growing industry, the special automobile tax proposed in the L'Hommedieu bill would simply be an injustice to or a discrimination against automobilists. At present no special taxes are levied upon automobilists in any of the principal countries of Europe with the exception of France, and the United States has no reason to take an example from France in matters of taxation, as this country is not burdened with the same enormous national debt, large standing army and bureaucratic system of government. It is therefore to be hoped that the revised L'Hommedieu bill will meet with the same fate as its author's first attempt.

The Multiple Jet Carburetor.

While the familiar single jet, constant level vaporizer, with automatic air supply, has proved a fairly successful solution of the carburation problem, in connection with vehicle engines not requiring an extreme range in the rate of fuel supply at constant quality, engineers have realized, for some time past, its inadequacy to meet the enormously variable demands of very large motors which are required to operate both

extremely high speeds and at excessively low rates of rotation under throttle control. The causes of the difficulties experienced, under these latter arduous conditions, are most lucidly explained in articles in the recent Engineering Number. By the employment of multiple spraying jets, the number of which in action is progressively increased with the augmented demand for fuel, in connection with a properly constituted throttle and auxiliary air supply system, a solution of the difficult problem presented may doubtless be attained, although it is admitted that the solution is only an approximate one. There will, no doubt, be much heard of multiple jet carburetors in the near future.

As to whether the practice of employing a multiplicity of spraying jets, with their attendant complexity, furnishes an ultimate solution of the carburation problem for motors of which an extremely wide range of performance is demanded, may well be open to question. It certainly seems a very labored solution of the problem, involving as it does a very material multiplication of parts and very careful mutual adjustments between them. While it may perchance be found to finally dispose of the difficulties which it is designed to meet, it presents more the aspect of a rather clumsy expedient, the resort to which may tend to show that the principles involved in the flow of gases and liquids as involved in the production of vapor mixtures are as yet too imperfectly understood to allow of their being turned to the desired use in the most efficient manner. Speaking generally the ultimate development of a device is seldom found in a multiplication of parts having complicated mutual relations, as here exemplified, although such a phase may form an intermediate stage of progress. Practical perfection of a device is more often attained with simple elements, perfectly adapted in form and function to allow of the action of natural principles, the existence of and practical import of which are at first unknown or disregarded. The laws governing gas and vapor flow, the passage of liquids through contracted orifices and other phenomena which may conceivably have bearings upon the carburation problem, have not been investigated to the limit. There have already been brought to light, through investigation, certain actions which may be fruitful in leading to true carbu- automaticity, combined with a high city of elements, and further very possibly lead to the discovery of others. It is believed that a thorough investigation of the scientific principles involved is more likely to prove of value than labor spent upon clever mechanical arrangements made more or less in the dark and involving a high degree of complexity.

The inventor is too often compelled, through ignorance, to make the traditional tour "'round Robin Hood's barn" in order to reach his goal.

It is safe to say that the progress of the multiple jet idea, though not, perhaps, of extremely vital concern to the average motor car user, will be watched with great interest by all connected with the industry, and it may at least be hoped that it may call attention to the shortcomings of ordinary carburating devices and hasten their correction.

Decrease of Electric Vehicle Mileage by Stops.

The stopping and starting of a motor car involves a loss of energy, because in stopping some of the stored up energy is absorbed by the brakes, and in starting the same amount of energy must be stored in the vehicle again to accelerate it to its full speed. It is chiefly for this reason that trolley motormen try to avoid all unnecessary stops, and in slowing down to pick up one or two passengers of sufficient agility seldom bring the car to a complete halt. With a storage battery propelled vehicle the loss of energy in stopping and starting is even greater proportionally, for the reason that in accelerating the car the motors are usually worked far beyond their normal load, and the rate of discharge of the batteries is equally increased beyond the normal. Some interesting calculations on the reduction in the mileage of a car by stops are given by Frank B. Rae in a recent article in the *Electrical World*. The calculations are based upon torque curves published by a large manufacturer of electric vehicle motors and upon assumed data of speed and traction resistance. Mr. Rae carries his calculations through for a truck of standard construction, of 4 tons weight and 5 tons load capacity, which has a rated speed of 6 miles per hour, reaching the following conclusion: "The watt hour per ton mile" rate varies 34 per cent. from no stop to four stops per 1,000 feet, and the decrease in the mileage of the truck is over 24 per cent. It is to be noted that the watt hours per ton mile in the calculations are based upon a resistance to traction of 30 pounds per ton. This is evidently too low fo conditions, and the vehicle mileag based upon this value will be too hi the rate and the mileage, howeve found to vary for the stops made, i imately the percentage given."

These figures show the advantag ping the vehicle as little as possibl of traveling on the momentum o after the current is cut off prior A skillful driver may evidently g siderably greater mileage with the especially in dense traffic. Th speed is, of course, slightly reduce ning the car out," as compared ping on the brakes, but hardly to make up for the current eco the saving in current is the more when a route nearly equal to th pacity of the battery must be co is consequently advisable to give t of electric vehicles full instructi what they must do under differ tions in order to get the greate out of their vehicles, just as motormen are usually instructed.

Elementary Articles on I

In the present issue we begin articles on the subject of electri It is intended to explain the fu principles of electricity and ma simple language, and to develop with reference to the application ity in gasoline engine ignition. many text books on the theory of are to be had, but most of the much matter that is not pertin subject of ignition, and are theref suited to the average motorist's need hardly be pointed out that t system is a very important po car's mechanism, and a thorou standing of its principles is almo to the successful operation of a bile. Now, not only is the igni responsible for a very large per the mishaps to gasoline autom the average user is less familia laws governing its action than for instance, which affect the v of gasoline, the lubrication, etc. no reason, however, why the a should look upon the electric ig tem as a mysterious apparatus th of which is understood only by the few simple laws and prin must be known to understand its easily learned.

In explaining the principles

nomena, hydraulic analogies will be e use of, as the phenomena of flowing r are familiar to almost everyone. Af- the fundamental principles have been ained, the construction and method of ation of each separate device used for ric ignition will be described, and final- ome typical actual ignition systems and iances.

Kerosene Fuel.

view of the agitation at present going n favor of motor fuels of more abun- supply than gasoline, it is surprising not more attention is given to the tation of kerosene for use in high d throttling engines. Kerosene has successfully used for years in sta- ry explosion motors governed on the nd miss principle, and although con- able difficulties are encountered when attempted to use this fuel in throttling es, they are by no means insurmount- It need only be pointed out that some years back the explosion engine gen- was regarded as necessarily an in- le, one speed engine, and that remark- progress has since been made in ren- g gasoline engines flexible as to power speed.

comparison with alcohol, which seems to be monopolizing the attention of endeavoring to find a suitable substi- for gasoline, kerosene has the advan- that it gives greater power in a motor ven dimensions, and does not tend to de the cylinders and valves under any tions. Kerosene is at present obtain- at even the smallest country store, supply stations for denatured alcohol elatively few. The only valid objec- to kerosene is that it is less cleanly gasoline, as any spillings and leakings not evaporate immediately, as in the of gasoline, but will expand over the e of the parts and accumulate dust. objection will become less important, ver, as automobiles pass from the of luxurious pleasure vehicles to that eryday utility conveyances, and also signers learn to provide better pro- n for the working parts against dust, nore ready access to these parts for ng. Owing to this very feature of of cleanliness it would be practically ss under present conditions to at- to adapt kerosene fuel to high class re cars, and the problem of the kero- carburetor may be considered to be with the general problem of the com- mercial automobile. It is, of course, very well to make every effort to get the tax removed from alcohol for industrial purposes, and study the most favorable conditions for the use of this fuel in explosion engines, but it would be a mistake to neglect the kerosene engine on this account. There are at present a large number of kerosene engines in actual use in this country, which cannot be said of alcohol engines. Moreover, the alcohol engine must be constructed specially, requiring to be operated at very high compression, while any gasoline engine will run on kerosene if it is fitted with a proper type of carburetor.

Cork Inserts for Frictional Devices on Automobiles.

For some time past there has been in use for driving mill machinery, and for other purposes, a form of clutch consisting of two engaging metallic members, the surface of one of which is studded with inserts of cork forced, under pressure, into holes drilled in the metal and held therein by their expansion. The same expedient of inserting bodies of cork in the metal of pulley faces has been resorted to in order to reduce the slip of the driving belt, and brake shoes fitted with these cork inserts have also been applied to rail cars.

Quite recently several automobile manufacturers have adopted the cork insert in their clutches, with results which are reported to be of interest to the industry. Owing to its almost amorphous structure, its toughness and resiliency, cork is a material which, as is well known, will withstand an enormous amount of hard usage and suffer very little from the treatment. Its coefficient of friction in contact with metal is quite high, and it possesses the valuable property of not absorbing water or oil.

In clutches of the multiple, metallic disc type the cork inserts have been applied to alternate plates, holes drilled in the metal of the plate being filled with the cork, under powerful pressure. It is claimed that a clutch so constructed picks up the load very gradually by the frictional action of the inserts upon the surfaces of the opposing sets of plates. As the plates are forced together, the cork fillings are gradually compressed, and the load is gradually taken up, so that when the plates come into full contact there is a very slight amount of slipping between the metallic surfaces and (it is claimed) very little wear, even though lubrication be very sparingly supplied.

Clutches of the leather lined, conical type are especially objected to, on account of the suddenness and violence with which they too often engage. The use of flat springs inserted under the leather and some other devices are resorted to in order to cause the band, at first, to engage at a few points only and thus take up the load more gently. Cork inserts, set into the face of the male clutch member, are proposed as a substitute for the leather band, with its underlying springs. As the clutch is thrown in, the bodies of cork make a gradually increasing frictional contact, and are finally compressed flush with the metal surface, when the metallic surfaces of the clutch grip and carry the full torque.

The physical properties of cork are, it would seem, in many respects most appropriate for withstanding the demands of clutch service, and its application for this purpose may well be carefully watched.

Peculiar Accident.

A peculiar accident occurred in a London garage recently, resulting in the death of William Edward Bonner, 42, a fitter in the employ of the Clément Motor Company (Limited), of Leicester square. It was given in evidence at the coroner's inquest that while Bonner was repairing a car it suddenly moved forward and knocked him down an elevator shaft, falling after him. The coroner said it was one of those cases which showed that it was a common sense and prudent rule to lay down in motor works that under no circumstances must an engine be started. The car had been described as a "freak." Certainly it was very different from the ordinary type of motor car, and it could only be conjectured that Bonner, curious about the working of the car, unfortunately started it. The evidence clearly showed that there was no culpable negligence on the part of anyone. The jury returned a verdict of "accidental death," and expressed the opinion that the Clément company took all necessary care for the protection of their workmen. A similar accident with an electric runabout occurred in a New York garage a few weeks ago, only that the driver sat in the car and, being under the impression that the safety plug was out, turned on the switch right in front of an open elevator shaft.

Senator John Raines expressed tersely the sentiment of many people in New York State when he said: "I will not vote to spend any money on road improvement under the bond issue unless at the same time a statute is passed which provides for the instant care and maintenance of these highways under proper authority and conditions, so soon as they are completed by the State, and opened for the traveling public.'

MAINTENANCE AND REPAIRS

[Suitable contributions to this department, accompanied by sketches, are solicited and will be well paid for.]

Notes from a Repair Shop.

By O. V. H.

ACCESSIBILITY OF CAM GEARS.

I read with much interest in a recent issue of THE HORSELESS AGE an editorial on the resetting of valves. I could never see why the gears for operating the valve cams are put in the crank case, and prefer them outside the crank case, but in a separate case, where they are easily reached when desired by removing a few cap screws. The gears can run in oil or thin grease in this way, and are easily accessible. When reassembling an engine we sometimes find

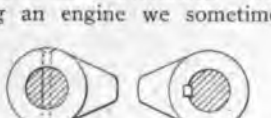


FIG. 1.

the marks on the gears incorrect, and where the gears are located in the crank case it is necessary to take the case apart to reset the gears, which takes time, and time is money in a repair shop. Some engines have the bottom of the crank case removable, which makes the gear a little easier to reach; but usually the inlet and exhaust pipe are under it so closely that they have to be removed before the bottom of the case will drop far enough to let the gears out of mesh.

Inaccessibility is not the only bad feature of gears in the crank case. If one of the cotter pins should break or drop out of the rods, it is almost sure to get into the gears and perhaps wreck the whole crank case.

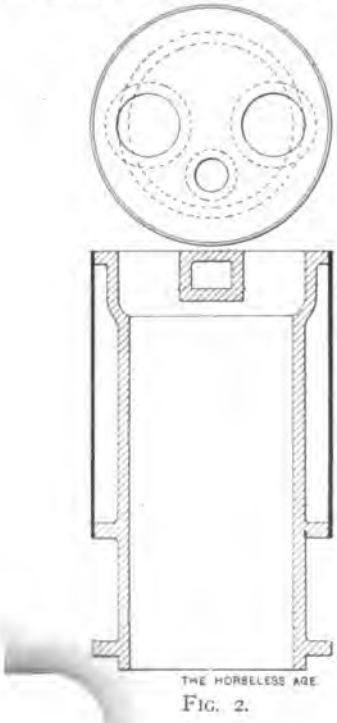


FIG. 2.

This is not a mere supposition, as I have seen not less than three cases wrecked this season on account of broken pieces of cotter pins getting in the gears, and I have often found steel balls from the check valve on the oiler and other bits of metal in crank cases. If the gears were located outside, no damage could be done by such pieces of metal.

Another bad feature on a double opposed horizontal engine is that the half time gear throws oil into one cylinder (the rear, if the engine runs in the same direction as the wheels), which soon fouls the plug, unless the crank case is drained frequently. On an engine with outside gears (not in the crank case) the gears can be shifted to any position in less than five minutes, while it may be a matter of an hour or more if they are inside.

CAM SHAFT CONSTRUCTION.

All the valve mechanism should be adjustable, so the travel and timing of valves can be kept the same as when new. A great many makers are using a drop forged cam shaft with cams forged on the shaft. While this will prevent cams from coming loose, causing loss of power and other derangements, it is a question whether it is more economical for the user than having the cams keyed on. Of course, a solid cam shaft properly made and hardened will stand a lot of ordinary wear, but should one cam wear it is harder to repair than on the built up system; but if repair parts were only furnished at a reasonable price this would be less objectionable. I never considered it high grade workmanship, or rather designing, to pin cams to a shaft. It is a cheap method for the maker, but a key properly fitted would give better results.

I have found more badly fitted keys in automobile construction than any class of machinery I ever repaired. Every maker seems to have a standard of his own as regards the sizes of shafts, and I frequently find keys made so they only touch the keyway on the sides and not on top. A properly fitted key should fill the keyway sidewise (but not form a driving fit), and the top and bottom should be fitted to a driving fit, so the key shows a bearing over its whole length at top and bottom.

Valves are much easier to get at where cages or false seats are used, as they can be easily removed for inspection or regrinding, which latter can be done in a vise more quickly than on the engine. Perhaps a valve will not cool as well where cages are used, but very little trouble is experienced from this source, and from my personal experience I prefer the cage, as it gives longer life to the valve seats by renewal. I have known cylinders to be rendered useless by the valve seats being worn out, the walls of the valve chamber being too thin to allow threading to put in new seats; if cages had been used the life of the engine could have been prolonged.

CYLINDER CONSTRUCTION.

I have found the cylinder shown in Fig. 2, with head cast integral with cylinder and

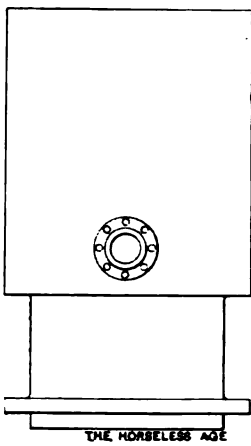


FIG. 3.

brass or copper jacket shrunk
convenient form of cylinder, bot
maker's and the user's standp
method reduces the loss from def
ings, gives uniform thickness
walls, as the casting can be finish
before putting on the jacket, ins
expansion, which does not occu
valve chambers are cast on the si
of the cylinder. There is no int
work, and the valves are entirely
ed by water. I find in practice
jackets give absolutely no tro
leakage when properly shrunk
manner, and water connection
trouble when the pad (see Fig. 3
on before the jacket is put on, a
after the shrinking process. A
be put on at any ordinary shop i
ner. The valves are located dire
head, where a more direct pass
obtained for inlet and outlet of g
are several advantages in having
in the head. Less heat is impa
valves, owing to straighter outle
gases; the explosion chamber
inside the cylinder, so that the
the moment of explosion occupi
ber of simple, symmetrical form
not have to pass through tortuou
before acting on the piston,
slight increase in the power is o

CRANK SHAFTS.

The crank shaft of an engine
that should receive especial care
tion and quality of material. I w
see a crank shaft too large than
Some makers produce a fine c
and then drill it so full of hol
oiling system that it almost ruins
as the shaft starts to crystallize
hole and breaks (Fig. 4). A f
crank costs quite a sum to repla
nothing else is broken, but someti
a crank breaks it wrecks a cylinde

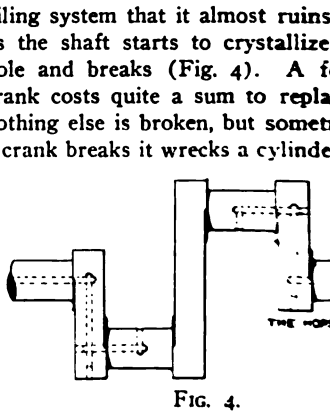


FIG. 4.

or both. There is no doubt that the g system is a good one, as it is an old tried one, but more metal should be n when such holes are drilled.

e oiling system on a number of gaso- autos seems to be neglected, and on more than half the oil is wasted, but problem, as well as many others, will orked out. The automatic oiler worked ank case pressure seems to be the most lar for small vehicles, but it has some tcomings and needs a great deal of hing if good service is expected.

ON TWO CYCLE ENGINES.

ıe two cycle engine seems to be having innings" now, and seems to be giving od account of itself. A lot of experi- ing has been done in the past year, but her any real improvement has been remains to be seen. One of the great- aids in the operation of a two cycle ne is the use of a compensating car- tor, or one having a poppet valve in air inlet. When the old mixing valve used it was an easy matter to flood the ne with gasoline, but with the compen- g carburetor this seldom occurs. Back g or crank case explosions sometimes

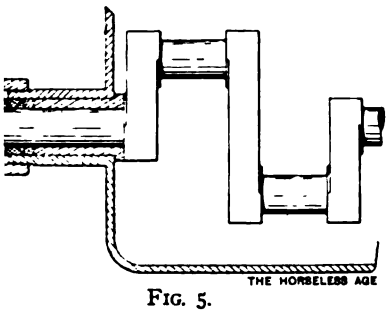


FIG. 5.

r from bad mixture or too long contact he timer, but can be remedied to some nt by a gauze screen in the port from crank case to the cylinder. This port ld be readily accessible to allow the n to be cleaned, as it will clog with oil lubrication or with a carbon deposit. ıe simpler form of two cycle engine g crank case compression seems to be ne most followed, and in a great many the main bearings have no means of stment. Some attempts have been made, ever, to provide adjustable main bear- to take up wear and prevent crank case ge, one construction being shown in 5. The beveled rings are made of llic piston packing. Another engine of st the same construction has a special ng, something like wicking with graph- nixed with it. Still another is made journals the same as lathe spindles are times made, with V grooves (Fig. 6) e bearings and corresponding rings on haft. Some makers use a single inlet a single exhaust port, while others use diron port extending nearly halfway d the cylinder (Fig. 7). In a test for I there was scarcely any difference n between engines with the different s of ports, but on the engines tried the were of equal width, and it seems to

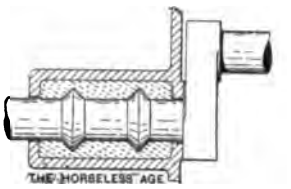


FIG. 6.

me that the gridiron port could be made much narrower and yet give equally good results as the single port. A two cycle engine seems to work best when pulling a load, and as far as flexibility is concerned they leave hardly anything to be desired. I have watched the repair bills on two cycle and four cycle rigs, the latter both air and water cooled, and the cost of up-keep was decidedly less on the two cycle than any of the others. The gasoline consumption was a trifle greater than with some of the four cycle machines, but not much. Of course, it is hard to get accurate comparisons, as the machines are driven by different operators, and it often happens that of two machines of the same make, and operated under the same conditions, one will cost five times as much for repairs, and one may use nearly a 50 per cent. more fuel than the other, owing to operation.

Some attempts at air cooling the two cycle engine have been made, but even with forced draught they get pretty hot. The two cycle engine is cheaper to build, owing to the small number of parts in its construction. Consequently it has also fewer parts to wear out, and they can be made very accessible. I prefer the head cast integral with the cylinder, and the whole bolted to the crank case with a flange, doing away with gaskets, which invite leakage. Hand holes should be provided in the crank case, held on by a single clamp and screw, to allow access to make rod adjustments readily. Both ends of the connecting rod should be adjustable, and a socket wrench should be provided for the piston end of the rod, which should have self locking nuts; by this I mean nuts that grip the thread when tightened, as they need no cotter pins to hold them. It is idiotic to make the piston end of a connecting rod adjustable in such a way that the piston must be taken out of the cylinder to make the adjustment. Many connecting rods are now so made. I was talking to a customer one day about

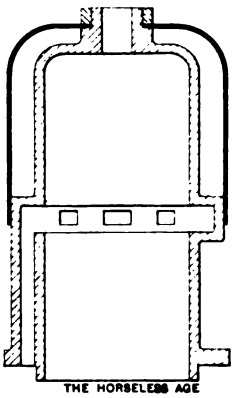


FIG. 7.

accessibility, and he said: "I don't care whether the machinery on my car is easy to get at or not, I never work on it myself." "Well," I said, "it costs you just that much more for repair bills, doesn't it?" "Oh, I never thought much about that, but I suppose it does." Strange a man wouldn't think of such an important item as the cost of an article, but perhaps fifteen cents doesn't look as big to him as it does to me.

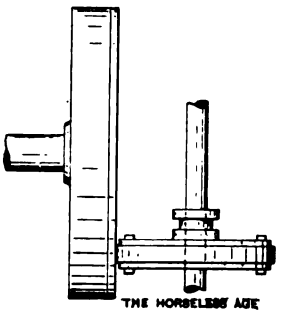


FIG. 8.

With a good two cycle engine, having shaft drive with bevel gears and a good transmission, one ought to be able to get a serviceable car at a low price.

I believe that in the near future the automobile business will be handled by fewer agents; that is, the large makers will handle their output themselves by establishing branch houses in the principal cities and having sub-agents in the smaller towns. It seems the business could be better handled in this way, at less expense to the makers, consequently cheaper to the user. Well equipped repair shops could be maintained for each make of car, giving better service for less money than when every wayside bike repairer proclaims himself a skilled

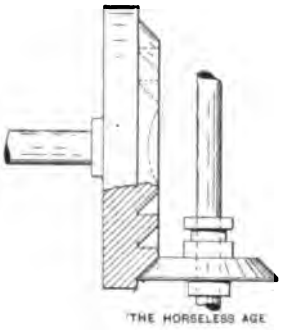


FIG. 9.

mechanic and proceeds to put automobiles out of business. I have no two cycle axe to grind nor any other kind; what I say is based on practical experience, and I have no pet car—some are worse than others, and none of them are ideal.

FRICTION DRIVES.

I notice there seems to be a tendency to "resurrect" the friction drive. I have used friction drive for a great many purposes, even to driving the complete machinery in a large mill for wood working, and the only style we had much trouble with was the right angle disc drive (Fig. 8). In the writer's opinion the principle is wrong, as th discs are working at variance with ea

other, producing a grinding motion that can't be gotten rid of, no matter what material is used. Have tried iron and leather, iron and wood, copper and rawhide, aluminum and paper, steel and paper, and various other combinations. The paper and aluminum pulled the best, but cast iron and paper seemed to wear best. Friction cones work fairly well, but they are too clumsy for auto use. Another method that worked fairly well is shown in Fig. 9. The flywheel has beveled steps on it, and the face of the friction wheel is beveled to match. This gives good contact, but causes side thrust the same as with bevel gears; besides, it requires a lot of movement to the shaft of the friction wheel in shifting from one cone to another. Various other styles have been tried, but all have bad features that, in the writer's opinion, make them undesirable for auto driving.

PLANETARY GEARS.

A properly constructed planetary transmission gives good service where the power is ample to require but two forward speeds, but if more than two are required it calls for too many gears in the transmission. An internal gear will last longer than one of the triple gear type. Some makers advertise "no internal gears," as though these gears were things to be avoided; but I can point to a number of the internal type that have outlasted the triple gear transmissions two to one. Triple gears would be all right if made heavy enough and case hardened, but with the small pinions usually used, and these of soft steel, the driving strain pulls the low speed teeth in one direction, till in a short time they incline that way, and the reverse pulls the opposite, and the teeth in its pinion will tilt the other way, with the result that the gear becomes noisy. The fault, of course, lies in the fact that not enough pinions are used, that the face is not wide enough and the pitch not coarse enough. An internal gear has more teeth in mesh at once, hence gives more strength. The planetary transmission is perhaps the most convenient to handle, unless it is excelled in this respect by the individual clutch system. Some of the latter type of gears are rather noisy, however, though it may not be the fault of the system. The sliding gear is mostly used on heavy cars, but it always seems to me to be an unmechanical thing at best.

Bearings.

By Harry Allen.

Seeing so much discussion about this important subject, I would like to say a few words upon it myself. It is not so very far back that we were using plain bearings almost entirely, while now we have principally roller and ball bearings of greatly varying size and shape, each kind having its advocates. No matter what kind of bearing is used, be it plain, roller or ball, unless it is properly lubricated it must fail sooner or later. Therefore it is essential that designers look more closely after this very important factor; that is, see that each one of the bearings, no matter where it is located, gets its proper share of lubricant. If need be, use one of the many styles of either mechanical or pressure oilers, and the life of the machine will be lengthened considerably.

In designing either roller or ball bearings one must take into consideration two very important factors, namely, the weight upon the bearing and the revolutions per minute at which the shaft turns. In roller bearings the rollers should never come in contact with a cast iron or soft steel shaft. If either is used bush it with a hardened steel sleeve, or, better still, use a hardened steel shaft—it pays in the end. Use also a hardened steel sleeve over the outside of the bearing, making it a drive fit. Theoretically a roller bearing should not be as long as a plain bronze or babbitt bearing, as the roller takes up a good deal of the load, and, of course, the length can be shortened.

Ball bearings can be put to many uses; in fact, they can be used in every part of a car, as some manufacturers are now using them even on the crank shaft, and a crank shaft in a gasoline engine certainly gets some very hard knocks. Ball bearings are made in almost endless varieties, owing to the fact that designers have their own ideas, some saying two, others three, and still others four point contact is the right principle. Now a two point bearing with the cone consisting of a 30 degree arc of a radius larger than the bearing ball, and of tangents to both ends of this arc, is a very good bearing. In designing ball bearings one must always provide a lock nut back of the cone, and the thread must be cut so that the tendency of the ball cone will be to back off against the nut, which is there to hold the cone in place. If it is not cut this way the cone will lock up on the balls and the bearing will become locked so tight that something give or break, and such an occu especially if in an automobile "aw nowheres," will cause some very ba as well as ruin the reputation of th ufacturer.

I have a very handy little table saves a lot of figuring, etc., in findi centres for ball races and cups. B use of this table the exact diam circles passing through the centr certain number of balls may be and accurately obtained. The n for 1 inch balls. To find the di for any other size balls, multip values in the table by the size ball required.

For example, say we wish to f diameter of a circle passing throu centres of thirty-six three-eighth balls. By reference to the table w that thirty-six balls give a diam 11.474 inches with 1 inch balls. W multiply this by three-eighths (s ball) and get 4.303 inches as the ter of the ball centre through th three-eighth inch balls. It is well to this two or three thousandth clearance. To get the size of the fit over these balls, add to the of the ball centre the size of o plus a couple of thousandths of a

It might be of use to some to kn many steel balls there are in a pou Standard Roller Bearing Company the following table:

Size of Ball.	Decimal.
1-16	.0625
3-32	.0937
⅛	.1250
5-32	.1563
3-16	.1875
7-32	.2188
¼	.2500
9-32	.2613
5-16	.3125
11-32	.2438
⅜	.3750
7-16	.4375
½	.5000

Exact Diameters of Circles Passing Through the Centres of Differe Numbers of One Inch Balls.

Number of Balls.	Diameter of Ball Circle.	Number of Balls.	Diameter of Ball Circle.	Number of Balls.	Diameter of B
4	1.414	20	6.394	36	
5	1.701	21	6.710	37	
6	2.000	22	7.027	38	
7	2.315	23	7.345	39	
8	2.613	24	7.662	40	
9	2.923	25	7.978	41	
10	3.236	26	8.296	42	
11	3.548	27	8.615	43	
12	3.864	28	8.934	44	
13	4.179	29	9.249	45	
14	4.494	30	9.566	46	
15	4.810	31	9.885	47	
16	5.125	32	10.202	48	
17	5.440	33	10.520	49	
18	5.758	34	10.838	50	
19	6.075	35	11.156	51	

me Tests of Jump Spark Coils.

Two graduates in the Mechanical Engiring Department of the University of chigan, W. C. Smith and J. H. Hunt, for ir thesis work made a series of experints on jump spark coils for gas engine ition, to determine, if possible, first, ether there is an appreciable amount of e required for the action of the coil and rator, and, second, if there is such a time erval, how a variation of the conditions der which the coils operate would affect s time. The experiments are described the latest issue of *The Michigan Technic*, m which the following is taken:

APPARATUS.

The apparatus was set up as shown, Fig. The motor M, which furnished the mon, was an "Apple Igniter," with rheot connected in series with the armature to mit of speed variation. As a dynamo it designed to give a pressure of 12 volts at 00 r. p. m. Used as a shunt motor, it uld run practically continuously without erheating the field under a pressure of 16 lts. When about 25 volts were applied field began to heat and the speed ran to 1,900 and 2,000 r. p. m. At the end a twenty minutes' run the field had bene as hot as it was considered safe.

The variation in speed of consecutive adings does not necessarily indicate that readings are in error, since the heating the field coil increases its resistance and luces the exciting current; so that the ed varies, decreasing when the machine been resting, and increasing when sevl readings are taken close together. The tor received its current from the storage tery S B, being usually connected to four ls. A double pole knife switch K conlled this circuit. Upon an extension of motor shaft and rigidly attached thereto s a 5 inch cast iron disc D, around whose iphery was placed a smoked paper strip. small slot, used in connection with a oden wedge, served to hold the strip in ce on the disc. In order to close the mary circuit of the induction coil I C at ertain point in the revolution, there was ached rigidly to the shaft a contact ker C M, giving a certain arc of contact the same portion of each revolution. In first part of the tests, a cam contact ker with a contact arc of 70 degrees was d, while in the latter runs a Herz timer ur point) with an arc of 36 degrees ved to close the primary circuit.

As usual, the primary circuit was groundon the motor. The current may be ed from this point through the shaft and tact maker; through an ammeter A, ugh a snap switch K, into a battery B from two to eight dry cells; from the ery through the vibrator of the induc coil I C and its primary back to the unded" terminal. A voltmeter V was ed across the batteries as shown, in r to obtain readings of the pressure in primary coil.

n the secondary circuit of the induction coil were placed two gaps, across which, of course, a spark leaped at each break of the primary circuit. One of these gaps G was between a movable steel point and the disc. The steel point was thrust through a hole in the end of a rod, which in turn passed through a hole drilled in the top of the post P set in front of the disc. Both rod and point were held in place by set screws. The post was turned so that by sliding the rod back and forth the point was moved across the face of the disc, and in a direction parallel to its axis. This post was connected through gap G_2 to the high tension terminal of the induction coil I C and the common terminal was "grounded" to the motor frame.

The other gap G_2 was between two steel points enclosed in a glass tube. One of these points was movable, permitting variation in the length of the gap at this point. The gauge glass tube was closed at the ends by cemented plugs, through which passed the terminals of gap G_2. Thus the secondary circuit may be traced from the high tension terminal of the coil through G_2 to

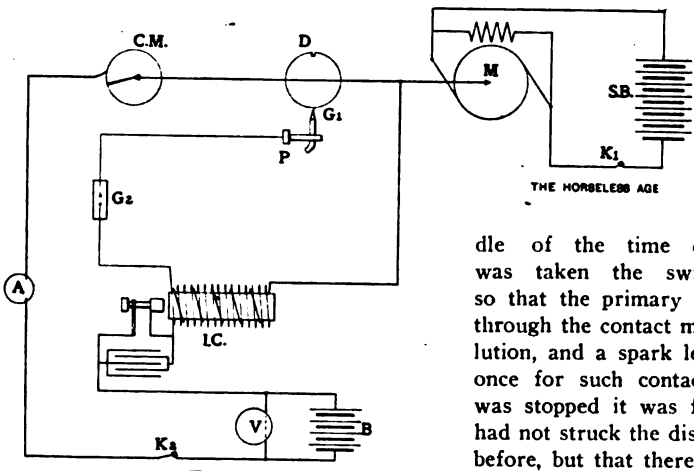


FIG. 1.

the point P, thence across the gap G_1 to the disc, and from there to the "grounded" terminal and back to the other terminal of the secondary winding.

A speed counter, several hundred strips of paper for records, a small lamp for smoking these strips, and a bottle of shellac in alcohol completed the apparatus as used in the tests.

In order to avoid confusion, the coils used will hereafter be designated as follows:

No. 1. Coil marked Nilmelior.
No. 2. Old coil marked Oldsmobile.
No. 3. New coil marked Oldsmobile.
No. 4. Western Electric Oldsmobile.
No. 5. Cylindrical coil, brand unknown.
No. 6. "National" coil.

METHOD OF OPERATION.

The method of operation in taking each record was as follows: A record was first placed on the disc (see Fig. 1), which was 5 inches in diameter and 1 inch wide. A record was a strip of tough white paper fastened by means of a wooden wedge, as explained above. At the point where the spark leaped the gap first, and for about 3 or 4 inches in the direction of rotation, the paper was covered with lampblack by holding it above a smoky kerosene flame. The disc was then turned slowly by hand in the direction of rotation after closing switch K. When the primary was closed a spark would leap the gaps G_1 and G_2, and at the point where the spark in gap G_1 struck the disc, the carbon particles were thrown violently away, leaving a white spot, in the middle of which was usually burned a small hole, noticeable only when the record was held up to the light. This spot showed the angular position of the shaft when contact was first made, since the rate of rotation was so slow that its effect may be ignored.

The primary circuit was opened at switch K_2 as soon as the first sparks appeared, since otherwise a stream of sparks would follow as long as the circuit was closed through the contact maker, and spoil the portion needed for the secondary record. The motor was then set in motion by closing switch K_1, and after it had come up to speed the revolutions were taken for thirty-second intervals. At this point we may mention that only a speed counter requiring very little power to run it was found applicable, because a heavy one would seriously affect the speed. For about five seconds in the middle of the time during which speed was taken the switch K_2 was closed, so that the primary circuit was completed through the contact maker once every revolution, and a spark leaped the gap at least once for such contact. When the motor was stopped it was found that the sparks had not struck the disc at the same point as before, but that there was a space between the points, this space being the distance passed through by the periphery of the disc while the coil was acting. Thus, if the distance between the first spot, when turned slowly by hand, and the one obtained when the motor was running at speed of 732 r. p. m. be 1.18 inches, the time elapsing is

$$\frac{1.18 \times 60}{732 \times 5\pi} = 0.00615 \text{ second.}$$

$732 \times 5\pi$ being the distance in inches traveled by the periphery per minute, and the factor 60 reducing the result to seconds.

The primary circuit was closed at the middle of the time speed was being taken, because it was found that the speed varied considerably as the temperature of its field varied; and assuming that the speed varies uniformly, the speed counter reading gives the speed when the record was taken. The switch K_2 was closed for four or five seconds to permit the vibrator to get into synchronism with the contacts, the effect of this being explained below. Upon removal the records were bathed in a fixing solution, and allowed to dry.

DISCUSSION OF TYPICAL RECORDS.

Photograph, Fig. 2, shows seven

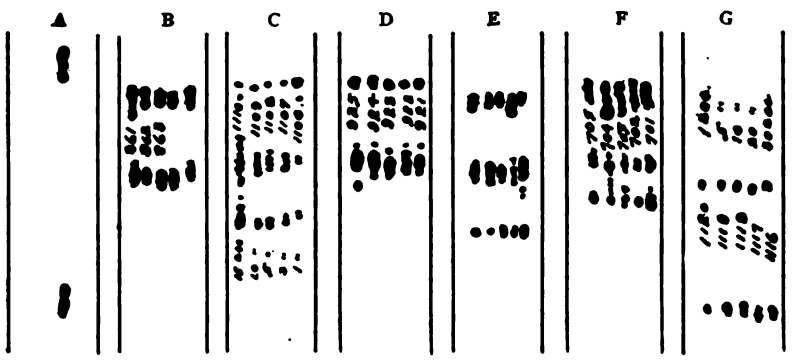


FIG. 2.

records, obtained in the manner explained above. The strip marked "A" is record No. 203, and is a part of the test of coil No. 1. The cam contact maker was used and four dry cells furnished the energy. The long spot at the top of the record was obtained as the disc was turned slowly by hand, and the lower spot was obtained by closing the primary circuit when the motor had attained a speed of 1,650 r. p. m. The distance 3.03 inches was measured from the first hole through the paper in the upper spot to the first hole in the lower one. The reason for assuming that this gives the proper time is that it shows the best working conditions of the coil, which occurs only after the vibrator's motion becomes "tuned" to the impulses sent into the primary by the action of the contact maker. Generally speaking, the first spark obtained gives the last hole in the lower spot, and then as the vibrator gets into motion sparks come earlier, until the best working conditions are reached.

This fact is illustrated in strip C, which was obtained during the test of coil No. 6. In this case the Herz timer was used, and a slower speed was necessary if any spark was to be obtained. Beginning at the right hand side of the strip, records 1,106 to 1,110 inclusive are shown. When the primary was closed 1 second approximately (record 1,106) the best time was 0.00955 second; when 3 seconds, 0.00899 second; when 5 seconds, 0.00856 second; when 10 seconds, 0.00813 second; when 15 seconds, 0.00677 second. This last record is apparently in error, as a result of some unknown condition. In other cases where this experiment was tried no appreciable change in time was found after, say, 5 seconds. These records were obtained at a speed averaging 400 r. p. m.

Now, if the contact maker shaft is running at high speed, say, 780, the time that the primary current is closed has apparently no effect on the time elapsing between the primary contact and the spark. This is illustrated on record G, numbers 1,116 and 1,120, inclusive. Strip B, records 861 to 865, inclusive, is merely a typical record obtained by using a Herz timer and slow speed, say 600. Strip D, records 921 to 925, inclusive, is practically the same, except that it exhibits the peculiarity of having an occ spark occurring in about 90 per cent time required for the average one.

Strip E, records 426 to 430, shows apparently the coil gives two sparks one contact, the time between the fi second sparks being nearly the ti quired for the first spark after the p circuit has been closed by the contact This same action is illustrated on s and also on strip F, records 701 to 7 this latter case (F), however, the ti quired for the first spark after con shorter than that between the first a ond sparks. The only explanation i difference in the relative times of th sparks is in a probable difference construction of the vibrators.

Attention is called to the fact that t No. 4, used for the strip F, was the coil tested, its best record being 0.004 onds; the best time of coil No. 1, t other hand, was 0.00587, the voltage the same in the two cases.

RESULTS.

Attention is called first to the fac the time elapsing as measured was entirely required for the vibrator to ac contact maker was placed as nearly as ble in the position of the break o primary circuit, and by making and b ing the circuit a spark was produced ever, when the circuit was closed, wi machine running, the spark came appa at the same point as before.

It is obvious that if there be a de time required for the spark to act, the tact must come earlier, when the spa needed for ignition in a running en The Splitdorf coil used on the Olds runabout engine was timed in the me ical laboratory, and its average time found to be about 4.6 thousandths of a

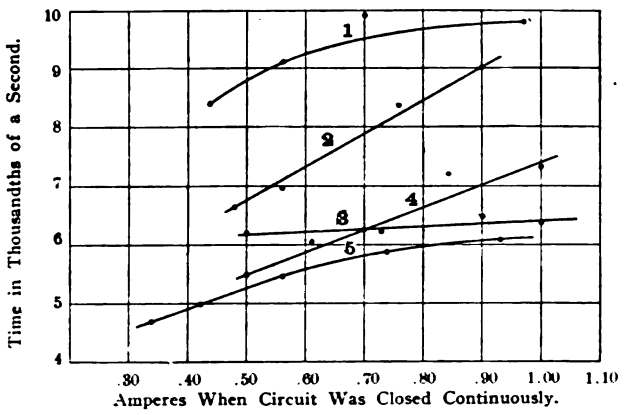


FIG. 3.

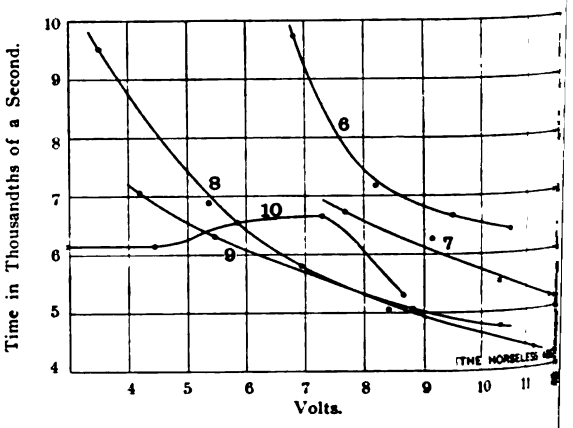


FIG. 4.

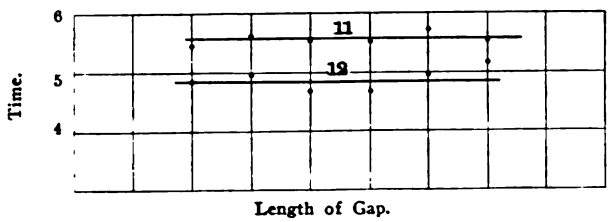


FIG. 5.

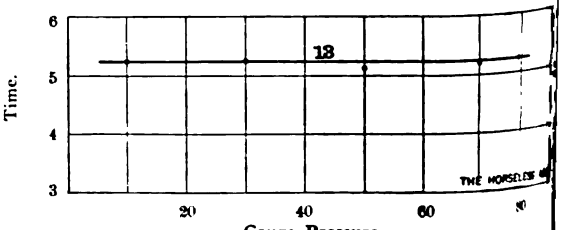


FIG. 6.

Now, if the engine be running at a l of 644 p. m., the secondary shaft will ınning at a speed of 322 p. m., and ıg 0.0046 second it will turn through ıgle of 8.9 degrees, or about 9 degrees is required for the coil to act at this l. Now, for a 30 pound load on the :, as per test, a lead of 40 degrees was 31 degrees must therefore be due to ime it takes for ignition, and also to act that the exploding gases must have shioning effect upon the inertia of the rocating parts. For heavier loads, say ›unds, at the same speed, more of the ia of the parts is taken up by the load, ss lead is used, in this case only 20 :es, which allows 11 degrees for igni- and cushion effect.

ıen the applied voltage was varied, the ts are best seen by consulting the curves ?ig. 4). For every coil (No. 1 possibly ›ted) increasing the voltage appears to en the time considerably, although coils d 5 are much less affected by voltage tion than 2 and 4.

ere was a certain minimum amount of ry necessary to obtain a spark in the ıdary circuit. The power consumed for No. 4 was computed, and it was found although the power fell off as the volt- was decreased, the current increased tly as the voltage fell, so that the power not fall off as the square of the voltage, ould occur in an ordinary circuit of resistance.

cause of the effect of the self induction ıe primary circuit at high speed the quantity of electricity will not get ıgh the contact maker, although the it is, of course, closed for the same :ent. of the time as at a lower speed; s not closed for so long a time at any :ontact; and if this current is so small insufficient power is taken by the coil, econdary spark is obtained, although ›ibrator may be working well. Thus the Herz timer the speeds could not be y so high as with the cam contact :r, the arcs being 36 degrees and 70 :es, respectively.

ıen the adjustment of the vibrator was d (see Fig. 3) it was found that the current taken when the primary cir- was closed continuously the larger the That is, when the larger currents used, the vibrators seemed to stick, ılthough the coils gave powerful sparks he greater currents when the machine not running, when running the action not nearly as good as when the vibra- as adjusted to take the smaller currents. as also noticed that the current when ing did not increase in the same pro- ›n as did the current when the ma- was still. Both dry cells and storage ries were used on coils during this test, articular difference in the action being vered.

e value of the current given is the ng of the ammeter in the primary cir- and is a sort of an average of the vary- values of the current, which pulsate from a zero to a maximum. As seen in Fig. 5, varying the gap has apparently no appreciable effect on the time. Theoretically, a stronger field would need to be built up and more time required, but this difference is so small that we failed to detect it.

In a gas engine the mixture is under compression at the time the spark is passed, and it was thought advisable to try the effect of pressure on the time. As seen in Fig 6, and as might be expected from the results obtained on varying gap, pressure variation did not affect the time.

From the above mentioned results it is seen that any condition affecting the primary circuit will affect the action of the vibrating apparatus, and therefore the time; while, on the other hand, any change of the conditions in the secondary circuit, which cannot affect the vibrator, does not appreciably affect the time.

Garage for Apartment Houses.

One of the latest developments in the commercial automobile field is the erection of a garage by the owner of one and agent of another large apartment house in New York city. The garage will be located in the rear of one of the houses, at the corner of Seventy-ninth street and West End avenue, and directly opposite the other. In the garage will be kept electric vehicles, broughams, victorias, etc., which will be operated for the convenience of the guests of both houses. They will be rented out by the hour, day, week or month. One of the gentlemen interested in the project told a HORSELESS AGE representative that the demand for such a service in their houses was great enough to keep as many vehicles as they could possibly store in their limited space busy all the time, and that they had consequently no intention of engaging in a public service enterprise. But if a request should happen to come in from someone in the immediate neighborhood, and a vehicle be in and not on order by one of their own guests, they would let it go out with the other party.

Commercial Vehicle Notes.

The Rapid Motor Vehicle Company, of Pontiac, Mich., have recently tested out a new twenty passenger bus.

A line of sightseeing automobiles is soon to be established at St. Paul, Minn., with a capital of about $10,000.

Chief Cheswell, of the Boston fire department, has placed a Columbia electric car in service in which he will run to night fires.

A project is now being considered for the establishment of an automobile stage line between Manchester Green and Hartford, Conn.

A peculiar condition of affairs has developed in connection with the operation of the "Jim Crow" motor stage line in Nashville, Tenn., by the Union Transportation Company . After the complete failure of a lot of second hand steam buses, the company purchased a number of the electric variety, and now finds that the only source of sufficient electrical energy to charge them is the power plant of the street railway company, with whom they are supposed to be competing. It is to be inferred that with this arrangement and the present amount of traffic handled by the transportation company, the railway company is not suffering to any great extent.



ONE OF THE NEW PACKARD TRUCKS USED BY THE ADAMS EXPRESS COMPANY IN NEW YORK.

OUR FOREIGN EXCHANGES.

French Gasoline Storage Regulations.

In our last issue we made some reference to regulations recently adopted in Paris for controlling the storage of gasoline in automobile garages. We are now in position to give more complete information on this subject, having just received a copy of the complete regulations. In September last the attention of the Prefect of Police of Paris was called by the French Minister of Commerce to the importance of drafting special regulations for the storage of gasoline at automobile garages. The Board of Public Health, at the instance of the Prefect of Police, appointed a committee of five members to draft regulations, and this committee made a report substantially as follows:

FIRST CLASS GARAGES.

A garage is of the first class if the total maximum quantity of gasoline stored exceeds 3,000 litres. In order to fix ideas we may take as an example a garage which houses 200 vehicles, having an average of 12 litres in their tanks, plus a certain number of vehicles having their tanks empty, and which besides has a supply of 600 litres on hand in form of 120 cans of 5 litres each. These suppositions apply to a very large garage; there are at present but very few of this size in existence, and the committee is of the opinion that it is unnecessary to lay much stress on this class, which can only be properly regulated after special inquiry in each case.

SECOND CLASS GARAGES.

A garage is of the second class when the maximum quantity of gasoline stored is between 1,500 and 3,000 litres. We have given above an example of a garage representing the upper limit of this class. The lower limit will be represented by an establishment housing 100 vehicles, each containing an average of 12 litres, plus a number of vehicles containing no gasoline and a supply of 60 cans of 5 litres each. It appears that there are at present in Paris about twenty garages which must be dealt with as establishments of the second class.

It is obvious that the ratio between the quantity of gasoline contained in the vehicles and that constituting the supply in cans is not always that indicated by the above examples, but may, on the contrary, vary in different establishments. At any rate, the committee is of the opinion that the portion constituting the supply should not exceed 1,000 litres. Moreover, it should be definitely specified that this supply must consist exclusively of sealed cans, and that except for the small quantity absolutely necessary for current use, the cans must be ...ed in a special location offering the ...test possible guarantee against all fire danger. The following general conditions are recommended:

1. The supply of gasoline of a garage, with the exception of the gasoline contained in the vehicle tanks, must not exceed 1,000 litres. This supply must be exclusively received and kept in full cans, closed and sealed, with a maximum capacity of 10 litres each.

2. The entire gasoline supply, with the exception of that necessary for current usage, and which must in no case exceed 300 litres, must be stored in a suitably chosen special enclosure of the establishment. This enclosure must be constructed of non-combustible material, and must be so located that it may be readily kept under observation. It must be closed by an iron door normally locked by a key. The floor must be laid with flagstone, brick or cement, and arranged to form a basin having a capacity equal to the whole of the liquid in case it should be accidentally spilled. No electrical conductor is allowed to be led into this enclosure.

3. The gasoline tanks must be introduced and taken out of the enclosure only during daylight. At night times entrance into the enclosure is absolutely prohibited. It is prohibited to light lamps or to carry lamps or matches into the enclosure or its proximity.

4. The garage must be surrounded on all sides by walls of masonry. If the garage is contiguous to other buildings or at a distance of less than 4 metres therefrom, these masonry walls must be of the full height occupied by the garage, and in no case must they be less than 2½ metres high. The story or stories occupied by the garage must not be surmounted by stories used for any other purpose.

5. There must not be within the same confines any human dwelling occupied during the night, except that which may be provided for a caretaker and his family. In that case the dwelling must be at a suitable distance from the enclosure containing the gasoline, and close to the exit of the garage. In case there are dwellings contiguous to the garage, special precautions should be prescribed.

6. The ground in the vicinity of the garage where the vehicle tanks are filled and drained must be non-combustible and impermeable.

7. The operations of filling and draining the vehicle tanks, and generally of handling the gasoline in any manner whatever, are absolutely forbidden within the garage at night. They may there be effected only during daylight, and then only under the condition as to the floor, as specified above. The gasoline necessary for current usage, except that contained in the vehicle tanks, must be kept in tanks exclusively. The parts of the wooden packing boxes, as well as the empty tanks, must be stacked up in such a manner that they do not interfere with moving about. They must be removed in the measure as new supplies are received.

8. The garage must be sufficie... ated. During daytime it must ha... natural illumination. At night ... which the vehicles are stored ca... only by fixed lights placed at ... metres above the floor. Operat... ing the use of a furnace, torche... lamps, etc., must be confined to ... establishment which are speciall... and separated from the rooms i... vehicle tanks may have to b... emptied. Heating furnaces, ste... tors and electrical apparatus m... placed in the garage except in ... specified in the foregoing.

9. Smoking in the garage is... This prohibition must be announ... bold characters at the entrance... various points of the establishm... ing of the vehicle lamps is prohi... garage proper. It is only toler... immediate vicinity of the exit... the door has been opened.

10. Efficient fire extinguishing... must be provided and always ke... order. This apparatus compri... a supply of sand and earth, reel... tinguishing hose in suitable pla... dition to these special hydrants. ... ulations may require fire extingu... inflammable covers, etc.

11. Arrangements must be... every case to provide against th... of gasoline or of water containi... into piping connecting with pu... vate sewers.

THIRD CLASS GARAGES.

Garages of the third class c... those in which the maximum ... gasoline contained is compris... 300 and 1,500 litres. The rule... this class may also be applied ... containing less than 300 litres ... if the owners thereof desire. T... tee is of the opinion that the ge... tions applicable to garages of the... should be the same as those for... class, except that the maximum... gasoline allowable should be 50... stead of 1,000 litres, and that ... and 5 the following should be ... for the second class:

4. The garage must be separat... inhabited dwellings by walls co... noncombustible material, or ... wood entirely covered with a su... ness of plaster.

5. Lodgings may be arranged ... garage for the watchman and ... These lodgings must be placed a... distance from the enclosure co... gasoline supply and in the vic... exit.

These recommendations were ... the session of the Board of Pu... on December 8, and are awaiting ... ture of the Minister of Commer... dustry. They show very carefu... ation, and are well worth the a... our fire underwriters and munici... ities.

ntribution to the Theory of Acetylene Headlights.

The incomparable brightness of the acety- ie light and the improvements that have en made in acetylene generating appara- have led to remarkable results in the plication of acetylene for automobile il- nination. Without attempting to give a nplete history of acetylene lamps since first searchlight was applied to auto- biles, which, moreover, was only a few ars ago, we shall point out several phases ich have marked the evolution toward rational use of acetylene with a view the ultilization of a maximum of the ht produced and its use under the special nditions of road illumination.

At first the parabolic reflector, until then mmonly used on kerosene lamps, was gen- lly applied to the acetylene searchlight. this connection mention should be made the use of parabolic reflectors of small al distance but of great depth, which in- ates that experiments are directed toward utilization of the total sphere of light itted by the luminous source, to increase power or range of the rays parallel to axis.

Following this same general idea, several nufacturers have adopted for automobile rchlights an optical combination which long been employed in marine practice, which consists in placing within the abolic reflector a convex lens having the ne focus as the reflector, and the diameter which is such that the lens intercepts and racts parallelly all the luminous rays ich are not reflected by the reflector. ck of this device is placed a hemispher- l reflector, with its centre at the centre the luminous source, and intended to rease the intensity of the rays falling upon parabolic reflector and the lens. There are o to be noted the use in searchlights of a pped convex lens in conjunction with one two distinct luminous sources; the more ent use of stepped lenses supplemented catadioptric rings, and, finally, the use the hyperlenticular optical system. We re no intention of discussing the respect- merits of these various systems, but we nk that it will be interesting to point out ne of the factors which are useful in de- mining the elements which enter into y in the formation of a cone of light and the determination of its power.

t has been believed—not without some son—that the luminous range or power a cone of light could be increased by the of reflectors, for recuperating a larger portion of the light emitted by the source, this connection we would like to point to remarkable investigations of André ndel, professor at the Paris School of ads and Bridges, on the optics of the ctric projector. In one of his works on s subject, "Theory of Electrical Pro- tors," the author determines mathemat- lly the power or intensity of projectors asured on the axis at a great distance. finds that the luminous intensity, in the case of a luminous source of well defined brightness, is expressed by the following formula:

$$P = y\ S\ I$$

in which P represents the power of the projector; S, the projection of the surface of the apparatus on a plane perpendicular to the optical axis; I, the intensity of the luminous source, and y, a numerical coefficient varying with the type of projector employed. M. Blondel thus interprets the above equation: "At a great distance a mirror or an aplanetic lens behaves exactly like a plane incandescent surface of the same intrinsic brightness at each point as the luminous source at the corresponding point, multiplied by the transmission coefficient k and the coefficient of optical effect u. In the above formula we have, therefore, $y = k\,u$."

We may consider the acetylene flame produced by a twin burner tip as of uniform brightness in its luminous portions, and, consequently, the conclusions of M. Blondel perfectly applicable to the case of automobile searchlights employing the acetylene flame as a luminous source. The brightness may, moreover, be determined experimentally. First of all it may be pointed out what is understood by the power or intensity of a searchlight. The above definition leads one to consider the optical effect of a light at a great distance as that of an incandescent surface acting as a secondary luminous source presenting the same intrinsic brightness as all luminous sources, and to which one may apply the law that the illumination varies inversely as the square of the distance, measured on the axis, from the nearest point where the device appears to the eye as incandescent over its whole surface. M. Blondel concludes: "The luminous power of an optical device at a great distance on the centre of the cone of light is equal to the constant which is rapidly being approached by the product of the intensity of illumination by the square of the distance:

$$P = F\ E,$$

that is to say, it is equal to the intensity of a bare flame which would produce the same illumination at the same distance.

Thus, in the formula for the determination of the luminous power,

$$P = y\ S\ I,$$

if I, the brightness of the luminous source, is expressed in decimal candles, it is obvious that P, the power of a luminous projector, may also be expressed as the number of candle power representing the intensity of a naked flame which would produce the same illumination at the same distance.

The expression for the power having thus been clearly defined, let us now examine the various terms of equation (1). It will be noticed that in the case of both the parabolic reflector and the lens, the focal distance and the form of the luminous source have absolutely no influence on the power of illumination along the axis; in other words, on the luminous range. On the other hand, the focal distance and the size and form of the luminous source have an influence on the amplitude of the cone of light, which latter must not be confounded with the luminous power or range of the searchlight.

This amplitude of the cone of light, which for automobile purposes is of as much importance as the luminous range, is determined by the divergence of the elements of the cone emitted by each point of the incandescent surface of a projector. This divergence increases with the amount of light received, and, as indicated by M. Blondel, a projector of given surface can be made to give a greater or smaller cone of light, and consequently to illuminate a greater or smaller surface, by reducing and increasing its focal distance respectively, but no effect is thereby produced on the intensity of illumination at the axis of the cone.

For the same reasons, the angle of the cone increases with the surface of the flame. In this connection mention should be made of the high efficiency of the flame produced by twin burner tips, which has a large luminous surface. An important factor in the determination of the luminous intensity by means of equation (1) is the surface S, which is not the total surface of the reflector, but the projection of this surface on a plane perpendicular to the optical axis, or the circle representing the luminous objective of the reflector. The power of the searchlight increases, therefore, as the square of the diameter of this circle. Too much importance cannot, therefore, be attached to the diameter of a projector, either in comparisons between the luminous powers of various systems, or in experiments with a view to developing searchlights of great power. It will be understood that as the average run of searchlights employs the same luminous source, viz., the flame from a twin burner tip, and under the same conditions of position, the value I of the brightness or intensity of the flame per square millimetre is approximately constant for burners consuming between 15 and 25 litres per minute.

On the other hand, the coefficient of utilization y, which is very variable and not by any means negligible, represents precisely the criterion of optical perfection of the device. The value of this factor cannot be increased beyond a certain point, however, and the value of the surface S remains, therefore, the essential factor when the power of searchlights is considered. Nevertheless, as it is highly important that apparatus for automobile illumination should not exceed certain dimensions, efforts should be made to increase the value of the coefficient y; that is to say, of the optical efficiency. The determination of the efficiency, which is always somewhat of a delicate matter, is simplified by the application of the formula,

$$P = y\ S\ I,$$

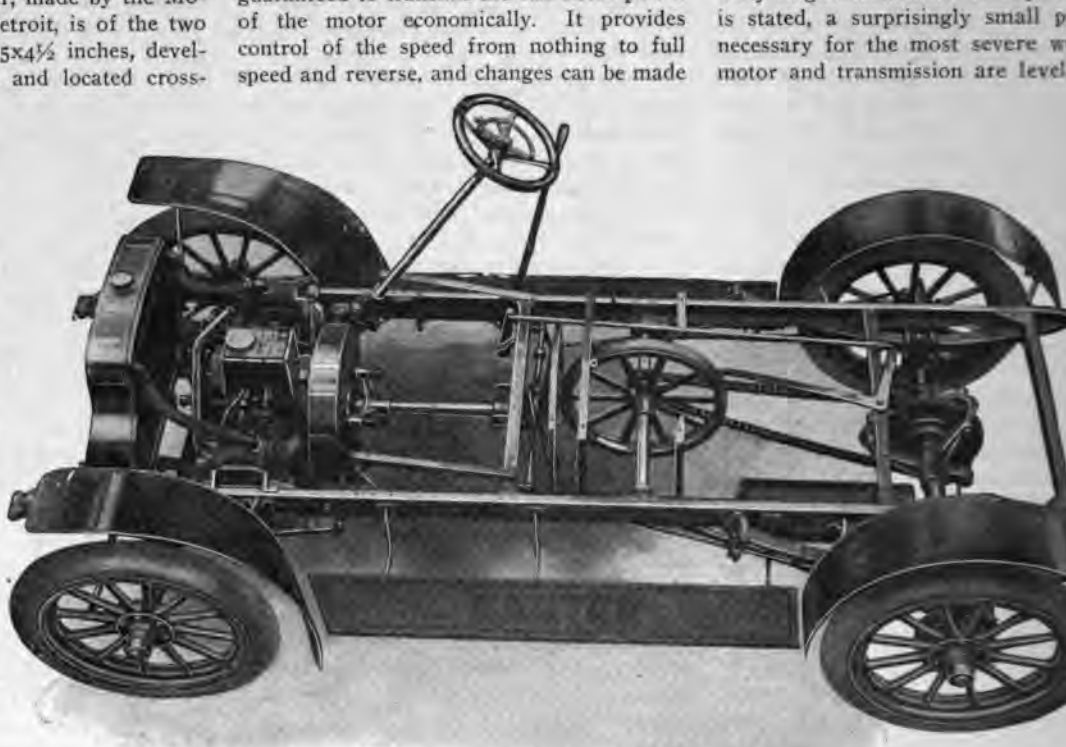
in which P and I are obtained very exactly by photometric measurements, and S by simply measuring the diameter of the luminous objective.—*M. Antoine, in La Vie Automobile.*

NEW VEHICLES AND PARTS.

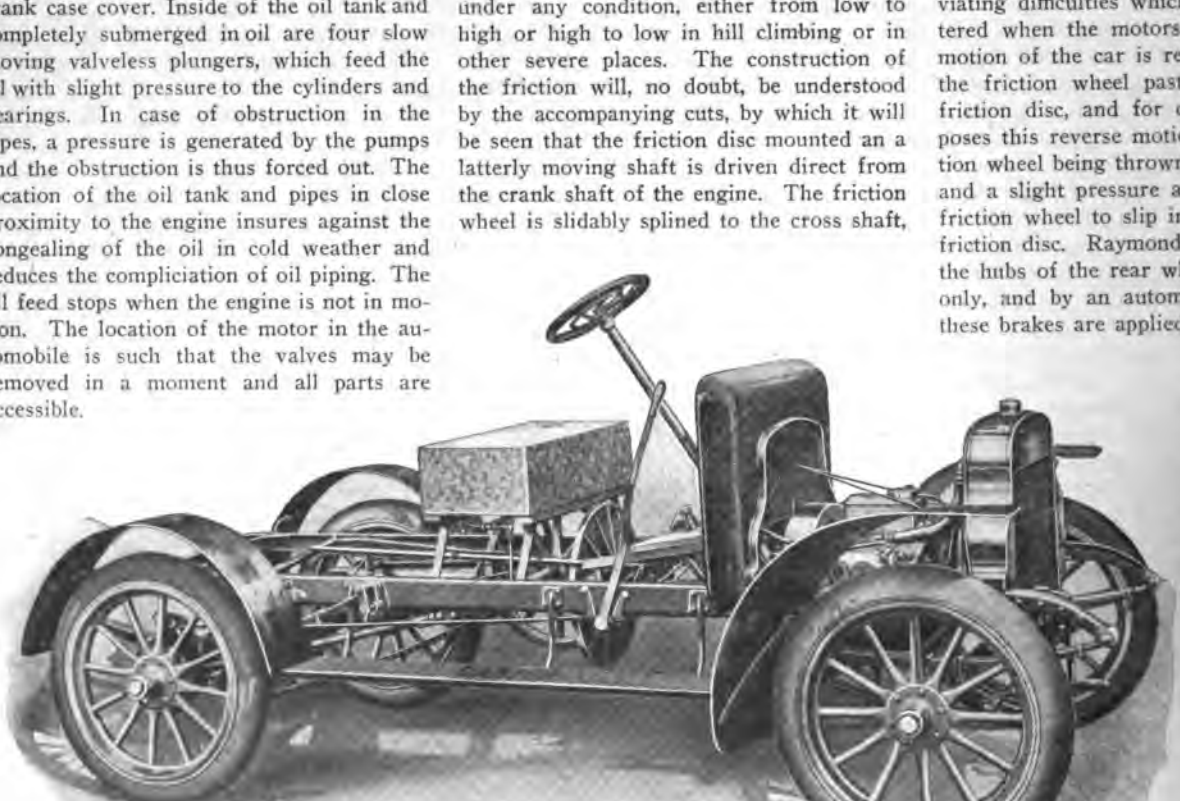
The Carter Friction Driven Automobile.

The motor of this car, made by the Motor Car Company of Detroit, is of the two cylinder opposed type, 5x4½ inches, developing 20 horse power, and located crosswise in front under a hood. The design is said to be the result of many years' experience, and careful attention has been given to the details of accessibility, large wearing parts and simplicity. The castings are of close grain iron, and the pistons and crank shafts are ground. The crank shaft is forged, and a flange is forged on the shaft to carry the flywheel. The flywheel is made with a solid web and finished all over, thus insuring absolute balance. The lubricating system is original and unique, consisting of a large oil tank forming part of the crank case cover. Inside of the oil tank and completely submerged in oil are four slow moving valveless plungers, which feed the oil with slight pressure to the cylinders and bearings. In case of obstruction in the pipes, a pressure is generated by the pumps and the obstruction is thus forced out. The location of the oil tank and pipes in close proximity to the engine insures against the congealing of the oil in cold weather and reduces the compliciation of oil piping. The oil feed stops when the engine is not in motion. The location of the motor in the automobile is such that the valves may be removed in a moment and all parts are accessible.

Transmission is by means of the Carter friction transmission, covered by letters patent. This device is said to have been tested during the past three years under the most trying conditions, and is absolutely guaranteed to transmit the full horse power of the motor economically. It provides control of the speed from nothing to full speed and reverse, and changes can be made under any condition, either from low to high or high to low in hill climbing or in other severe places. The construction of the friction will, no doubt, be understood by the accompanying cuts, by which it will be seen that the friction disc mounted an a latterly moving shaft is driven direct from the crank shaft of the engine. The friction wheel is slidably splined to the cross shaft, so that it may be thrown to an thereon by means of the lever at of the driver's seat. Contact is by a foot lever moving the friction d shaft rearward against the fricti Very slight movement is require is stated, a surprisingly small p necessary for the most severe w motor and transmission are level viating difficulties which are ofte tered when the motors are incli motion of the car is reversed by the friction wheel past the cen friction disc, and for ordinary poses this reverse motion is used tion wheel being thrown to the r and a slight pressure applied, al friction wheel to slip in the surf friction disc. Raymond brakes a the hubs of the rear wheels for only, and by an automatic devi these brakes are applied the frict releas drive to axle is of a si of large The f pressed chann Sprin inches front and the inche Wheels artillery car has tread an base of The ste is of pany's o and ma



Birdseye View of Carter Friction Drive Chassis.



Side View of Carter Friction Drive Chassis.

id is provided with attachments for adily eliminating wear and back lash. ie spark and throttle control are above e wheel.

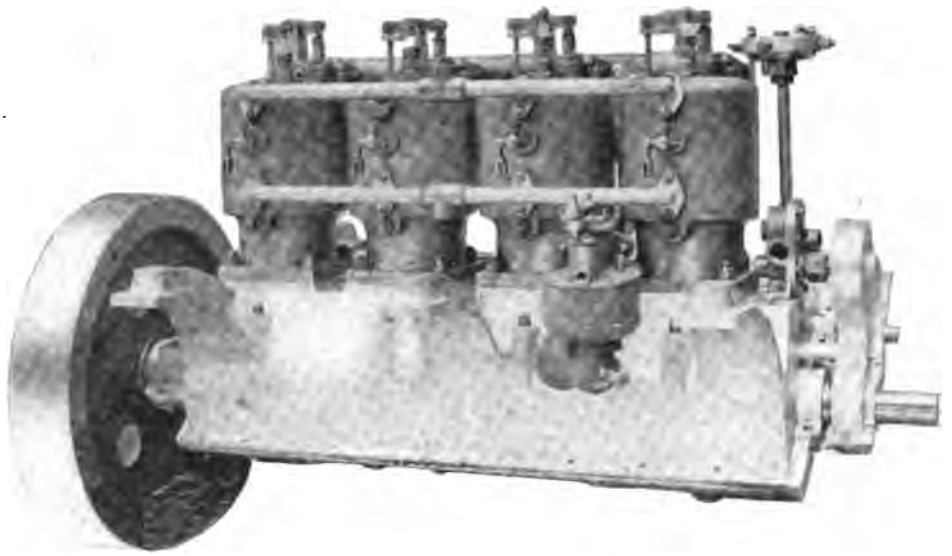
A 15 gallon gasoline tank is provided un- r the seat, and is directly connected to the ame. A device is provided in the gasoline nk which when the supply of gasoline is luced to about three gallons gives a warn- g, so that the operator knows positively at the supply is down to that quantity, t that he has still an ample supply to get a point where it can be replenished. Igni- n is by battery of two banks of six cells ch and double spark coil, the battery box ng located below the footboard, and wa- tight.

The axles are of the tubular type, with ratt roller bearing in the rear and large l bearings on the front axles. American ler bearings are used in the cross shaft, which the friction wheel is attached.

Three designs of bodies are regularly fur- hed to fit this chassis, one being the ip design, the other the victoria, ile a delivery body is also provided. ese various bodies are readily inter- nged, and may be removed or put on in minutes, it is claimed, as special atten- n has been given to the construction of chassis so that no wires, pipes or levers d be connected or disconnected when bodies are changed.

New Apperson Model.

The Apperson Brothers Automobile npany, of Kokomo, Ind., have lately ught out a 90-96 horse power runabout. engine cylinders are 6¼x5½ in dimen- ns. In general design the engine is sim- to their smaller one. It is fitted n a duck back covered space behind seat. It has a side chain drive, the front cket having 24 teeth and the rear 28. sliding change gear gives three for- d speeds and one reverse. The springs long semi-elliptic front and rear, and general control is the same as on their r cars. A double system of ignition by storage battery or Remy high tension magneto is supplied. The car is finished in dark gray, and is built only on order.



RIGHT HAND SIDE OF BRENNAN ENGINE.

New Brennan Four Cylinder Motor.

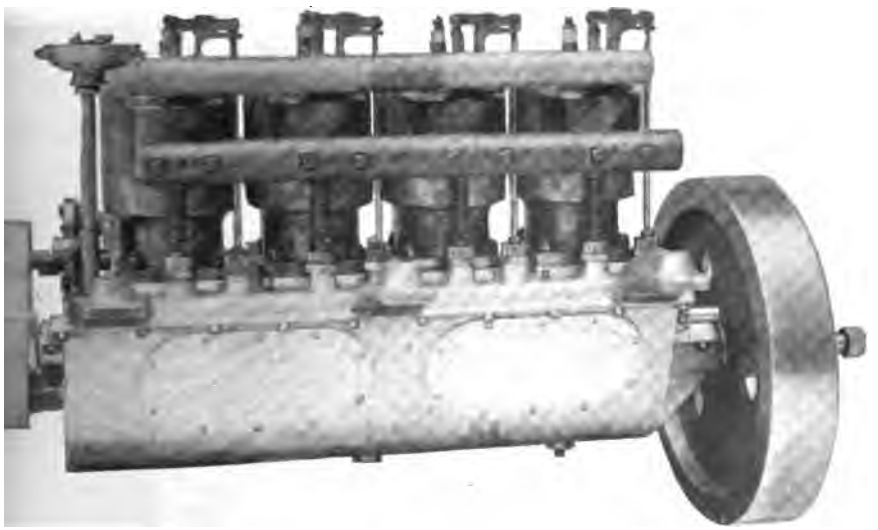
The Brennan Manufacturing Company, of Syracuse, N. Y., have developed a type of four cylinder gasoline motor, of which several illustrations are herewith shown. The special features of this motor are that it has individually cast cylinders, mechanically operated inlet valves, a timer accessibly located at the top of a vertical shaft, a gear driven circulating pump secured directly to the crank case and a combination rawhide, steel and bronze cam gearing. These motors are made in the following sizes and are claimed to develop their rated horse power at 750 r. p. m.; 20 horse power, 4x4 inch; 28 horse power, 4¾x5 inch; 32 horse power, 5x5 inch; 45 horse power, 5½x6 inch; and 80 horse power, 7x7 inch.

The crank shaft is made from a solid billet of forged steel containing 40 points carbon and 3½ per cent. nickel. The shaft has five bearings, and is forged with a flange, to which the flywheel is bolted. The clutch is self contained, and is claimed to be without end thrust. The clutch spring tension can be conveniently adjusted. There is a hardened flanged coupling between the clutch and the change speed gear, so that the clutch can be taken out without disturbing the engine or transmisison. The gears for operating the pump and secondary shaft are enclosed in an aluminum case.

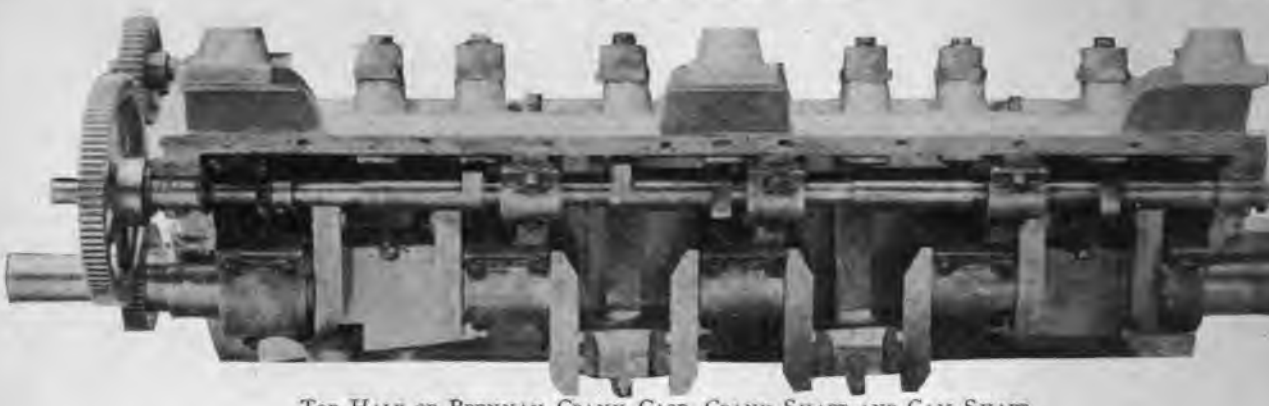
The design of the crank case deserves special attention. The combined cover and oil reservoir are joined to the upper half of the case at an angle of 40 degrees, instead of horizontally, as usual. When the cover is removed it gives full access to the cam shaft, connecting rods and main bearings from the right hand side of the case. In addition there is a large land hole plate on the side of the case.

All bearings are secured to and supported from the main section of the case. The connecting rods are of the I beam pattern, of forged steel and fitted with bronze bearings, which latter are guaranteed not to score or cut, owing to the use of high carbon steel, the quality of the bronze and the liberal size of the bearings, with ample provisions for lubrication. Oil tubes run to all bearings. The connecting rod bearings are adjustable on the pitman end and crank end.

The No. 3 sliding gear transmission, giving three speeds forward and reverse, is supplied with 20 horse power vertical motors. The transmission is fitted with arms to correspond with the arms on the motor, and motor and transmission are secured in perfect alignment by mounting on 1½x4 inch steel channels. The distance from the surface of the arms to the centre of the shaft is 5 inches, allowing the subframe to set on the same level as the main frame of the car. The bearings in the transmission are of a special bronze. The main bearing is 4½ inches in length, 2 inches in diameter. The countershaft bearing is 3½ inches in length, 1¼ inches in diameter. The shafts are made of high carbon crucible steel. The sliding member is mounted on a 1¾



VALVE SIDE OF BRENNAN FOUR CYLINDER ENGINE.



Top Half of Brennan Crank Case, Crank Shaft and Cam Shaft.

square shaft. All gears are made from steel forgings, the teeth being planed on a Fellows gear shaper. The teeth are carefully rounded over on a profiler and hardened in oil; they are 1 inch face, 6 pitch.

The high speed clutch deserves special mention. The construction is such that there is a gradual approach in throwing in the direct drive. The design of the clutch provides for replacement without interfering with the gears. The clutch is made from tool steel. All gears on the countershaft are idle when running on the high gear. The transmission is fitted with a quadrant, so the gears cannot be changed while the clutch is in. The bell crank for operating the clutch is mounted on the transmission; a ball bearing end thrust takes care of any thrust caused by the action of the foot pedal releasing the clutch. The No. 3 Brennan transmission is for direct shaft drive, and No. 4 for side chain drive. The 20 horse power motor weighs 280 pounds; the No. 3 transmission, 80 pounds, and the subframe, 70 pounds.

The Eastern Gasoline Storage Outfit.

The Eastern Oil Tank Company, 146 Fletcher street, Lowell, Mass., manufacture a gasoline storage outfit especially intended for automobile use.

It is claimed to be convenient and economical, and to give at the same time the quantity desired to fill the auto tank, as one stroke of the lever pumps one quart and very little time is consumed in filling the tank. The storage tank is buried in the ground outside the building, and is connected by a pipe with the pump in the auto house, etc.

The Aster Limousine.

The car herewith illustrated, which is of French manufacture and handled in this country by the Aster Company, of 1591 Broadway, New York city, is equipped with a four cylinder Aster motor of 4⅛ inches bore by 5½ inches stroke, and rated at 30-35 horse power. The motor is of thoroughly modern design, its features being separately cast cylinders, mechanically operated inlet valves, valve chambers on opposite sides [illegible], means of adjustment for valve lift and throttle governor. The ignition is effected either by means of a battery and coil outfit or by low tension magneto, with magnetic make and break, both systems being provided. The circuit breaker is placed on a vertical shaft at the back of the cylinders, operated by two bevel pinions and enclosed in an aluminum casing. With this position of the circuit breaker the length of wires is reduced to a minimum. A decompressing device is provided which allows the exhaust valves to be lifted in starting the motor. The ignition is timed automatically, according to the speed of the motor, and the motor is controlled by a single lever, that connecting to the throttle valve. The weight of the engine complete is 500 pounds. The change speed gear gives four forward speeds and direct drive on the high gear. The differential and bevel driving gears are enclosed in a separate housing to the rear of the change speed gear. All gear blanks are of solid nickel steel. The gear shafts are mounted on ball bearings. There are two sliding gear sets within the case which are operated by a single lever. The drive to the rear axle can be made either by side chains or by shaft, option of the purchaser. The wheel base of 117 inches.

The body is a convertible type, seating seven persons, equipped with all modern conveniences, such as electric lights, radiator, parcel holders, etc. There are adjustable seats, which fold up when in use and are so arranged that occupants thereof face forward while riding. The idea in the design of the body has been to make the car comfortable for winter use, and at the same time adapt it for summer touring by simply removing the top.



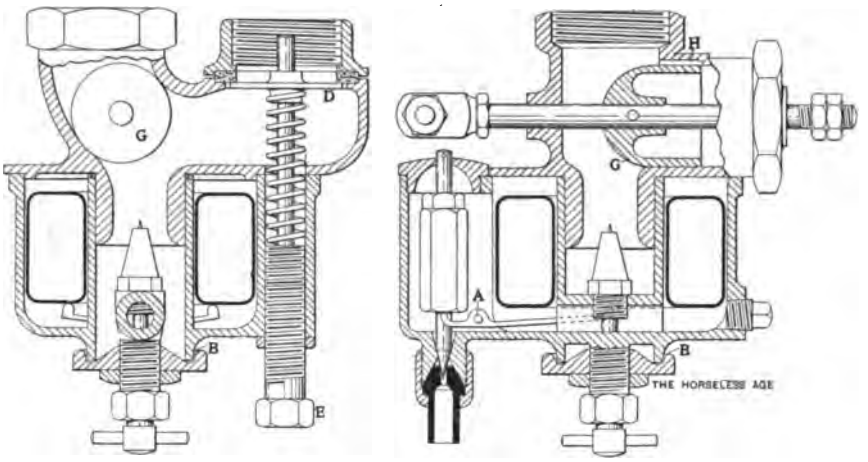
The Aster Limousine Car.

Frankel's Electric Testing

In order to avoid the necessity of cutting a wire bare of insulation when testing for a break, a device known as Frankel's test clip has been placed upon the market. As shown by the illustration, it consists of a spring snap clip with a pin in each of the jaws. The teeth grip the wire and the pin pierces the insulation and makes the electrical test connection, saving, it is claimed, much time and materials. The clip is handled by supply houses.

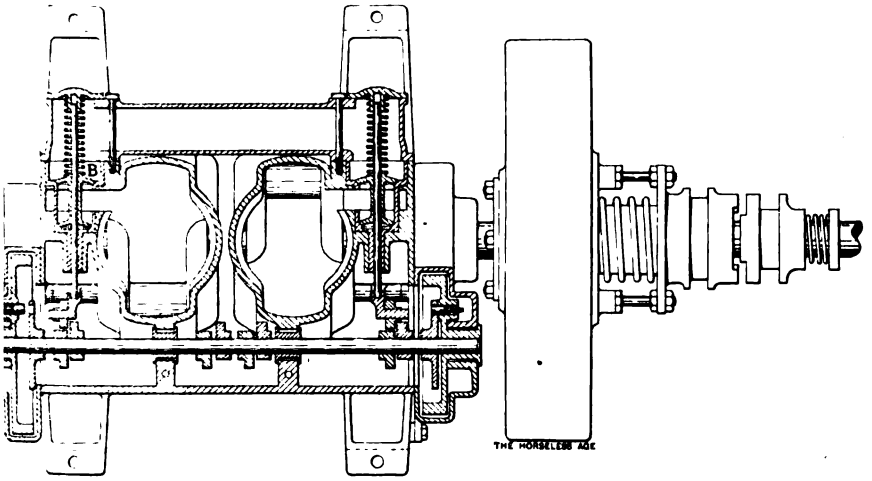
Convertible Two and Four Cycle Engine.

e convertible two and four cycle en- made by the North Chicago Machine pany was first shown at the fourth Chi- show in 1905, and no radical changes been made since then, but only such nd to make the parts more accessible to increase their life. The general ation of the motor is as follows: Refer- to side and plan view of the engine, poppet inlet valves B are located in a ontal position at the bottom of the e and admit the mixture into the crank These valves are operated by push worked by rocker arms carrying a r which runs on the cam shaft. The valve into the combustion chamber is utomatic poppet valve A in the piston , as shown in the drawing. The ex- t valve D is in the head, and mechan- operated by a push rod and rocker



North Chicago Machine Company's Carburetor.

the pressure. The crank case gas rushes through the piston and into the cylinder, and on the up stroke is compressed and



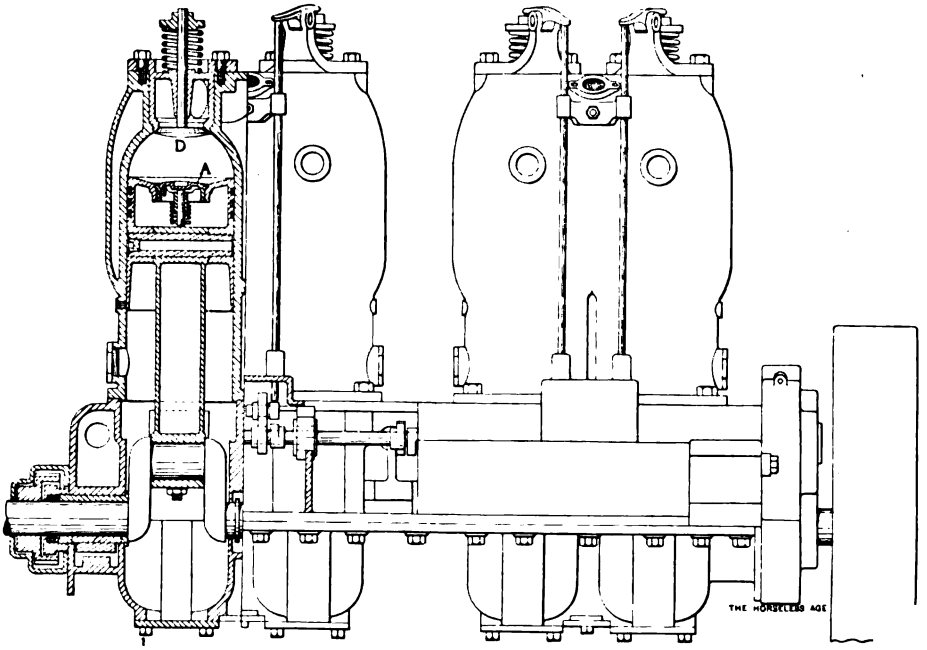
Horizontal Section of Two Cylinder Convertible Engine.

The change from four to two cycle tion is accomplished by sliding the shaft by means of a small lever from eat, which at the same time shifts the ct piece of the timer onto a new set ntacts. The cam shaft is provided a double set of cams, as seen in the view, for operating both the exhaust s and the crank case inlet valves. In ng four cycle the crank case valve as the piston ascends on the exhaust e, causing a suction in the case. On own stroke, which is the suction stroke e ordinary engine, the gas rushes up gh the valve A into the head and is ressed by the up stroke and fired and ited in the usual way. During this the cam shaft has been driven by the gears at one end. Upon shifting this haft, it is driven by 1 to 1 gears at her end, and a new set of cams come operation. On the up stroke of the the crank case is filled, and on the stroke the charge is compressed n. valves A not opening until the bot- of the stroke, when the pressure in the exceeds that in the cylinder above. before transfer valve opens, the ex- at the top opens and helps to relieve fired at the top of the stroke in the usual four cycle manner. When running on good roads at speed the four cylinder method is used, but for hills or mud by pulling a lever the engine instantly becomes a two cycle, and the power, it is claimed, jumps from 25 or 30 to 40 or 45 horse power, and, of course, the torque is much more continuous.

The engine is oiled by force feed to the cylinders, and the excess of oil runs down and is caught in a ring and feeds to the main bearings, where the surplus is again caught and fed by centrifugal force to the crank pins, there being no splash. It is built in two styles, a two cylinder and a four cylinder, each 4½ inches bore by 5 inches stroke. Running two cycle the engine will turn at over 1,200 revolutions on the road. The two cylinder is rated at 12 horse power as four cycle and 20 as two cycle, both ratings being at 900 r. p. m.

Correction.

In the equation near the bottom of the first column on page 230 of our February 7 issue, in the article by Mr. Fay, the term I^2 (square of the stroke) should have been I (stroke).



Part Sectional Side Elevation of Four Cylinder Convertible Engine.



THE "ROYAL" RUNABOUT.

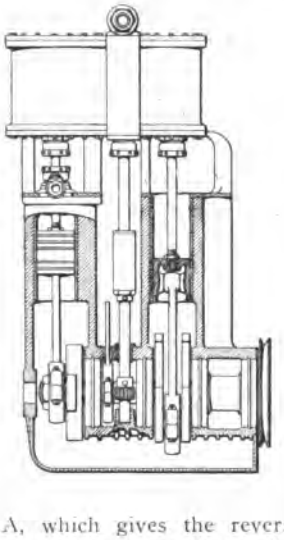
The "Royal" Runabout.

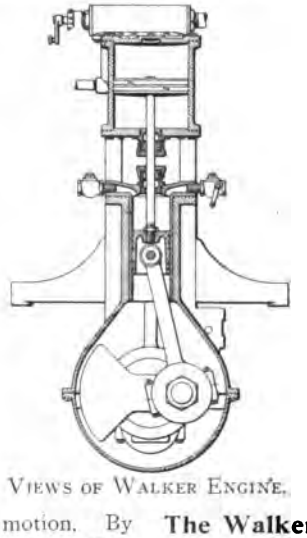
We show herewith the new Model N of the Royal Motor Company, of Cleveland, Ohio, a 40 horse power two passenger runabout with long sloping back. The car is equipped with the same engine as the "Royal" touring car model, a four cylinder of 5 inches bore and 5 inches stroke, and also has the same sliding gear transmission, which affords three speeds forward and one reverse. The wheel base is 110 inches and the wheels are 34x4½ inches. The car is equipped with powerful expanding clutch type brakes on the driving wheel hubs and a similar brake on the transmission. The equipment furnished with this car includes five lamps and a horn.

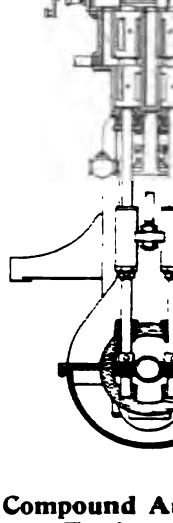
The Palmer Runabout.

The Palmer Automobile Manufacturing Company, with a factory at Ashtabula, Ohio, and sales offices at Cleveland, are turning out a new design of runabout which they are exhibiting at the Cleveland show. The engine is a single cylinder, two cycle one, of 4½ inches bore by 4½ inches stroke, rated at 8 horse power, and is arranged vertically directly in front of the rear frame cross member. The transmisison is by rope cable running under idler pulleys A and B, over a fixed pulley D and an idler pulley C. The shifting collar E moves on a feather key on the main shaft, and is normally engaged with the pulley A, being held in this position by a coiled spring attached to the rear cross member of the frame. When the sliding collar E is in this position, the gear gives a forward motion to the car. By pressing on the lever F the shifting collar E is brought into engagement with pulley A, which gives the reverse motion. By pressing on lever G the sliding sleeve E is moved into a neutral position, and both of the hub brakes are applied simultaneously. The car affords two forward and two reverse speeds, the change of speed being effected by means of a shifter fork, which engages and disengages pulleys H and J by means of a sliding key. The slo obtained by rope drive from p pulley K, and the high by rope M. The shifter post has three fi and changing the position of the lever operates the shifter fork.

A Schebler carburetor is used tion is by jump spark, while th cooled on the gravity circulatio by means of a combined radiato consisting of a copper tank with ning through it from end to frame is of pressed steel, the double elliptic, and the axles s forgings. Wood artillery wheel the front ones being 32 inches and the rear ones 36 inches, an fitted may be any of the three types: 2 inch ordinary solids Swinehart or 2½ inch pneum seating capacity of the vehicle be three, and the weight of th plete 800 pounds.



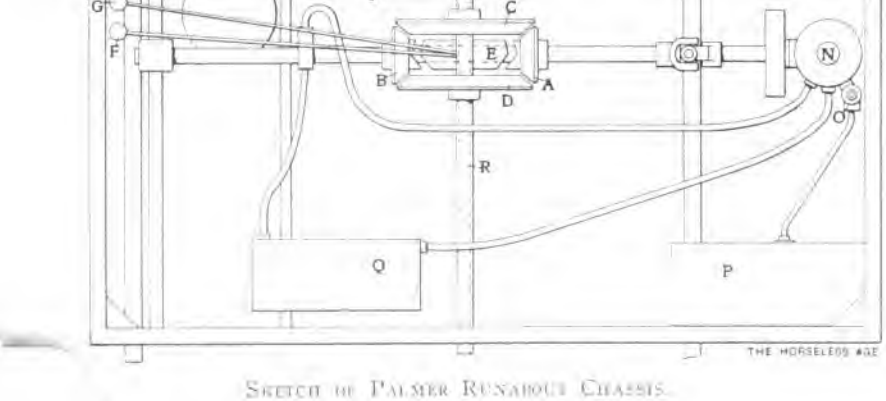




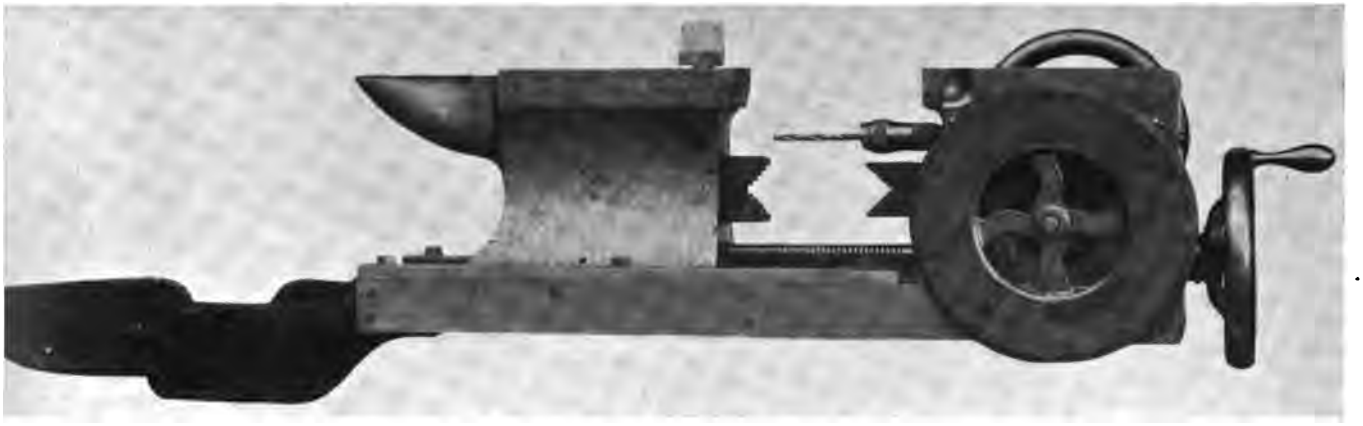
VIEWS OF WALKER ENGINE.

The Walker Compound A Steam Engine.

We show herewith some views of a compound automo engine of recent design m by William N. Walker, N. Y. As shown by the dra steam admission and exhaus trolled by balanced rotary valve rods being driven by a on the crank shaft. The valv fectly balanced, there being r posite the ports in the steam that when the steam is cut pansion of steam passes th tube, giving the same pressu opposite side. The steam comparatively small, and so that the cylinders come quite gether, making a compact will be noticed that the crank ings (which are of the ball supported from the upper h crank case. Other construc tures can be seen from the The crosshead acts as pl pumping air pressure into th tank. On top of the valves "simpling" valve, which enab



SKETCH OF PALMER RUNABOUT CHASSIS.



THE DETROIT COMBINATION TOOL.

ge the engine from compound to le. The eccentric on the crank shaft ıtes a feed water pump for genera-

The cylinder dimensions are 3½ inches and the horse power rat- s 18, the weight of the engine com- being 175 pounds.

ıe Detroit Combination Tool.

e Detroit combination tool is adapted ıaking general repairs on all classes of inery. This tool comprises a drill press, ı vise, emery wheel, pipe vise, anvil ı forge provided with a rotary blower. manufactured by the Detroit Tool ıany, Detroit, Mich., with an Eastern at No. 120 Liberty street, New York

e bed of this tool is steel faced, having ıe end a head stock containing the anism for operating the rotary blower, mery wheel and a socket that receives rill chuck. It forms one of the bench aws, and also receives the jaw for the ⁄ise. This head stock remains station- ıs it is bolted right through the base. tail stock, which is the movable part e machine, being operated by a heavy e threaded steel screw, serves as an

The opposite end from the horn of ınvil has a regulation steel faced jaw, ı corresponds in alignment with the face on the head stock. This makes ⁄erful bench vise. This bench vise can ıerated to hold in thickness from a of paper to anything 10 inches in . It is claimed that it holds as se- ⁄ when fully opened as when closed, ⁄re is no overhanging weight, owing to ıct that the tail stock slides on a solid

It slides on the base between two ad- ıle guides, which are beveled to con- with the bevel on the base of the tail

This overcomes any lost motion, and es the vise jaws and screw of all s.

⁄ air delivered by the blower in the stock is conveyed through a channel base to the forge at the opposite end. ılower shaft extends through the air ⁄ to receive the emery wheel. This ⁄ wheel is constructed so as not to in- e with the suction of the blower.

The emery wheel, blower and drill socket are operated by a combination driving pulley and hand wheel, allowing it to be operated either by a belt or by hand. These can be operated separately as occasion demands. The meshing of the gears from the drill press to the blower is controlled by a clutch arrangement.

The accessories furnished with the tool include tongs, blacksmith's hardy, twist drill and crucible holder, for holding crucibles or a metal ladle over the fire. This also can be used for holding a soldering iron when it is desired to heat it over the forge fire.

We understand that the tool has been specially designed to meet the needs of automobilists who do their own repairs of minor importance. The tool has the advantage that it requires very little floor space and can easily be installed in almost any auto house. The variety of work that can be done with it will be apparent to those familiar with the use of machinist's tools.

The Hawkins Timer and Distributer.

To provide a timer of good wearing qualities and reliable in its operation has been a problem since the advent of high tension ignition. The Hawkins Manufacturing Company, of Boston, Mass., have for some years made a study of the requirements and conditions of the electrical timer, and as a result of their experiments are placing on the market one which they claim to fully serve the purposes. They make use of the roller contact which for wearing properties has never been surpassed, but which, as experience is said to have proven, is not sure to make a good electrical contact when coated with oil or dirt.

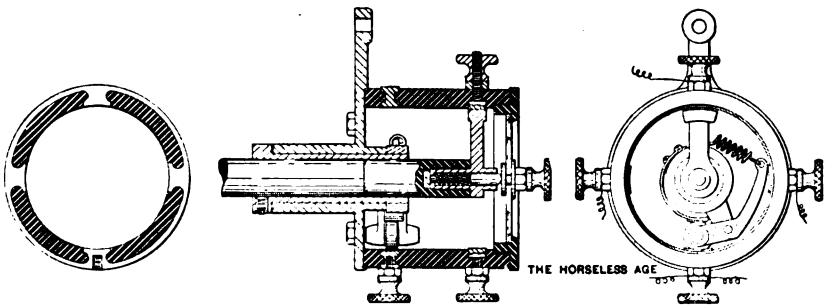
To overcome this difficulty they place a cleaning spring or scraper against the contact roller, which keeps the roller bright, slightly retarding the same, thus giving sufficient friction against the contact points to insure a perfect electrical connection between the roller and cam shaft without passing through the roller bearing and lever. The roller bearing is constructed of antifriction metal and requires no oiling. The casing is made of insulating material, and is dust proof, while the parts are accurately machined to jigs and are interchangeable.

The Hawkins Manufacturing Company have also on the market a secondary distributer in connection with their timer, which is herewith illustrated. For this they make a special insulating casing, which gives it a very neat and compact appearance. The secondary current enters the front at the centre, and is distributed to the respective spark plugs by a revolving arm, which is synchronized with the arm of the primary timer.

The firm referred to have made gasoline engines and auto parts for some years, and have assembled some complete cars to try out and experiment with their motors and parts.

New Flexible Shaft.

The Wood Speedometer Company, of Chicago, are manufacuring a chain serving as flexible driving shaft for speedometers and other devices requiring little power. The links consist of steel stampings pressed



THE HAWKINS TIMER.

into the form of tapered tubes 9-32 inch long, with holes through the wall at opposite sides 3-32 inch from the small end, and inwardly turned spikes at opposite sides on the big end, the spikes of one link passing through the holes in the wall of the neighboring link.

The Firestone Mechanically Fastened Pneumatic Tire.

Among the recent inventions in the tire world is the Firestone mechanically fastened pneumatic tire, herewith illustrated. It is built up with successive layers of strong



SECTION OF FIRESTONE PNEUMATIC TIRE.

fabric and rubber. A wire cable is inserted in each edge of the tire to hold it in an exact circle, and the several lays of fabric pass around these cables. Six noncorrosive clips are riveted to the outer edge of the tire at regular distances apart, with rivets which have large smooth heads. The felloe bolts pass through these clips, as well as through the felloe and side flanges, which is claimed to insure the utmost rigidity when the tire is in place, whether inflated or deflated.

Although the method of attachment is such as to hold the tire absolutely fast to the wheel, both tube and casing may be easily and speedily removed. To accomplish this the nuts are removed from the bolts, which permits the withdrawal of the outer flange. The case and tube may then be removed together, the whole operation requiring less than two minutes, it is

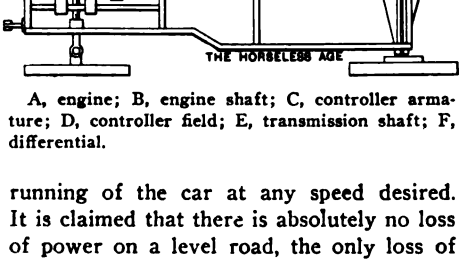


E PNEUMATIC TIRE AND RIM.

claimed. Many advantages are claimed for this tire by its manufacturers. One of the most important is the total elimination of rim cutting. The flanges are made to flare outward, and the tire, when in action, rolls on these rounded edges without the slightest injury to the casing. It is also claimed that the inner tube is never pinched, as it is in plain sight until out of danger. The tire is said to be fastened so positively that it cannot come off when in use, insuring absolute safety.

Electric Transmission for Gasoline Cars.

Our Philadelphia correspondent writes as follows: "A number of Philadelphia parties are interested in a form of vehicle propulsion which the writer understands to consist of a gasoline engine of common construction which generates electricity to run the car by means of what is called a controller. This controller is inserted in the shaft leading from the motor to the rear axle differential, as is shown in the accompanying illustration; it is claimed to be very simple in construction and impossible to burn out. Many different things of great importance are claimed for this controller, among others that of a transmission, and clutches are entirely done away with. The controller starts the engine, feeds the searchlights (front, back and inside of the car), starts and stops the car, furnishes the ignition spark for the engine, acts as a magnetic brake for stopping the car and regulates the



A, engine; B, engine shaft; C, controller armature; D, controller field; E, transmission shaft; F, differential.

running of the car at any speed desired. It is claimed that there is absolutely no loss of power on a level road, the only loss of power possible being in hill climbing under a heavy load and cannot exceed 5 per cent., while the loss of power on any automobile is from 25 to 35 per cent. under similar conditions; and in addition to the loss of power there is a great strain on all makes of automobiles in the engine, transmission and clutches, especially when running slow or in hill climbing, which causes much trouble on all modern automobiles.

"G. J. Scott, an electrical engineer of Philadelphia, who is the inventor of the controller, is said to have been working on the idea for the past ten years. It is said that a considerable sum of money has been spent in perfecting this controller by a party of Philadelphians. A company is about to be formed to build automobiles equipped with this Scott & Janney controller, at 130 Arch street, Philadelphia. Another man concerned and who has charge of f present company is William D. P of 1547 North Thirteenth stree phia. Mr. Aims is a mining en chemist."

[It appears that the idea is no than to insert an electric gene both its armature and field ro tween the engine and rear axle. a very old one, and has often bee by experimenters, but has never on the market on any scale. Th much greater than stated abo even at high speed, when the greatest, power is lost in keepin mo field excited, and in the ar low speeds the loss of power is as it is proportional to the sli stance, if the propeller shaft tu half the speed of the dynamo s cent. of the power is lost in armature. Moreover, starting th means of the controller is only storage battery is carried, which ly to the weight.—ED.]

Workingmen's Insurance ployers' Liability

The Bureau of Labor is prep port covering the various systen ingmen's insurance and employe both in this country and abroa port will cover insurance again accident, disability, old age, dea employment.

In this connection it is end secure information concerning t in the United States of what known as establishment funds— tual relief or insurance funds and maintained by the employe dustrial establishment, or relief ported either wholly or in part ployers themselves. It is desire wherever possible, copies of c rules and bylaws, blank certi and any other matter relating this character. In the absen data the name and location o ments in which such funds exist Persons possessing data of an tive to the existence of establish in this country are requested t cate with Chas. P. Neill, Com the Bureau of Labor at Wash

In the Argentine Republic t duty on motor vehicles is at 50 per cent. ad valorem. It m ble to make an arrangement w toms authorities for this amou posited and returned when leav Consul General for the Repub don cannot give definite info this point. Gasoline is obtain large towns, where many cars residents. Away from the mo centres the roads are mere and they would be almost im cars during winter, but from M March touring is feasible, thou and heat are excessive.

OMMUNICATIONS.

Braking.

OR HORSELESS AGE:

r. Fay's remarks upon the subject of minimum distance in which a car can topped by its brakes, which form a por- of his most excellent article on "Motor d" in the issue of February 7, remind of a legal incident in which this ques- arose in a rather interesting form.

gentleman was arrested in an Eastern for overspeeding and was fined in the cipal court. An appeal was taken, and e trial in the Superior Court the ar- ng officer and several others testified the car was being driven at about 30 per hour. When questioned as to distance required to stop the car the r testified that it was brought to rest feet after he gave the driver a signal lt. The driver of the car testified that mployed only the foot brake, acting the transmission, in making the stop. car in question carried almost exactly its total weight upon its rear wheels, s the roadway was fine dry macadam efficient of adhesion was taken as 0.5. writer, who was summoned as an t witness, showed in court that under conditions the distance in which the ould have been stopped, if running at iles per hour, even with the brakes d to the extent of just slipping the s, would not have been less than 120 and, conversely, that if the car was ly stopped in 30 feet, its speed at the nt of brake application could not ly have exceeded 15 miles per hour.

formula used in the above computa- and applicable to any car the weight ich is evenly divided between its front ar wheels (a condition often closely timated in practice), is very simple: e minimum distance in (F) feet in stopping can be effected, $F = \frac{M^2}{7.49}$

M is the speed in miles per hour.

jury in this case seems to have ap- ed the very contradictory nature of resting officer's testimony, as it was ard learned that they did not con- e evidence submitted sufficient proof e maximum legal speed of 20 miles ir had been exceeded.

rtheless, the verdict of the lower vas sustained, as it was held that the pon which the alleged speeding was ated was within the compact portion city, where the legal rate of speed miles per hour, and not 20 miles per s elsewhere permitted. The para- in the law defining the "compact" of the town, describes it as that along the streets of which the build- erage less than 100 feet apart for a quarter of a mile adjacent to the point in question. In this particular instance the buildings (private residences) were found to be more than 100 feet apart, on the average, if measured from centre to centre, but less than 100 feet apart if the distance between their adjacent sides was measured.

The latter construction was that which was upheld, and the fine was imposed.

There is one fact which, though implied in Mr. Fay's discussion, may warrant special comment, and that is the minimum distance in which a car can be stopped if independent of the car's weight. That is, a heavy car can be stopped just as quickly as a light one, provided its brakes are sufficient to just slide the wheels and that the weight distribution is the same in the two cases.

This is directly contrary to popular belief, but is the fact notwithstanding. The minimum distance in which a car can be brought to rest from rectilinear motion is dependent solely upon the proportion of the car's total weight which is borne by the braked wheels, its speed and the coefficient of adhesion.

In Mr. Fay's formula $\frac{W}{P}$ is simply the reciprocal of the fraction which represents the proportion of the total weight that is carried by the braked wheels.

This fraction is determined by the fore and aft position of the car's centre of gravity, and is entirely independent of the absolute weight of the car. It may be interesting to note that heavily loading the tonneau of a car diminishes rather than increases the distance in which it can be stopped when moving straight ahead, assuming the brakes sufficient to just retard the wheels to the slipping point. It does so by increasing the fraction of the total load which is borne by the braked wheels. Weight may be added or subtracted over the fore and aft centre of gravity without changing the conditions so far as braking is concerned.

Some commercial cars of the four wheel drive type have been constructed with a brake upon each wheel. If these brakes are powerful enough to produce the maximum retarding effect, such a car could be stopped in a much shorter distance than could a rear braked vehicle. As the entire car weight would be available for braking effect, the fraction $\frac{W}{P}$ would become unity and be eliminated from the formula. Such a car, traveling at M miles per hour, could be brought to rest in $\frac{M^2}{15}$ feet.

It is rather a frightful thought, but nevertheless a fact, that a racing car such as has recently attained a speed of 120 miles per hour on the Florida course, would require about 2,800 feet, or somewhat over a mile, to effect a stop, assuming that one-third of its weight rested upon the braked wheels, and that the brakes were capable of the maximum theoretical effect.

L. C.

"Laying Up" Storage Batteries.

Editor HORSELESS AGE:

The article, "Laying Up Storage Batteries," where the instructions are quoted from the pamphlet issued by the Hunt Storage Battery Company, is of little value unless the number of cells in the battery is mentioned. It undoubtedly is mentioned in the pamphlet, but the quotation gives only 45 volts. Unless we know what voltage this is per cell, the information is of no value to the layman in telling him how to lay up a storage battery.

There are three ways to lay up a storage battery. It may be laid up dry, in the acid itself or in water. If it is to be laid up dry, the enclosed instructions, taken from the instruction book of the Electric Storage Battery Company, are concise and easily understood by any garage man.

If laid up in water, the paragraph quoted in your issue of January 31 above referred to is all right, except that generally such work is done upon the battery when it is out of the carriage. Another way of putting it is, after the battery is filled with distilled water, discharge it completely at its normal discharge rate, which depends upon its size. It is usual, however, to leave the battery in water, and, in fact, necessary when the battery is made up with wood separators, as these will disintegrate if exposed to the air for any length of time. Of course, when the battery is put away in water it must be kept in a room above the freezing point.

When put away in its own acid, which is really not put away at all, but kept in commission, a battery may be kept in proper condition by occasionally discharging it, say, once in two weeks, through a rheostat, and charging it up again immediately to keep the sulphate from forming. When standing in its acid, the battery must always be kept charged. HERBERT H. RICE.

ENCLOSURE.

"Where a battery is to be out of service for several months, and it is not convenient to give it the freshening charge every two weeks, it should be taken out of commission. It should first be charged until every cell is in a state of full charge. If there are short circuited cells, they should be put in condition before the charge is commenced, so that they will receive the full benefit of the charge. Then remove the elements from the jars, separating the positive groups from the negative groups, and place in water for about one hour to remove electrolyte adhering to the plates; then withdraw the groups and allow them to drain and dry. The positives when dry are ready to be put away. If the negatives in drying become hot enough to steam, they should be again rinsed or sprinkled with clean water and then allowed to dry thoroughly. When dry the negatives should be replaced in the electrolyte (of from 1.275 to 1.300 specific gravity), care being taken to completely immerse them (two groups may be placed in a jar a

the jar filled with electrolyte), and allowed to soak for three or four hours. After rinsing and drying they are ready to be put away. The rubber separators should be rinsed off in water. Wood separators, after having been in service, will not stand much handling, and had better be thrown away. If it is thought worth while to keep them, they must be kept immersed in water or weak electrolyte, and in reassembling the electrolyte must be put into the cells immediately, as wet wood separators must not stand exposed to the air for an unnecessary moment, especially when in contact with plates.

"When putting the battery into commission it should be treated in the same manner as if it were new, and the regular instructions for assembling and putting into commission a new battery followed."

Six Cylinder Motors.

Editor HORSELESS AGE:

I would like to have some information in regard to six cylinder motors. I understand that the main advantage is that the six cylinder gives a more constant impulse, but would ask if there are no disadvantages to offset this. I am informed that the six cylinder motor is not perfectly balanced, as compared to the four cylinder. Is this correct? If so, why? T. H. H.

[The six cylinder motor has a perfect mechanical balance, and in this respect is slightly superior to the four cylinder. The four cylinder has an almost complete balance of moving parts, the motion of the two inner pistons and connecting rods being balanced by the motion of the two outer pistons and connecting rods, which move in the opposite direction. However, for any given point in the lower half revolution of the crank the piston moves slightly slower than for the corresponding point in the upper half of the revolution; in other words, the speeds of the ascending and descending pistons are never quite equal, and hence they cannot quite balance each other. The difference in the speeds is, however, very slight.

The objection to the six cylinder engine is its complication. There are six inlet valves, six exhaust valves, six igniters, etc., against only four of each with the four cylinder engine.—ED.]

Queries.

Editor HORSELESS AGE:

Will you or any of your readers kindly answer the following questions: What are the tenable objections, if any, to the use of two coils for sparking four cylinders, the same as one coil is successfully used for sparking two cylinders? What are the objections to pressure or gravity feed oilers when suitable strained oil is used? They are simple, having no extra driving mechanism, no complicated working parts, and simplicity is what we want. Is it very hurtful to the gears in a planetary transmission to use the reverse pedal for braking purposes? It is very convenient and works well. It is claimed that the mechanical inlet gives about 10 per cent. more power than the automatic, by virtue of permitting a greater volume of mixture to enter. Why not use a higher compression with the automatic and do away with all the extra parts? Why has the single tube tire, which is ordinarily easily repaired without removal from the rim, so completely fallen into disuse? They are simpler and less expensive. PACIFIC MOTOR CO.

[A single coil has been used for sparking two opposed cylinders by several well known manufacturers, but the practice has not been found entirely satisfactory and has been at least partly given up. We know of no particular theoretical objection to it, except that if the vibrator of the single coil is out of adjustment the engine will at once act very badly or stop altogether, which it would not do if two coils were used and one of the vibrators got out of adjustment. Then, too, the spark must jump two gaps in series, which requires a somewhat greater pressure and is therefore harder on the insulation. None of the theoretical objections to this system is very strong, but, as stated, its applications in practice have not proven entirely satisfactory.

The shortcoming of the pressure and gravity oiler resides in the fact that their feeding force may be insufficient in case the oil is very heavy, as in cold weather, or when the feed tubes become choked by impurities. Under all ordinary conditions these oilers are practically as efficient as the mechanical or force feed oiler, but it is, of course, very important that unlooked for contingencies in this respect be provided for, and to judge from the way the force feed oiler has been adopted this season by American manufacturers of higher priced vehicles, these contingencies do arise.

The effect of braking on the reverse gear of a planetary gear depends on the manner in which the brake band is applied. If the brake is applied suddenly it is, of course, obvious that the teeth of the pinions are greatly strained and may possibly be stripped. But if the application is effected gradually no undesirable results are likely to occur, as the wear on the teeth cannot amount to much.

In our opinion it is doubtful whether the mechanical inlet valve adds much if any to the maximum power of an engine, but it adds considerably to the power when the engine is pulled down in speed by the load, as the suction is then so small that the automatic inlet valve would close prematurely.

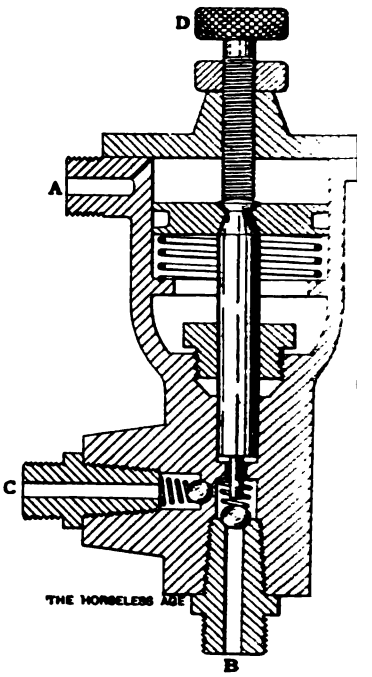
We think there is room for a difference of opinion as to the relative ease of repair of single and double tube tires. Personally we have never been able to make a lasting repair to a single tube tire, owing, undoubtedly, to want of skill, which most automobile users lack. On the other hand, any amateur capable of following printed directions can effectively repair a puncture in a double tube tire.

Any reader who may not agree wi above answers is invited to comm us his views.—ED.]

A Force Feed Oiler Suggesti

Editor HORSELESS AGE:

The accompanying sketch of a matic force feed oiler may be of i The action is as follows: A pipe fr cylinder connects at A. Supply an ery pipes connect at B and C. The is driven down at each explosion the pressure resulting therefrom a turned by spring at each suction The feed can be adjusted from no



DU MOND'S LUBRICATOR.

several drops of oil by means of the screw D, which determines the lift plunger. P. E. Du M

License Regulations.

Editor HORSELESS AGE:

Motorists hereabouts will (as the travel season approaches) want to definitely how far the laws of at leas sylvania, New Jersey, New York an England States are going to respe home licenses when traveling. G something sure and authoritative, pl J. C

[Abstracts of all the State laws force were published in our issues 17 and 24, 1905. There would be in printing the regulations now, a mobile laws are usually very uns this season of the year, and the laws may be superseded by others i States before the touring season Along in April or May, when th legislative activity abates and the again become fit for travel, we sha

er digest of automobile laws. New and all the New England States the licenses of other States. Penn-ıia and New Jersey do not.—Ed.]

Inclined Vehicle Springs.

r Horseless Age:

page 774 of your issue of January 10 show a cut of an inclined vehicle g. Would you mind telling me how steering is connected up to this wheel ow the road wheel to travel back to the steering wheel? S. F. Edge.

e do not know whether the "inventor" s spring made any special provision to ome the difficulty of variation in the ıce between the steering gear and The trouble can be eliminated, how- by running the connecting rod from ear to the steering knuckle crosswise e car frame, as is done in many Amer- runabouts. Where the steering gear behind the axle, two connecting rods ı bell crank would be necessary.—Ed.]

Suggestions Wanted.

r Horseless Age:

vish some of your readers would help ut of a trouble that is proving expen- to me. I have five inner tubes (30x that leak when in the shoe and under ure—not rapidly, but just slow leaks, ow that they cannot be found when ıbe is taken out and blown up as much will stand. Not a bubble appears, but one of the blamed five will leak gh overnight to let the rim onto the Can anyone give me a tip?

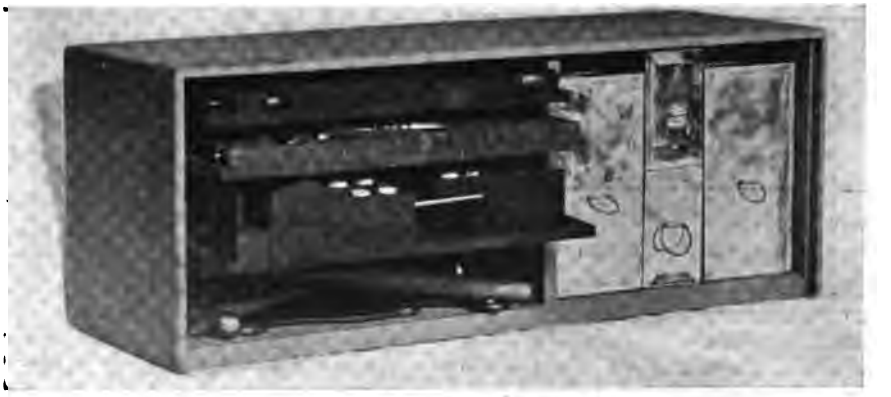
O. E. Davies.

ılicts Cessation of Automobile Importation.

ırge N. Pierce, president of the George Pierce Company, of Buffalo, who is ırning in Denver for a short time, in ıterview with a Horseless Age correı- lent said that within the next few none but American made automobiles ɔe used in this country. "We are more able to compete with foreign manu- rers," said Mr. Pierce, "and within years the importation of automobiles :ease. The main trouble in manufac- g automobiles in this country has been we could not secure steel of the de- quality. When we ordered steel from .merican manufacturer he asked how hundred thousand tons we wanted, ve were forced to admit that we didn't hundreds of thousands of tons, but say, 15 or 20 tons.

'here the foreign automobile makers had the advantage over us is in secur- ı finer quality of steel. Their steel ıfacturers went in to make a better ty of steel and did not count on quan- ıs the steel manufacturers in this coun- lo. Conditions are rapidly changing, ver, in the United States, and we will be able to secure even better steel than gn automobile makers use. Some of the large steel companies are erecting plants which turn out a special high grade steel for automobile use. They are beginning to realize that the automobile has come to stay, and will make ample provision to supply the demand for a fine quality of steel.

"The automobile has developed more during the past five years than any other manufactured article in the history of American enterprise. It is destined to be the main means of transportation in this country. Its development will continue to be marvelous. More than 95 per cent. of the commerce of the country is carried on on wheels, and it will not be long before the automobile surpasses all other methods of transportation. All the States are now making better roads, and the day is not far distant when transcontinental highways will be established and automobiles can be run from the Atlantic to the Pacific. These boulevards will make a cheap and quick means of communication between cities in all parts of the country, and will add to the popularity of the auto."

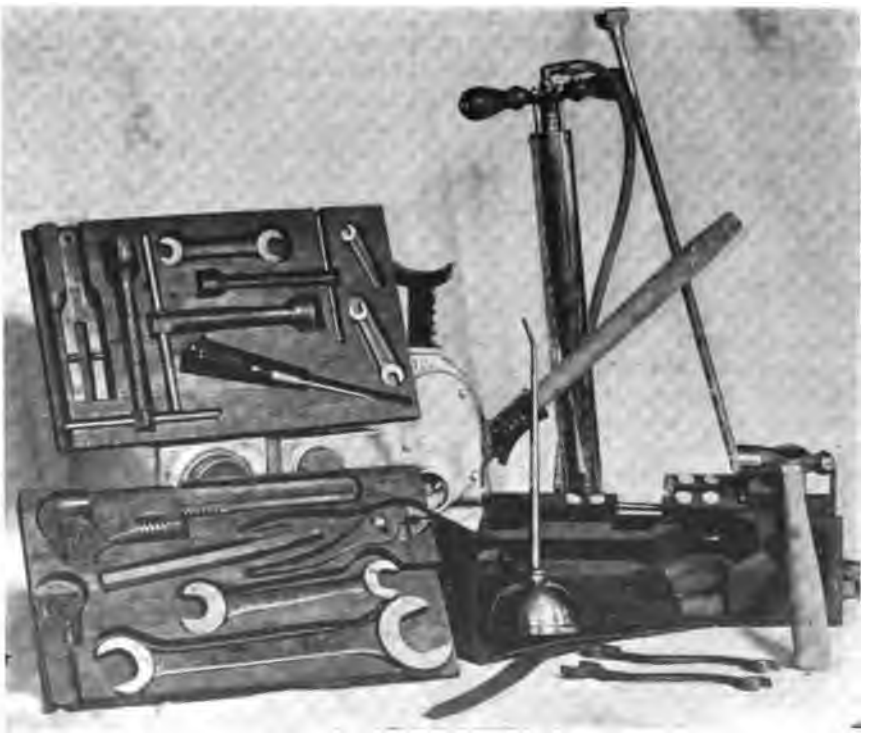


Locomobile Tool Box.

Locomobile Tool Equipment.

The two photos herewith show the case for tools and extra oils carried under the rear of the tonneau in the 1906 Locomobile. One of the photos shows the tool case as it is placed on the car, the hinged vertical cover, however, being removed to give an idea of the interior. At the left will be noticed three trays with a compartment underneath them; and at the right four oil cans, two for engine oil and transmission compound, and two others for hard grease and soft grease respectively.

In the other view the trays are shown removed to give an idea of the manner in which the wood is cut away to make place for the various tools so that each will fit its proper place. All tools are said to be of the best quality drop forged and case hardened steel. It will be noticed that the equipment includes a jack, a tire pump, ball pein hammer, etc. The long rod leaning against the pump is a tool provided to enable the owner to open the pet cocks underneath the engine base conveniently.



Drawers of Tool Box and Tools.

LEGISLATIVE and LEGAL

New Regulations Proposed for the District of Columbia.

The District Commissioners gave a hearing on February 15 to all in favor of or opposed to House of Representatives bill No. 12,310, introduced by Representative Sims, of Tennessee, a member of the House District of Columbia Committee, "to regulate the speed of automobiles in the District of Columbia and for other purposes."

When the commissioners appeared the room was full of representative automobilists of the city. Commissioner McFarland first read the proposed bill, which with few exceptions is the same as the present regulations. Speed is reduced from six to four miles an hour rounding corners. A new requirement makes an autoist slow to six miles per hour at all street crossings, but the real bone of contention is the provision for punishment in the case of a second conviction of any regulation of the bill. This is mandatory, and specifies an imprisonment of not less than ten days or more than one year.

Pursuing the usual course in hearings given by the commissioners, Commissioner McFarland asked for the advocates of the bill. No one responded, and after a dignified pause of a few minutes he asked for those opposed to the bill. W. S. Duvall, president of the Washington Automobile Club, then appeared before the commissioners and read a carefully prepared paper presenting his reasons for objecting to the bill with marked ability. So completely and logically did this paper answer his purpose, and of those assembled, that there was practically nothing left for any one else to say when he had concluded.

The paper began by assuming that the commissioners were not in favor of such a bill. The author then cited the successful operation of the present police regulations, calling attention to the fact that during the automobiling period in Washington there had been but one casualty, and that the coroner's jury in that case had completely exonerated the driver from any blame.

Mandatory imprisonment was then discussed. Attention was invited that not a State in the Union had such a law, and prediction was made that no judge in this district would send a citizen to jail because he had unwittingly broken a simple police regulation.

Commissioner McFarland here interrupted the reading to ask how many automobilists had speedometers on their cars. Mr. Duvall thought possibly 20 per cent., not over. "Then how do the others regulate their speed?" asked Mr. McFarland. "By their knowledge of speed, the same as the drivers of horses do," was the answer.

Continuing, Mr. Duvall mentioned the national effect of any bill passed by Congress would have as establishing a precedent for action in other States and cities. He impressed upon the commissioners the necessity for uniform laws throughout the land, with interchangeable courtesies. He cited the condition of affairs in Pennsylvania as an example. An autoist living in Philadelphia must leave the city with a city tag on or be fined; as soon as he is in the country he must put on the State tag and remove the city tag or be fined. A tourist running from Washington to New York must write days in advance of his contemplated trip for licenses. He leaves Washington with a District of Columbia number; later uses a Maryland. Then in Pennsylvania removes his old ones and puts on Pennsylvania. In New Jersey another; also some on his lamps. He pleaded for some reasonable regulations, some relief from the onerous ones now in force, and stated that if horses are allowed ten miles an hour, autos should be allowed twenty, as an auto can be stopped in one-half the distance a horse can, and that its stopping depends on the will of the driver, not on that of the horse.

Mr. Duvall admitted the fact that a few automobilists were reckless, and stated they should be punished. Questioned by Commissioner McFarland as to the percentage of reckless drivers in the city, Mr. Duvall thought it was less than 2 per cent. He then read a bill that he proposed as a substitute to the regulations now in force. It limits the speed of autos in certain defined business districts between 9 a. m. and 7 p. m. to twelve miles an hour, and in more congested places to ten miles per hour, and in crossing street car tracks and turning corners to six miles an hour. Outside the districts mentioned and within them between 7 p. m. and 9 a. m. the maximum speed is fixed at fifteen miles per hour, and outside the fire limits at twenty miles an hour.

Horse drawn vehicles are limited to eight miles an hour in business districts, four at crossings and corners, and to ten miles an hour outside the fire limits. A general rule is included providing that nothing in the bill shall be construed as permitting dangerous speed at any time or place, and that drivers of autos or horses or riders of bicycles shall at all times and places be governed by surrounding circumstances.

Penalties fixed for first offence not less than $1 nor more than $20; for a second conviction within six months, not less than $5 nor more than $50, with imprisonment not exceeding thirty days in addition at the discretion of the court.

Commissioner McFarland expressed himself as very well pleased with the bill proposed, and stated that the commission would give it due consideration.

R. B. Caverly, the object of Representative Sims' vicious attack in the House of Representatives on February 14, made bold to suggest that as the law now in force was the result and survival of experience, and a law that munity at large understood, why thing else? Why have laws those who reside in Washington months of the year, when the already in force were satisfactor

Hearing on Automobile Le at Boston.

BOSTON, Mass.—The first h the year on automobile legisl held at the State House, Bost the Roads and Bridges Com Monday, February 12. Two taken up—one of Representati W. Williams, of Attleboro, the placing of nails, glass and articles in public ways and p the bill to accompany the Representative Jacob H. Mo quire the use of warning or vices on automobiles and mo

The Williams bill reads as

"It shall be unlawful for a knowingly to throw or place o be thrown or placed in any public place or bridge any t wire, scrap metal, glass, cr other thing injurious to the f sons or animals, or to the tires of bicycles or other vehicles. violates the provisions of thi be subject to a fine of not less nor more than ——dollars."

This bill was the first one to up for discussion, and there w position, the only question ra "Does not the present statu malicious mischief cover to s the object of this bill?"

Among those present to s bill were Thomas W. William boro; Francis Hurtubis, Jr., the Massachusetts State Auto sociation, and Frank S. Billing horseman. Representative Wi ed that while he was a resid State of Rhode Island, and up lice board in one of the lea the need for such a bill in tha found necessary, and he was in securing its passage. It p effective when used with the mischief law, the fine being and costs. Since his residen State the need for such a bil itself, and he cited many cas had been found that persons erately thrown tacks, glass things of a similar nature int ways with the intent of injuri bile tires.

Again, there are cases wh have been thrown or droppe highways unintentionally, with no thought to do injury. Line ing glass insulators into the drunken and careless person bottles into the street, were b the most frequent causes o

:. Mr. Billings spoke of a case where was known that town officials put ards with nails in them into the high- ys to injure automobile tires and thus ce automobilists to take other routes. : said that this was also the cause of uring horses' feet. Mr. Hurtubis was favor of the bill to be used as an endment to the present malicious mis- ief law. Elliott C. Lee, president of : Massachusetts State Automobile As- iation, when asked by a representative THE HORSELESS AGE what his opinion the bill was, said: "It is a good thing, t it cannot be enforced." This ques- n, of course, is well worth consider- , but was not brought up at the meet- .

The text of the petition accompanying : bill of Jacob H. Mock is as follows: very automobile or motor cycle used operated in this Commonwealth shall equipped while in use with a gong or l which shall sound or strike at every olution of the wheels, and which shall of a pattern approved by the Massa- usetts Highway Commission. Who- r uses or operates an automobile or tor cycle which is not equipped ac- ding to the provisions of this act shall punished by a fine of not less than ; nor more than $50."

The bill of Representative Mock was y supported by himself and Senator honey, of Holyoke, and Representative ll. of Leicester. Mr. Billings and Mr. rtubis opposed it. Representative Mock imed that the present speed laws ounted to nothing for preventing acci- nts, and that a warning was what was essary. He believed that some contin- us warning should be placed upon auto- biles, as it was required that bells uld be placed upon sleighs, and that omobiles came under the same class. If ell was placed on an automobile to ring very revolution of the wheel, the faster y went the faster the bell would ring, l if his bill was passed he would be in or of allowing automobilists to drive fast as they desire.

t was also suggested that the bells be anged in chimes, and that the State ghway Commission be allowed to select ell of a tone they considered best.

he principal objections were that it uld be impracticable as well as spoil pleasure of automobilists, and that it uld become a nuisance to those living ng the highways through which auto- biles are constantly passing, and in time en people became accustomed to it no ice would be taken of the warning. Mr. ings, who is decidedly against automo- s, said that he would prefer no warning all than to have an automobile horn wn at his horses. He asked the com- tee what in its opinion would become of air of horses if an automobile, equipped h a bell ringing at every revolution of wheel, passed at a high rate of speed. was figured out that with a 32 inch wheel, going at the rate of 15 miles an hour, the number of revolutions would be a lit- tle over 150 a minute. Mr. Hurtubis said that in his judgment there was enough noise on the street at the present time with- out adding this automobile bell to drive people to the insane asylums. It has been found that the system has been tried in London, but after a short time it was dis- continued. When these bills are to be pre- sented to the House and Senate is not yet known.

To Erect Road Signs in Massachusetts.

BOSTON, Mass.—An interesting bill soon to come before the Committee on Roads and Bridges of the Massachusetts Legislature is that to accompany the petition of the legislative committee of the Massachusetts State Automobile Association, to authorize them to erect signboards and notices on State highways. The bill in full is as fol- lows:

"The Massachusetts State Automobile Association may, under the direction of the Massachusetts Highway Commission, erect signboards or notices at such points or places upon the highways of the Com- monwealth as the commission may deem proper and necessary for the safety and comfort of users of the highways and resi- dents living contiguous thereto, the cost of such signboards or notices and the expenses in connection with their erection and main- tenance to be defrayed by said Massachu- setts State Automobile Association. This act shall take effect upon its passage."

The members of this committee are as follows: Lewis R. Spear, of the Bay State A. A. (chairman); Elliott C. Lee, of the Mass. A. C.; S. L. Haynes, of the A. C. of Springfield; Dr. Brandow, of the Berkshire A. C.; W. H. Chase, of the Wachusett A. C.; J. H. Coghlin, of the Worcester A. C., and Dr. F. E. Constans, of the Brock- ton A. C. They have fully discussed the bill, and are anxious as to its outcome.

Mr. Hurtubis, counsel for the association, when interviewed, said that its object was to warn automobilists of dangerous hills, curves, etc., in the road and the location of hospitals, to thus enable the person in such a case to be careful with the use of his gong. This bill would be of great help to all parties, and there is no doubt but what it will be approved by the Legislature.

The time for the hearing has not yet been set.

Automobilists Oppose Stanley Bill.

NEW YORK CITY.—Automobilists have expressed themselves as being emphat- ically opposed to the bill introduced last week in the Legislature at Albany to create a State Motor Vehicle Commis- sion. They may form a delegation to go up to Albany and try to defeat it. The bill is known as the Stanley Bill, which repeals the present automobile law and provides for the appointment by the Governor of a commission of three mem- bers to serve without compensation, who shall supervise the operation of motor vehicles in the State. The commission shall have the services of counsel and a secretary. The main office is to be in Albany, the branch offices in New York city and Buffalo. The bill further pro- vides that all motor vehicles shall be ap- proved by the commission, and that all chauffeurs must be at least eighteen years of age and pay a license fee of $5. The commission is also to regulate the speed of motor vehicles on the highways of the State and fix a fine and term of imprisonment for violation.

FRANKFORT, Ky.—A bill has been intro- duced in the Legislature providing that au- tomobiles must come to a full stop on meeting persons riding or driving horses. Offenses will be punishable by a fine.

SOUTH BEND, Ind.—The plant of the Chas. Kaestner Manufacturing Company, manufacturers of automobiles, was bid in last week by the St. Joseph Loan and Trust Company at a receiver's sale for $16,050.

DAYTON, Ohio.—The county commis- sioners have decided to strictly enforce the law which limits the speed of automobilists outside the boundaries of the city to 20 miles an hour, with a penalty for violation of not less than $5 nor more than $50.

COLUMBUS, Ohio.—The council have adopted a resolution providing that auto- mobiles shall not travel at a greater rate of speed than 7 miles per hour on High street, the principal thoroughfare, and not more than 12 miles per hour elsewhere in the city.

CINCINNATI, Ohio.—The bill pending in the Legislature providing for the improve- ment of highways in this State will be vig- orously contested, it is said, by farmers who declare that automobilists will be the sole beneficiaries; they further state that the roads are good enough for them.

OTTAWA, Kan.—The automobile ordi- nance which has been before the House, providing that all automobiles operated within the city limits must carry a gong, bell, whistle or similar device of warning, and that at least one good light must be carried when the machines are operated after dark, was passed.

FRANKFORT, KY.—A measure has been in- troduced in the Legislature by Representa- tive Frazier, requiring motor vehicles to be registered with the county clerks, and to display the number of the vehicle in let- ters not less than 3 inches high, and to be provided with efficient brakes, a bell, horn or other signal and a light at night.

COLUMBUS, Ohio.—In a resolution which was adopted by the council last week, Mayor Badger is asked to enforce the ordi- nances regulating the speed of atuomobiles, street cars, bicycles and vehicles of all kinds. Automobiles and other vehicles may not run in the downtown districts at a speed greater than 7 miles an hour, and in oth-

sections of the city not greater than 12 miles an hour. All these ordinances, according to the resolution, are being violated, and for the safety of pedestrians should be enforced.

ALBANY, N. Y.—Another automobile bill was introduced in the Assembly on February 15 by Robert J. Cox, of Erie. It provides that when an automobilist has been arrested for violation of the law he may give security for his appearance in the form of a bond issued by a surety company. The present law provides that he may either give cash bail or leave his vehicle as security.

BOSTON, Mass.—A petition of Frank S. Billings for legislation to prevent overspeeding and dangerous use of automobiles is accompanied by a bill specifying that automobiles must be so geared or arranged as to be incapable of exceeding the maximum legal speed limit, and that speed excesses are to be punished by suspension of the driver's license for one year in the first case, and a definite suspension in case of a second offense.

ANNAPOLIS, Md.—A bill has been introduced in the House which transfers the custody of the registration lists and places the collection of the fees in the hands of the Comptroller, instead of the Secretary of State. Owners are required to pay a $1 fee each year, instead of only once, and half the fines imposed are to go to the informer. The speed provision is changed to permit automobiles to travel at the rate of 20 miles an hour in the open country.

HARTFORD, Conn.—The matter of regulating by ordinance the storage of gasoline in garages and similar places has been freely discussed in the city council of late. Hearings have been given to the fire department, insurance companies and garage owners. The mayor has been authorized to draft an ordinance, and submit it to the corporation counsel. It will include a provision for the appointment of an inspector of oils under the State law.

ROCHESTER, N. Y.—Municipal Court Judge Hebbard has entered judgment for the plaintiff for $150 and costs in the case of H. D. W. Mackaye vs. Thomas J. Northway. It was alleged in the complaint that Mackaye purchased an electric car from the defendant for $200, and received a warranty of its condition. The vehicle appears to have been in such poor order that the expenditure of some $50 was necessary for repairs before it would run satisfactorily.

WHEELING, W. Va.—The new regulations provide that no automobile shall be run on any public street or highway within the city limits at a speed exceeding 10 miles per hour. In passing or approaching a horse drawn vehicle precaution must be taken to avoid frightening the horse. Upon approaching crossing or intersecting streets, the vehicle must be under control and the speed reduced. Every machine must be equipped with a horn or bell which must always be sounded before turning a corner. The number of every automobile must be registered with the license clerk, and plates with registry number must be carried at all times. For violation of the ordinance the penalty shall be a fine not exceeding $100, or imprisonment for a time not to exceed fifteen days, or both.

HARRISON, N. J.—The town council recently passed a resolution which provides that no automobile shall be driven through the streets at a higher rate of speed than 8 miles an hour, that large signs shall be erected at both ends of Harrison avenue warning automobilists of this fact, and that in cases of arrest for violation of this rule a heavy fine shall be imposed, and that half of the fine shall be paid to the person causing the arrest.

The Detroit Show.

The local show at the Light Guard Armory in Detroit, which is the fifth annual show held in that city, opened on Monday night, February 12, at 7.30 o'clock. The attendance on the opening night was very good. The local trade was fully represented, and as in former years the space available for automobile exhibition was crowded with exhibits. Some of the exhibitors were tardy and the last exhibits were put into place only on Tuesday. The weather was bad the early part of the week, but this did not seem to affect the attendance in the evenings much. Following is a list of the exhibitors:

Soules Motor Company, Northern Manufacturing Company, Reo Motor Car Company, Jackson Automobile Company, Cadillac Motor Car Company, Detroit Automobile Manufacturing Company, White Sewing Machine Company, J. P. Schneider, Welch Motor Car Company, Packard Motor Company, Pungs-Finch Gas Engine Company, Rapid Motor Vehicle Company, Buick Motor Company, C. H. Blomstrom Motor Company, Olds Motor Works, Detroit Automobile Company, Thomas B. Jeffery & Co., J. Miller, Ford Motor Company, Wayne Automobile Company, Maxwell-Briscoe Motor Company, Aerocar Company, Motor Car Company, Reliance Motor Company, Walker Motor Car Company, THE HORSELESS AGE, Hayes Manufacturing Company, Detroit Steel Products Company, Herz & Co., Auto Accessories Company, Gray & Davis, Edwin S. George, Schug Electric Company, Michigan Storage Battery Company, Monnier Auto and Cycle Supply Company, Michigan Steel Boat Company, Firestone Tire and Rubber Company, Edmund-Jones, MacDonald, Wessels & Ames, Auto Equipment Company, C. Splitdorf, Auto Brass and Aluminum Company, Briscoe Manufacturing Company, Hyatt Roller Bearing Company, Peerless Switch Company, Standard Oil Company, Jones Speedometer Company, W. Leeler Manufacturing Company, Hydraulic Storage Company, W. Cramp & Sons Ship and Engine Bu... Company, American Lamp Com... Hicks Auto Company.

A. M. M. A. to Hold Outdoor Sh...

The annual meeting of the Ame... Motor Car Manufacturers' Association w... held on February 9 at the New Sou... Hotel, Chicago, with a very full attend... of the membership.

The association has decided to incr... the number of its committee of man... ment from five to nine members. The ... lowing nine gentlemen were elected: Be... Briscoe (Maxwell-Briscoe Motor Co... pany), James Couzens (Ford Motor Co... pany), J. B. Bartholomew (Bartholom... Company), A. C. Newby (National M... Vehicle Company), Wm. Mitchell Le... (Mitchell Motor Car Company), Cha... Duryea (Duryea Power Company), C... Lewis, Walter Marmon (Nordyke-M... mon Company), W. H. Van Dervoort (... line Automobile Company).

The association also voted unanimo... to hold an outdoor show in either ... months of September or October, invi... the trade at large to join them. The ... sociation will become responsible for ... management of the show. The gen... manager was instructed to investigate ... mediately and make a recommendation ... the location of the show at the earliest p... sible date. The association desires by ... course to lengthen the manufacturing s... son for the manufacturers, and thus ... a reduction in the cost of their produ... Offers of locations for the exhibit are s... to be already coming in from various cit...

The Crawford Automobile Company, ... Hagerstown, Md., and the Dorris Mo... Car Company, of St. Louis, have rece... been elected members of the association.

Trade Literature Received.

Rollins Manufacturing Company, Bost... Mass.—Pamphlet showing several views ... the Hoffecker speed and mile register.

Jackson Automobile Company, Jackso... Mich.—"No Sand Too Deep, No Hill To... Steep" is the title of a booklet on the Jack... son car.

Light Manufacturing and Foundry Company, Pottstown, Pa.—Booklet de... voted to their aluminum, manganese and phosphor bronze castings.

Salisbury Tire Company, Owosso, Mich. —Illustrated circular of the Salisbury steel studded pneumatic tire as applied to clincher and Dunlop rims.

The Winkley Company, 226 Abbott Street, Detroit, Mich.—Circular showing the Eureka separator and various forms of the Garllus automatic carburetor.

Firestone Tire and Rubber Company, Akron, Ohio.—Illustrated booklet showing and explaining the construction of and method of applying their new mechanically fastened pneumatic tire.

Club Notes

ıb Activity to Kill Anti-Automobile Bills.

\ great deal has been done in the ırse of the past few weeks by various bs in New Jersey to have several soled anti-automobile bills killed, espelly the Frelinghuysen and Jackson ɛasures. To this end the Associated ıtomobile Clubs of New Jersey have nt circular letters to each of their memrs telling why the bills should be killed d stating that each member's assistce is needed. The club further reıested all those who possibly could to tend the hearing at Trenton on Febary 20. The Atlantic City Automobile lub sent a committee of members to the ɛaring, of which Harry Leeds, president the city council is chairman, to oppose ıe Frelinghuysen bill. The Plainfield u tomobile Association was represented the hearing on the bills by Senator has. A. Reed.

ınnual Banquet of Syracuse Club.

The Automobile Club of Syracuse held its ɔurth annual banquet at the Yates Hotel ast Wednesday night, 125 members and uests being present. The banqueters took heir seats while the orchestra played "Auomobile Club of Syracuse," a march comɔosed by Theodore E. Young, one of the nembers of the club. The speaker of the evening was Charles S. Terry, of New York. Mr. Terry's subject was "The Automobile and the Farmer." He said that when a farmer became so conservative as to want to block the wheels of progress it was time to fight. "I wish," said the speaker, "that I could induce every automobile club to take upon itself the duty of looking after members who drive faster than the law allows and to prosecute if necessary. In this way we could establish a clearing house for complaints and could soon show the people that we did not approve of violating the law. In this way, when we went to Albany to ask for any legislation or the appeal of any legislation, we could say that we were doing all we could to see that the law is lived up to."

Mayor Alan C. Fobes said he had become a member of the automobile club. Although he did not own a machine personally, the city owned a police patrol and a runabout, and it kept him busy looking after them. The mayor said that the Franklin Automobile Company was the largest single industry in the city of Syracuse, employing 1,400 skilled mechanics and having a weekly payroll of $16,000. He said the company had done a great deal for the city and should be loyally supported.

Robert E. Gilman, chairman of the good roads committee of the board of supervisors, said there was no possibility of passing the "fool legislation" now before the New York State Legislature at Albany. He said it was ridiculous to think of taxing automobiles which were makers of and not destroyers of good roads. Other speakers were Police Justice Benjamin J. Shove, W. K. Wickes, George W. Driscoll and C. Arthur Benjamin.

CATTARAUGUS COUNTY (N. Y.) A. C.

The club held a good roads meeting at Olean on February 16, and also discussed a banquet which will be held early in March.

A. C. OF AMERICA.

John Brisbane Walker delivered an address before the club on the evening of February 20 on the "Proposed Highway Between New York and Philadelphia."

ALBANY A. C.

The club will hold its first annual dinner at the new Kenmore Hotel on the evening of February 24. Chas. E. Duryea will deliver an illustrated lecture on "The Past, Present and Future of the Automobile."

A. C. OF PHILADELPHIA.

The club has sent out invitations to meet at the clubrooms during Show Week for the purpose of forming a State organization and using this means for bringing all those interested in the project together. If the association is formed it will probably become a member of the American Automobile Association, the national association of automobile clubs.

PLAINFIELD (N. J.) A. A.

The association has been formed to foster and protect the interest of automobiling and to prevent arbitrary legislation. A meeting was held on the night of February 13, and the following officers were elected: Dr. F. C. Ard, president; Dr. J. P. Zeglio, first vice president; J. P. Stevens, second vice president; Allen B. Lang, secretary, and George J. Tobin, treasurer.

ERIE M. C.

A number of motorists recently met at the Reed House, Erie, Pa., and formed the Erie Motor Club. The business of the organization will be transacted by six governors, who will be chosen at the annual meeting. Two governors will be chosen every year to serve three years, and may elect the president and vice president from their number and select the secretary and treasurer from the club. The first governors of the club are Dr. E. F. Gifford, H. M. Fleming, Davenport Galbraith, W. O. Davis, Fred Densmore and F. H. Payne. The governors elected the following officers: Davenport Galbraith, president; F. H. Payne, vice president; W. O. Davis, secretary, and H. M. Fleming, treasurer.

New Incorporations.

York Motor Car Company, York, Pa.—Capital, $100,000.

The Nielsen Motor Company, Detroit, Mich. — To manufacture automobiles. Capital, $150,000.

F. A. Weaser Company, Chicago, Ill.—Capital, $10,000. Incorporators, Frank A. Weaser, F. S. Scott and G. A. Major.

York County Garage, Sandford, Me.—To deal in automobiles. Capital, $10,000. President and treasurer, C. S. Holmes.

George J. Scott Motor Company, New York City.—Capital, $25,000. Directors, J. G. Scott, Madeline Scott and Jacob Michaels.

The National Auto Company, Los Angeles, Cal.—Capital, $25,000. Directors, Geo. F. Cope, L. H. Johnson and Wm. Van Shoock.

American Gasoline Motor Company, Baldwinsville, N. Y.—Directors, J. B. Sweet, Howard Hendrickson and W. A. Hendrickson.

New Century Auto Company, New York City.—To conduct a garage. Capital, $1,000. Incorporators, Wm. B. Franke, David Lamb and Frederick L. Kelley, Jr.

The Power Wagon Publishing Company, Cleveland, Ohio.—To publish weekly a self propelled commercial vehicle paper. Capital, $10,000. President and editor, Walter Wardrop.

The Cleveland Auto Top and Trimming Company, Cleveland, Ohio.—Capital, $5,000. Incorporators, A. M. Snyder, A. A. McCaslin, G. D. McGwinn, A. E. Clevinger and E. G. Derr.

Montclair Auto Station Company, Montclair, N. J.—To manufacture motors, engines, machinery, etc. Capital, $50,000. Incorporators, John W. Surburg, Wm. H. Benjamin and Roy Jenkins.

The Rossell Company of America, New York City.—To manufacture engines, motors, etc. Capital, $100,000. Incorporators, Eugene N. Robinson, Manuel De Casert and Chas. M. Eaton.

The Downtown Garage and Automobile Repair Company, New York City.—To manufacture automobiles and parts. Capital, $5,000. Incorporators, E. R. Geddes, F. M. Raynor and A. Collins.

The Constantine Storage Battery Company, New York City.—To make storage batteries and ignition apparatus. Capital, $8,000. Incorporators, E. B. Constantine, W. Hunet Smith and John A. McEwan.

The list has closed with three challenges for the International Motor Cycle Cup, held by Austria. There will accordingly be four nations represented in the next contest, viz., Austria (holders), England, France and Germany. The event will take place in South Bohemia on June 29. The Austrian eliminating trial will be held over the same course on June 3, and the English trials probably during May, in the Isle of Man.

MINOR MENTION

The Swinehart Clincher Tire and Rubber Company have removed their New York office to 1843 Broadway.

It is reported that George F. Krieger, of Grand Rapids, Wis., will engage in the manufacture of automobile engines.

The F. W. Spacke Machine Company, of Indianapolis, are erecting a two story addition to their plant, 65x150 feet.

A plant for the manufacture of automobiles is to be established at Akron, Ohio, by H. A. Williams and others.

The Baker Motor Vehicle Company, of Cleveland, Ohio, have moved into their newly constructed plant at the foot of Seward street.

The Garford Automobile Company are considering the removal of their Cleveland factory to Elyria, Ohio, thus enlarging their plant at the latter city.

Mr. Van Slark is now general manager of the Illinois Parts Manufacturing Company, Peoria, Ill., J. A. Holsman having resigned both as manager and president.

Patent rights and title to the Culver automobile were recently purchased by Thos. G. Sager, John Hadsall, Thornton J. Hoover and P. W. Stephens, of Genoa, Ill.

The magneto heretofore made by the Ruprecht Igniter and Electric Company will in the future be manufactured and sold by the Williams Telephone and Supply Company, of Cleveland, Ohio.

The Board of Trade of Newark, Ohio, is said to have made a propostion to the Oscar Lear Automobile Company to have them remove their plant from Columbus, where they are now located.

An abrasive powder intended for use in grinding valves has just been put upon the market by the Essex Manufacturing and Supply Company, of Newark, N. J., under the trade name "Rapidcut."

The Firemen's Fund Insurance Company have organized a department for the insurance of automobiles by their owners. The insurance is computed in accordance with the value of the car.

The Palmer Automobile Manufacturing Company, of Ashtabula, Ohio, have recently elected the following officers: H. P. Palmer, president; R. Conrad, vice president; A. P. Fisk, treasurer, and G. Cathart, secretary.

Daniel Haverstick, of the Capitol City Auto Company, Trenton, N. J., has invented a metal rack which fastens to the steering wheel to hold road maps printed on cards in such a position that they are always in range of the driver's eye.

We learn that the W. S. Shuler Spring Company, of Amsterdam, N. Y., are [illegible]t to introduce their special patented [illegible]s, which have so far been used mainly for buggies, surreys, buckboards and slat bottom road wagons, for automobile use.

A number of Cleveland and Akron, Ohio, capitalists met at Akron on February 9 and formed a company with $600,000 capital for the manufacture of automobiles both for pleasure and commercial uses. No location has yet been decided upon.

The Automobile Equipment Company, of Detroit, have increased their capital from $30,000 to $50,000, and have elected the following officers: P. E. Hawley, president; Sherman L. De Pew, vice president; George Hawley, secretary, and R. S. Hawley, treasurer.

A committee representing the New Jersey Automobile and Motor Club presented, on February 15, to the Hudson County Board of Freeholders a resolution requesting the widening of the Newark plank road to 125 feet. The board will probably act upon this matter at their next meeting.

Laverne W. Noyes, Chicago, Ill., is about to erect a seven story apartment house, a feature of which will be a room on each floor large enough to accommodate three or four automobiles and to lodge the chauffeur. There will be an elevator in the building large enough to accommodate the biggest machine.

The professional chauffeurs of Providence, R. I., have formed an association for social purposes and mutual protection, which will be known as the Rhode Island Professional Chauffeurs' Association. The following officers have been elected: President, Edward Shay; vice president, Alfred Moille; secretary, Frank Weeden; treasurer, Geo. Champlin.

A company has been organized at New Orleans, La., under the name of the Dixie Motor and Boat Company, in which the following are interested: Isidor Newman, L. H. Fairchild, T. W. Castleman, Albert Godchaux, W. C. Faust, Ferdinand Gombel and others. The company will manufacture automobiles and motor boats, together with engines and their appurtenances.

Automobilists of Camden, N. J., have formed an organization known as the Camden Automobile Association, the objects of which are to promote sociability and to seek the general improvement of the roads in South Jersey. The officers are: S. W. Sparks, president; Geo. E. Rhedemeyer, vice president; H. G. Hollinger, secretary, and John T. Dorrance, treasurer.

Signor Zust, an Italian automobile manufacturer, is at present in New York, among his other objects being to create interest in the touring contest to be held under the auspices of the Automobile Club of Milan from May 15 to 25. There will be three classes of competitors—heavyweight, middleweight and lightweight. It will be purely an endurance contest, a certain distance to be covered each day, with disqualifications ties for stopping engine and for low the speed limit.

Agency and Garage N

E. C. Stevens & Co. are opening a garage at Pittsburg

Miller & Davis, of Pomona act as Rambler agents during season.

The Cleveland branch of th Rubber Company will remove 1 to 1514 Euclid avenue.

The Ford car will be handle bury, Conn., during 1906 b Hughes, of 130 Bank street.

D. G. Pfoutz, of Bloomsbur convert his coach and carria Second street into a garage.

The American Motor Car C Boston, have acquired the Ne agency for the American car.

C. W. Spencer has becom manager of the Pope Ma Company's New York branch

The Ford car will be rep Indianapolis during 1906 by Short Cycle and Auto Compa

Frank C. Blomberg & Co phis, Tenn., have erected a n bile garage at 346 Madison st

George E. Bates, formerly Brothers, of Syracuse, N. Y., season as agent for the Frank

On April 1 Curtiss & To Ansonia, Conn., will open a pair station on Seymour avenu

The Electric Garage, 271 avenue, Chicago, is now the pot for the National Battery of Buffalo.

The Churcher Electric an turing Company, of Cincin have opened a garage at 132 where they will represent P ley electric vehicles and act a the Exide vehicle batteries.

George Lamberty and J. have severed their connectio New York Motor Car Compa York City, to become the so New England for Leon Rub accessories and Michelin t will have headquarters in Bo

The 1906 Chicago agency rion car has been secured by Banker Company, the Philad cy by Thos. W. Twining, agency by the Poppenberg Company, the Los Angeles the Southern California Moto and the Denver agency by A.

W. D. Strong & Co., forme Euclid avenue, Cleveland, ha rated under the name of the W Company, with a capital of $ new company will open a s 1256 Euclid avenue, where th dle a line of automobile They will use their old quart pair shop.

...THE...

Horseless Age

VOLUME 17 FEBRUARY 28, 1906 NUMBER 9

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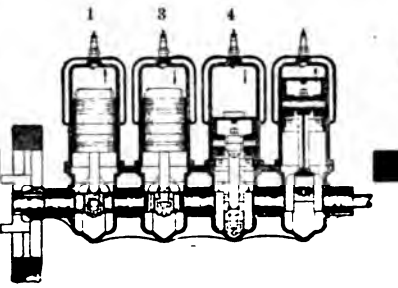
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Look at Cylinder No. 1. The force of the explosion is acting on it at the same time that an explosion takes place in No. 2. No. 3 will come into action when No. 2 is half way through, and before the force of No. 3 is exhausted No. 4 will come into action.

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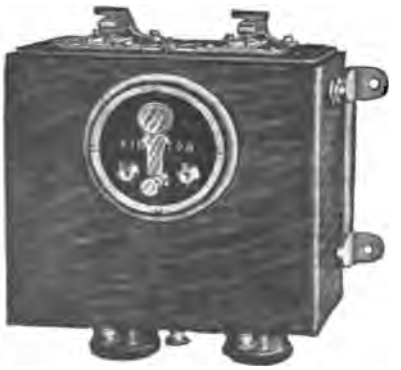
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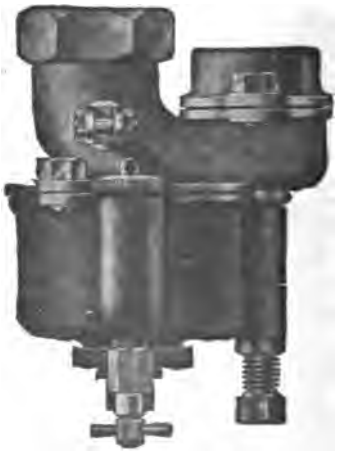
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Automobile for Use on the Farm.

By J. C. Cunningham.

the traction engine and automobile are y being perfected and made use of, the r car enthusiasts, of course, prophesy iorseless farming is at hand. In fact, publications go so far as to say that orse will soon be a thing of the past, only as pets and used for pleasure.

ng a farmer, and also a pioneer in the iobile world, I feel able to throw some on the subject. To commence with, I say that automobiles and traction en- are going to supplant the horse to a extent in the very early future. So s taking the place of the horse entirely, is doubtful, especially on garden truck s, vineyards and orchards. It is doubt- f a piece of machinery will ever be ted to step over plants, squeeze be- vines and dodge under limbs. This t not be impossible, though, for special inery could be built for the purpose; the gardens and orchards laid out and ed so as to allow their use. We need ook for these changes for some time However, I believe that it will only be v years until there will be a combina- motor built for the farmer's use that e used for a road wagon, even a fam- arriage and a light tractor. All that be necessary will be an extra set of ls and body for tractor purposes. The e change could be made in the same that a farmer would take to curry his , harness and hitch them up.

ch a machine is not yet built and none e manufacturers are considering them. : of the manufacturers, especially the · ones, have about all they can do to ly the demand for the style of machines are already building. Until the de- d for such a car is supplied, which lly goes to people of means, we need look for anything built purposely for armer's use. Yet it must not be under- l that the automobile of today is of no :o the agriculturist. Though they are what they should be and may still be nsive, the busy farmer, particularly on arge farms, will find them, after trial, st indispensable.

hen the farmer decides to make use of utomobile he must first take into con- ation that it is not a perfect machine. es not seem to possess even the reliable ties of the traction engines now on the et. Perhaps the cause of this is that perators running the big tractors are ugh mechanics, having served time at trade. Still, there are some very reli- motor cars on the market at a reason- price.

hen a farmer has the means, an auto- le, even as it is now, will afford and his family much pleasure and e him a great deal of satisfaction in y ways. I claim that he has the advan- over his city brothers or the profes- l men in handling them. He is accus- d to tools and machinery and sooner acquires a knowledge of them. In nearly all cases he can do his own repairing, which is a great saving. Any man not insane can learn to operate an automobile, and the farmer quickest of all.

As to what make or system is the most reliable, I will say that all systems are about the same. The controversy that once raged concerning the comparative merits of electricity, steam and the internal combustion engine for the propelling power of automobiles has been settled by the general recognition that each type possesses a distinct field of usefulness.

The objection to electric cars just at present is the difficulty in finding facilities for charging the batteries, this being not always possible in small towns and cities; also the time it requires for recharging and the small radius of miles they make on one charge. Their points of superiority are that they require very little oil, no fuel for fire, no water to cool and no cranking.

The steam car is a great favorite of the few farmers owning automobiles. They not only have all the silent features of the electric, but have a greater mileage, with the advantage of being able to procure fuel and water at every cross road store. The fact that steam is widely known and easily understood makes it less difficult to effect a roadside repair than with gasoline or electricity. On account of farmers having much use of horses a quiet machine appeals to them. However, it cannot be said that all gasoline cars are noisy, as many of them are as quiet as the steamers. They also have the advantage of a greater mileage, using less fuel and, when in order, are ready to start at a minute's notice. There seems to be but little difference in economy between large steam and gasoline cars. Both advocates favor their own system in this respect. The small cars are much more economical in "up-keep" than the larger ones.

The cars such as the farmers mostly demand sell for about $1,000 and less. Most any of them can carry five people with ease anywhere they desire to go. They may not be as fast as the larger and more expensive ones, but they will take you over the roads as fast as it is comfortable to ride.

The expense of keeping a car depends on the handling and the care taken of it. If a person is a careful driver and gives care to adjusting, there will be but little expense from broken parts. About 15 miles to a gallon of gasoline is a good fair average the year round. This commodity varies in price throughout the country, from 15 to 30 cents a gallon. The oil expense for such a machine is trifling, much depending on the way it is used. The greatest cost to reckon on is that of tires.

On a farm where several horses are used and two are set apart for driving or pleasure, an automobile could be kept just as cheap, giving all the satisfaction of the team and more pleasure. Such a change would depend on the condition of the roads and the amount of snow falling. Where there is much snow the auto is not a success; neither is it a success in heavy drift sand. Bad roads in a very hilly country are not favorable to one, yet where the roads are good they will do all and more than the horse.

As I have said before, the motor car is not perfect, but it is capable of great achievements when properly handled. Five cars have crossed the continent on their own power. One accomplished this wonderful feat in a little over thirty days' running time, and only one time were horses used to assist it.

I have used automobiles for six years. That is not very long in considering anything else but the auto. When I began using them motor cars were a novelty. With my first car I was towed nearly as many miles as it carried me. It was not altogether the fault of the car, but lack of knowledge on my part.

A car that ran 100 miles in 1901 without a stop was a wonder. The few automobile papers of the time devoted columns of reading matter to it. Now 1,000 miles without a stop is nothing out of the ordinary. A farmer uses his mower or reaper a few weeks each year and spends a few dollars every season for repairs and parts. He also adjusts some part of the machine very often several times a day while using. The mower has been used nearly half a century now, and still these adjustments are found necessary, and there is nothing heard about the mower's not being a success. The locomotive runs a few hundred miles and goes into a roundhouse for repairs, sometimes lasting several days. There is nothing said about its not being practical. But let the user of an automobile have a few stops on an all-day's trip and he condemns the machine as not a success. He is usually a person, too, who knows nothing about mechanics. Let the intelligent farmer take any of the old standard makes of automobiles and learn to understand them as well as he does his mowers, reapers, threshers, harvesters or engines, and it will give just as reliable service as any of his machinery. We have had the mower and locomotive with us for years, and they still have their little troubles; so it is with the motor car. Do not expect any more of it than other machines. There is no piece of machinery but needs care and constant adjustment of parts, and just because you are ignorant of how it is done do not condemn the system or the machine.

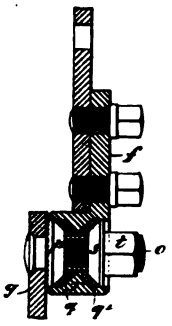
Motor cars are successfully used interchangeably as business and pleasure vehicles on English estates. A somewhat low geared touring car is usually chosen, which, when fitted with the ordinary touring body, serves perfectly for inspection purposes or pleasure trips, while, with the tonneau removed and a luggage tray fitted instead, it is very useful for hauling baggage and goods from and to the station. On some English estates horses have been entirely dispensed with, and an appreciable econ· has been effected.

The Patent Situation Concerning Frictional Spring Retarding Devices.

By F. W. Barker.

[In view of the fact that suit has been brought by the Hartford Suspension Company against the Diezemann Shock Absorber Company and the American Shock Absorber Company for alleged infringement of complainants' patents, we believe that the review of the patent situation herewith will be found of interest.—Ed.]

The Hartford Suspension Company control patents Nos. 695,508, 12,399 (reissue)



No. 695,508.

and 803,590. The Truffault patent No. 695,508 was issued March 18, 1902, on an application filed September 4, 1900. The broadest claim follows:

"1. In a vehicle, the combination with a supporting spring between the parts of the vehicle movable relatively to each other, of non-pneumatic frictional means between the parts which provides a yielding resistance to movement, said means producing a retarding effect on the reaction of the spring."

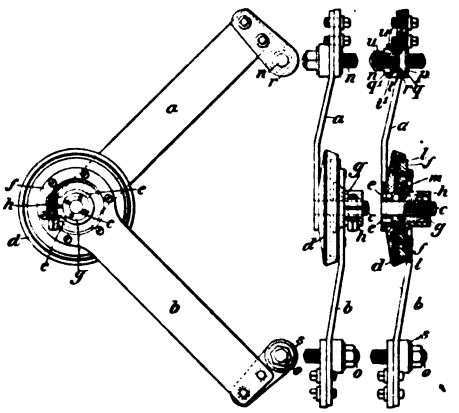
The device is illustrated in the patent as applied to a motor tricycle, a tubular attachment to the steering post containing a coiled spring, supporting the tricycle frame upon the front fork. The cut represents the friction device having arm *f* extending from the fork and arm *g*, which is connected to the wheel support. The eye *r* at the end of arm *f* has two conical seats, provided with leather washers *q* and *q'*. The bolt *o*, which is fixed at its head in arm *g*, has a conical part *p*, fitting in washer *q*, and a splined conical member *s* fitting in washer *q'*. The nut *t* tightens these members and creates the desired degree of friction between the cones *p*, *s* and leather washers *q*. *q'*.

Truffault reissue patent No. 12,399 of November 7, 1905, was applied for January 10, 1905, the patentees surrendering their original patent No. 743,995 of November 10, 1903, on the ground that the invention had not been therein so broadly covered as was warranted.

This patent shows the bolt *c* on which is mounted socket *d*, having arm *a*; a disc *f* fitting in the socket, and having an arm *b*. Said arms *a* and *b* connect, respectively, with the chassis and axle. A leather washer *l* is placed between socket *d* and disc *f*, and another washer *m* between disc *f* and nut *g*. The nut *g* is split and is secured by screw collar *h*. Following are the six claims of this patent:

"1. An anti-vibration device comprising a friction disc having a peripheral flange and a flat interior surface, an arm rigidly attached to said disc and means on said arm for securing it to the frame of a vehicle, a second friction disc concentric with said first disc, an arm rigidly attached to said last mentioned disc and means on said arm for securing it to the running gear of a vehicle, a washer seated within the recess formed by said flange and between the faces of said discs, a bolt rigidly attached to one of said discs and passing freely through an aperture in the other disc and means on said bolt for adjusting the discs relatively to each other, substantially as described.

"2. An anti-vibration device comprising a friction disc having a peripheral flange and a flat interior surface, an arm rigidly attached to said disc and means on said arm for pivotally securing it to the frame of a vehicle, a second friction disc seated within said flange, an arm rigidly attached to said last mentioned disc and means on said arm for pivotally securing it to the running gear of a vehicle, a washer seated within the

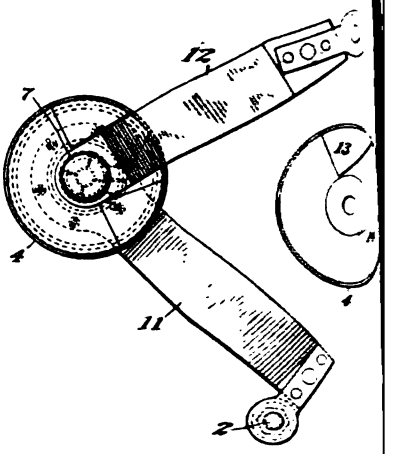


No. 12,399.

recess formed by said flange and between the faces of said discs, a bolt rigidly attached to one of said discs and passing freely through an aperture in the other disc, a nut on said bolt to regulate the friction and means to lock the said nut in position substantially as described.

"3. An anti-vibration device comprising a pair of friction discs having parallel friction faces, an arm rigidly connected at one end to each of said discs, means upon the opposite end of one arm whereby the same may be pivotally secured to the frame of a vehicle and means upon the opposite end of the other arm whereby the same may be pivotally secured to the running gear of a vehicle, the friction faces of said discs being in a vertical plane parallel to a line drawn between the pivotal supporting means of said two arms, a washer between said friction faces, and means for adjusting said friction faces toward and from each other substantially as described.

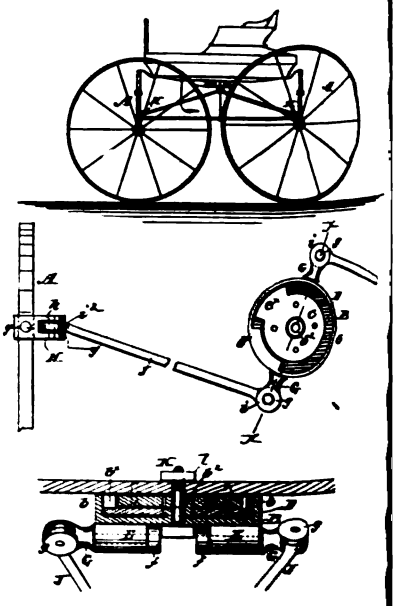
"4. An anti-vibration device comprising a



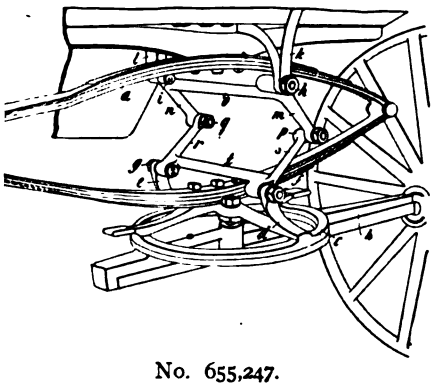
No. 803,589.

pair of friction discs having parallel [illegible] faces, a peripheral flange upon one [illegible] discs, which receives and partially [illegible] the other disc, an arm rigidly connected one end to each of said discs, means the opposite end of one arm where same may be pivotally secured to the [illegible] of a vehicle and means upon the opposite end of the other arm whereby the same be pivotally secured to the running gear vehicle, the friction faces of said discs in a vertical plane parallel to a line between the pivotal supporting means said two arms, a washer between said tion faces, and means for adjusting friction faces toward and from each consisting of a bolt affixed to one disc passing through an aperture in the disc, a nut on said bolt and a lock for nut substantially as described.

"5. An improved anti-vibration device vehicles of all kinds, as hereinbefore scribed, in which every folding joint prises two arms hinged together, one ing a socket or flanged disc and the a plate in frictional contact with the inserted within the socket and with a washer pressed against the plate by



No. 242,983.



No. 655,247.

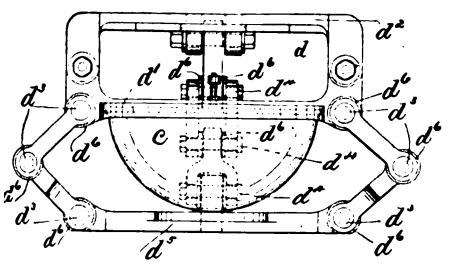
a nut screwed on a stud, substantially as cribed.

6. An improved anti-vibration device for icles of all kinds, as hereinbefore described, in which the arms of every folding nt are frictionally mounted on the one nd upon a stud secured upon the axle and the other hand upon a stud secured upon frame, each of these studs presenting o conical parts abutting against conical ther lined surfaces presented by pivots ounted at the end of each of the arms of folding joint, substantially as described."

Hartford patent No. 803,589 of November 1905, filed October 1, 1904, relates to a vice corresponding to the foregoing, except for the clearance in socket 4, this being enable the arms 11 and 12 to have a nited amount of free movement before exercising a retarding influence on the vehicle prings. The lugs in socket 4 limit this ee movement.

Before Truffault's invention comparatively little had been done by inventors roughout the world to retard the action of ehicle springs by the use of friction devices. The earliest patent of record bearing any resemblance thereto is Reinwald, No. 242,983, of June 14, 1881. It shows the arms J J, pivotally connecting with the springs A A and a socket B, a smaller disc C screwed to the bottom of the vehicle and fitting within said socket, and a bolt b^3 pivotally securing the socket to the bottom of the vehicle. The lug c^x on disc C limits the movement of socket B by abutment b^x. A leather washer D lies between discs B and C.

While no function is prescribed for the leather washer, it must, if the discs are drawn together by the bolt, exercise a frictional retarding effect upon the action of the springs. No mention of such retarding effect is given in the specification, leaving one to infer that the leather washer is merely used to prevent rattling.

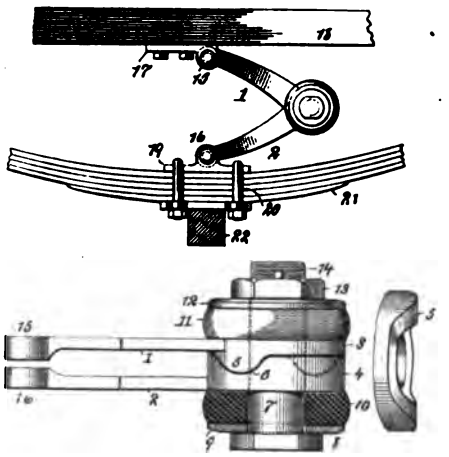


No. 664,444.

Klovstad & Jonsen patent No. 655,247 of August 7, 1900, filed April 10, 1900, shows an equalizing device, comprising the toggle arms *n, m, r, s,* united by bolts *p, q,* which are said to have a tapering form, capable of being tightened when worn, to obviate jolting of the carriage. No frictional washers are used, and it is doubtful that this patent would affect the Truffault broad claim.

In Stubbs' patent No. 664,444, dated December 25, 1900, filed August 27, 1900, a pneumatic cushion is employed instead of a spring, and toggle arms having hinges d^2 d^4, while insertions d^6 of rubber or other yielding material are provided, the insertions "preventing to some extent vibration being transmitted from the bottom plate d^6 to the top plate d^2." The claims in this patent are limited to the combination of the hinges with the pneumatic cushion. While the description is not very clear on the point of a spring retarding effect being desired, that is what is obviously intended, and this patent might be considered as interfering with a too liberal interpretation of the Trauffault patent.

The particular construction of the Truffault devices, and of the Hartford device, and the means for regulating the degree of frictional contact can probably be sustained, and possibly the practical carrying out of

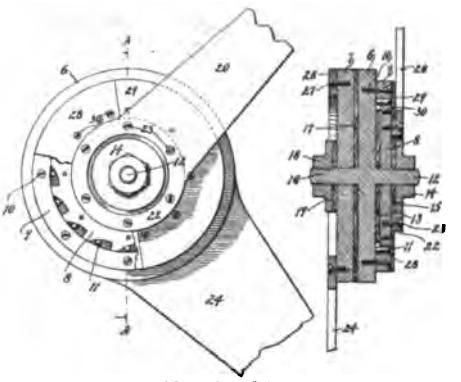


No. 807,968.

the principle involved in applying such devices to a motor vehicle would necessarily bring such devices under the terms of one or other of the Truffault or Hartford patents.

The patent to Herz, No. 802,860, of October 24, 1905, filed April 14, 1905, describes an interesting device, showing an elaboration of the frictional retarding principle, wherein the clutch members 8 and 9 are locked by rollers 11 engaging with the cam surfaces on member 8 when the vehicle springs are expanding, said rollers turning freely in the reverse movement, allowing member 8 to move frictionally against washer 13. By this means the frictional resistance is less when the spring is compressing and greater when expanding. This patent comes under the terms of Truffault's broad claim, if sustained.

In Seery's patent No. 807,968 of Decem-



No. 802,860.

ber 19, 1905, filed July 14, 1905, the elasticity of the rubber blocks 10, 11 and compression by the action of cams 5 in passing from one depression 6 into another, are relied on to afford the desired retarding effect. Should the Truffault claim be broadly construed it would include this device, "the yielding resistance to movement" and "retarding effect" being produced in this patent by altering the form of the contacting surfaces and changing the location of the washers.

The Manufacturer's Responsibility.

By Xenophon P. Huddy, LL.B.

Among the many reported judicial decisions concerning motoring and the motor car, no reported case in reference to the manufacturer's part played in automobiling has as yet appeared, though circumstances have happened pointing in a direction of what reasonably might be expected from litigation in the near future.

No person is more intimately connected with motoring and of so vital importance in qualifications as the manufacturer. The position of the chauffeur, in regard to the necessity for prudence, intelligence and carefulness, is somewhat insignificant compared with the great responsibility resting upon the shoulders of the automobile constructor, and yet the latter has not been deemed an individual of sufficient police regulatory account to be considered a favorable subject of legislative control in regard to the manufacture of safe machines.

The thousands of automobiles which are being turned out every year, and the hundreds of new incorporated companies which are being formed for the purpose of manufacturing motor vehicles, necessarily will be felt in occupying the attention of the courts. We have only to wait for the decisions to come; they are bound to arrive.

The manufacturer of automobiles occupies a position of serious responsibility not only to his customers and the users of his car, but to the public. He is producing a powerful carrying machine to run on the public streets and highways in the midst of traffic. This he knows and fully realizes. His position is one of trust and confidence. On him rely his customers and others for the safe construction of machines, in workmanship and in material.

The cars turned out thus far have devel-

oped no defects in construction and no use of inferior materials so far as to render them dangerous for their contemplated use. The manufacturers have established a feeling of safety and reliance in the people. But have we the assurance of a continuation of this feeling of confidence?

From our American experience regretfully we have to say that our industry is apt to be contaminated with adulteration and substitution. We know that the cost of production is sought to be reduced by using cheaper labor and inferior materials. This reasonably may be expected in the manufacture of automobiles on the part of some producers, if precautions are not taken. There are and will be, of course, many automobile manufacturers whose products always will stand for the best and safest material and workmanship. The very cheap machine and its manufacturer, however, will need our serious consideration.

Speaking generally, what are the duties and responsibilities of the automobile manufacturer in putting an automobile on the market? It must be conceded that a safely constructed motor vehicle is not of itself a dangerous machine, and only becomes a source of danger to the occupants through faulty construction or imprudent driving. We have simply the case of a manufacturer placing on the market for sale a vehicle of somewhat complicated machinery, of high speed power and used for the transportation of persons. What is the law governing such a manufacturer?

Since no cases concerning the automobile dealing with the subject under discussion have arisen for determination by the courts, we are compelled to reason from a consideration of cases decided in reference to the manufacture and sale of machines and articles generally other than vehicles.

Without exhaustively reviewing every decision concerning the manufacturer's liability for the sale of defective machinery, it would be impossible to say more than that the manufacturer of an automobile impliedly warrants to purchasers that the vehicle is reasonably fit and safe for its contemplated use. Any negligence on the part of the manufacturer or his servants in constructing the automobile, or in the use of improper materials, subjects the manufacturer to liability in damages for an injury received by the party purchasing the machine who is injured while exercising due care.

There are many other questions which suggest themselves in considering the automobile manufacturer's position—questions of importance and some little difficulty; but for the present the suggestion that there is serious responsibility resting upon the manufacturer probably is sufficient.

An unusual outbreak of attempted automobile legislation is reported from Massachusetts, where no less than ten bills are up for a hearing. Fortunately, some of the bills are not antagonistic to the interests of automobilists.

Transmission of Power to the Auxiliaries.

By A. L. B.

On all gasoline motors, especially those of the four cycle water cooled type, the large number of auxiliaries to the engine furnish no inconsiderable problem as to the best method of driving them, and a brief glance at the methods now in vogue may be of some advantage. There are, in general, but three methods by which power is transmitted to the different auxiliaries, namely, toothed gear, chain and sprocket, and the belt drive. Each has its own advantages, yet no one will altogether answer the purpose, as is evidenced by the fact that there are some motors which employ all three methods. The best way to approach this subject is to take each auxiliary separately and note what method of drive can be employed to the best advantage.

Taking up first the cam shaft or shafts, they are in the large majority of cases located within the crank chamber, and almost without exception are driven by two to one gears from the crank shaft, the gearing being undoubtedly the most positive method of drive. In a number of air cooled and one or two water cooled motors the cam shaft is located immediately above the cylinders, operating the valves through rocker arms, in which case the drive is universally accomplished by a vertical shaft driven by bevel gears from the crank shaft. Only two instances of the use of a chain drive for the cam shaft have come to the writer's attention, and the drive by direct gearing may be regarded as by all means the most reliable and satisfactory as far as the cam shaft is concerned.

The timer or commutator, owing to the variety of its possible positions, is variously driven. Quite frequently it is located upon an extension of the cam shaft, or even upon the crank shaft, and when so placed, of course, requires no additional gearing. A very neat arrangement is now appearing upon the better class of cars, in which, for the sake of accessibility, the timer is located above the engine, usually just behind the second or fourth cylinder, and is driven by a vertical shaft and bevel gears from the cam shaft. On cars employing a "self contained" magneto the distributer is in every case driven by spur gearing from the armature shaft.

The water pump, as it is mostly placed close to the crank and cam shafts, is usually located upon an extension of the cam shaft or driven from it by means of spur gears. There seems to be a rather general tendency to locate the pump upon an extension of the cam shaft and in front of the motor, which is a very neat and satisfactory arrangement, and does away with the complication of additional gearing, which is to be avoided where possible. In a few instances a chain drive is used, the noise evidently not being considered a serious drawback. The great difficulty, however, in using a chain lies in the fact that it is apt to stretch, and so become perm- loosened, as it is almost impossible : vide means to tighten so short a cha-

All three methods of drive are fre- ly employed for the oiling system. the system is a mechanical one. Th- ety of oilers, however, is so great render a discussion of the best meth- drive almost impossible. When a p- used for the oiling system it is mos- quently driven by spur gear from th- shaft. Some very neat and effectiv- rangements for driving different oilers been devised, but the best method f- particular system depends almost w- upon the location and the nature of device. If the oiler is located upo- dash a vertical shaft driven by bevel from the cam shaft or an adjustab- can be used to the best advantage.

On cars equipped with a magne- number using a chain is about eq- those employing a spur gear. A short from the cam shaft works very well. would seem that drive by gear is the satisfactory. The chain drive is noisy, requires more attention, and is apt to get out of adjustment than a gear, and would not on the whole see desirable.

If a governor is used, the best po- is undoubtedly upon an extension of cam shaft, if such an arrangement is possible by the design of the motor; an- so placed, unnecessary gearing is avo- and, besides, this makes a constru- which can be easily enclosed and protec- Special types of governors are, of co- variously driven, according to their po- and construction.

It is in driving the fan that the belt its great usefulness. A gear drive has b- tried, but owing to the distance between centres of the crank shaft and the fan a system, if used, must necessarily heavy and clumsy. A chain drive has been used, but is being abandoned, bec- the length of the chain creates undesirable noise and renders it apt to jump sprockets, besides adding considerable necessary weight. The belt drive, on t- other hand, is light, noiseless and simpl- and if means are provided for adjusting t- belt after stretching, it fulfills very sat- factorily all requirements.

In general, it may be said that a cha- drive for the auxiliaries is to be avoided account of its noise and its liability become loosened and to jump the sprockets and that, therefore, a bevel or spur driv- is to be preferred in practically every cas- with the exception of the fan, for which belt drive is unquestionably superior.

It is intended to install a motor omnibus service in Siam, and the French envoy at Bangkok has requested the French automobile manufacturers to furnish him detailed information with respect to the omnibuses they are in position to supply, prices, dates of delivery, etc. The buses are to have a seating capacity of twelve.

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...EVERY WEDNESDAY...

Devoted to Motor Interests

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Instability of Front Driven Cars.

Reference has frequently been made in these columns to an important advantage of driving through the front wheels, viz., that it obviates to a large degree the tendency to skid. It appears, however, from a recent accident to a front driven electric cab in Berlin, that the front driving system also possesses a rather serious defect, in that it renders the car unstable in a vertical plane. The cab referred to was driven at a 15 mile per hour speed over a level asphalt pavement, when, coming to a point where the road surface suddenly becomes quite bad, the driver cut off the current with the controller handle. The controller on this particular car is combined with the reversing switch, and in some manner or other the driver moved the handle past the neutral position and thereby reversed the current through the armatures of the two powerful motors. Now, it is obvious that when a vehicle is proceeding at this speed and the current is suddenly reversed, a tremendous braking effect is developed, and this, together with the fact that the asphalt pavement at the place where the accident occurred was very dry and presented conditions of maximum adhesion, caused the rear wheels to rise up in the air and the car to turn completely over.

Had the motors been secured to the rear portion of the car and driven through the rear wheels, such an accident could not have occurred. Yet it is not quite fair to place the responsibility for the accident entirely on the front driving system. It is a very bad mistake to suddenly reverse the armature current when going at a considerable speed, and the disastrous possibilities of such an operation, aside from its effect on the stability of the car, have long been recognized by American manufacturers of electric vehicles, and most of them provide a separate operating lever for the reversing switch, so that an accidental reversal of the current is practically impossible.

Another factor which must be taken into consideration in discussing accidents of the kind mentioned is the distribution of weight. In the vehicle concerned the whole or nearly the whole of the battery is carried under the driver's seat, directly over the front axle, and the weight on the rear axle is small. Moreover, the weight of the enclosed cab being rather high from the ground, adds still further to the moment tending to turn the car around the points of contact of the front wheels with the ground in case the wheels are suddenly blocked. Finally, it is more than likely that the cab had a rather short wheel base.

It must be admitted that stability in a vertical plane is even more important than stability in a horizontal plane (absence of skidding), and if the danger of the whole car turning a somersault must be taken into the bargain, it would be better to leave the front drive system severely alone. It is our opinion, however, that if the control system is so constructed as to preclude the possibility of accidental reversal of the power, the weight is equally divided between the two axles, and the car has a long wheel base and a low centre of gravity, the front driving system offers all the guarantee of safety that can be desired.

The Glare of Acetylene Headlights.

It is now recognized even by automobilists themselves that the public complaint about the blinding glare of automobile searchlights in city streets at night is well founded, as is evidenced by the recent action of several prominent automobile clubs in recommending their members not to make use of their searchlights while driving in the city. This action of the clubs is an indication that automobilists as a body are willing to meet any reasonable grievances of other road users. Possibly the clubs in making these recommendations also had it in mind to forestall possible legislation on the subject.

There is no objection to the use of power-

ful lamps in driving on deserted roads, and, indeed, for night driving in the country such lamps are almost indispensable, but as soon as a shying horse is met the lamps are liable to cause trouble to the horse driver and to the automobilist as well. However, in all built up sections where the streets are fairly well lighted, and where there is considerable traffic, the searchlights should not be used. Now, in touring in the well settled sections in the vicinity of large cities, small towns with well lighted streets are encountered at rather short intervals, and the automobilist could hardly be expected to extinguish his lights every time he comes to a small town. There seems, therefore, to be need of an invention which will enable the automobilist to quickly decrease the glare of the searchlights without leaving his seat, or at least to change the direction of the beam of light so as to illuminate only the road directly in front of the vehicle and not blind horses and drivers passing in the opposite direction. Here is an opportunity for a progressive lamp maker to fill a deeply felt want.

Ratchet Sprags.

The brake equipment of the modern motor car has been brought to a point of high efficiency, not only by increasing the holding power of each brake for motion in either direction, but by providing a multiplicity of separate brakes (usually four in the best practice) acting directly upon the hubs of the driving wheels. Nevertheless, there seems to be a desire for the provision of still further safeguards against the involuntary backward motion of a car in case of the failure of the power when climbing a steep grade.

The ratchet sprag or positive back motion stop is found embodied in quite a number of the new American cars. This is not an entirely novel device, as it has been employed in previous seasons by one prominent manufacturer of high powered cars. This device is found in the form of both internal and external ratchet wheels, bolted to or integral with the rear wheel hubs, upon the ratchet peripheries of which a pawl may be dropped by means of a releasing device within the reach of the driver. It is also found applied to one of the gear shafts within the gear box, in which case matters may be so arranged that the device becomes inoperative when the change speed gears are arranged for reverse motion—a very useful provision, as the starting of the car on the reverse with the ratchet device in action would involve very trying mechanical stresses. Applying the ratchet device to the change speed mechanism, of course, causes its action to depend upon the integrity of the driving chains or shaft. The employment of a ratchet back motion stop upon a car adds one more important safeguard to its operation, especially if the device be made very strong, to resist the shock of its application in case the car is already moving slowly backward. Its proper location would seem to be with the other brakes—upon the rear wheel hub. It should be automatically disengaged when the car is put into the reverse gear, and the manual or foot operated lever which calls it into action should be as accessible as the control devices of the other brakes. Old cars, which were too often fitted with brakes ineffective against backward motion, may be rendered much safer by equipping them with these so called ratchet sprags, and in most cases the labor and cost of so fitting them would not prove excessive. The old form of rod sprag, with one end pivoted upon the car structure and its other end arranged to be dropped into contact with the roadway, seems to have been entirely discarded.

Patent Litigation.

The atmosphere is at present rife with rumors of suits for infringement of patents. First it may be noted that the Selden suit is still pending, and that additional testimony is now being taken in New York city, although a decision was confidently expected last fall, and very little has been heard recently of any progress in the proceedings. This remarkable case promises to develop into a record in patent litigation as regards the length ot time during which the patent has been under dispute before the courts. The first suit under the Selden patent was brought in 1900, against a firm which was later induced to recognize the validity of the patent, whereupon the proceedings were dropped. After a few more similar cases, which terminated prematurely by what might perhaps be best described as a settlement out of court, there was a lull in the litigation under this patent pending the formation of the Association of Licensed Automobile Manufacturers. When the organization of the association had been completed, the present Selden suits were brought against manufacturers, importers and owners of unlicensed cars. The Selden patent suit far overshadows in importance any other suits for infringement of automobile patents that have been brought threatened, because if the Selden should be upheld it would give its ow monopoly on the gasoline automo every practical form of construc the situation appears at present. T little danger, however, of such a re ever becoming effective, because, as th ent was issued in 1895 and expires it has only six years more to ru judging from the slow progress of t in the lower court, a decision of t preme Court, to which the case wi doubtedly be carried, whatever the de of the lower court, can hardly be ex much before the expiration of the te the patent. There is therefore little for anxiety as to the final outcome suit, and neither manufacturers no chasers seem to be much influenced The feeling of security is probably stre ened by the lack of any sign of ef force the suit to a speedy conclusion.

About the same thing applies ever strongly to the two cycle patent su One of the patents, which is clai cover the essential constructional fe of the high speed two cycle engine, ex during the present year, and as the tw engine is only now being adopted to a tent it would hardly be worth the ex to prove the validity of the patent. view seems to be shared by the owne we hear of no suit being brought by though this may be accounted for by fact that at present the most impo users of the three port two cycle en other than the owners of the patent members of the "Licensed Association" entitled to the use of this patent by the ass ciation's patent pool arrangement.

Three other automobile patents w submitted to the courts to test their v ity in the near future. These relate t selective system of change gear opera the braking of vehicle spring action an direct bevel gear drive to the rear a Actions under the first two patents h already been brought. No announcem has yet been made of any intention of t Renault firm to enforce their United St direct drive patent; but as they have forc French manufacturers to a royalty agr ment and decided to begin proceedings England, it may be inferred that they w soon turn their attention to their Ameri patent. The shock absorber and d drive patents are of much importance account of their broad character, and pr ise to furnish hotly contested fights.

ELECTRIC IGNITION

emical Effects of the Electric Current—Units of Measurement —Ohm's Law—Chemical Generators.

When the ends of two wires connected to source of electromotive force are inted into a glassful of slightly acidulated ter, a current will pass through the water m one wire to the other and gas bubbles l form and rise from the surface of both es. Acidulated water is thus a conduc- of electricity. The gases formed at the faces of the two wires are hydrogen and gen, the components of water. In mak- this experiment it will be observed that quantity of gas given off at the two es (called in this case electrodes) is not same. The hydrogen is given off in ch greater quantity than the oxygen, and he oxygen is evolved at the positive pole the wire where the current enters the id, and the hydrogen at the negative , where the current leaves the liquid, apparatus admits of determining the ction of flow of the current. Conduc- which in conducting a current are deposed by it are called electrolytes. Elecytes include many solutions of metallic s. One of the most familiar electrolytes solution of copper sulphate. When solution is decomposed in the electro- bath, metallic copper is deposited on negative electrode and gases accumulate the positive electrode. In all electro- work the metal radical of the electro- travels with the current through the and is deposited on or liberated at the itive electrode.

he rate at which either component of a n electrolyte is liberated depends diy upon the current strength, and the mposition of electrolytes therefore s itself, by weighing the deposit of l obtained in a certain time, to the surement of current serength. The unit rms of which the strength of electric ents is expressed is the ampere, which e current necessary to deposit .00118 of silver per second from a bath of r nitrate in water. It will be noticed this unit of current is based upon the ic system of measurements, and so are lectric and magnetic units. The above tant .00118 is called the electrochemical valent of silver, being the amount lib- d by one ampere in one second. Each ent has a different electrochemical valent. and those metals which, like er, form two sets of combinations, have electrochemical equivalents. The elecemical equivalent of copper in cupric inations is .000327 and in cuprous comions .000654.

OHM'S LAW.

fore proceeding any further we must mention of a most simple and widely applicable law of electric phenomena named, after its inventor, Ohm's law. It is to the effect that the current in an electric circuit is directly proportional to the electromotive force active in that circuit and inversely proportional to the resistance of the circuit. In other words, if all three factors are expressed in units of the same system, the current is equal to the electromotive force divided by the resistance. Ohm's law is generally written as follows:

$$\text{Current} = \frac{\text{E. M. F.}}{\text{Resistance.}}$$

There are two variations of this equation which may be deduced directly from it; they are,

$$\text{E. M. F.} = \text{Current} \times \text{Resistance};$$

$$\text{Resistance} = \frac{\text{E. M. F.}}{\text{Current.}}$$

We have seen how current can be measured and how the unit of measurement, the ampere, has been determined. The unit of resistance, the ohm, is the resistance of a column of mercury of one square millimetre cross section and 106.3 centimetres in length, at the temperature of melting ice. The temperature is here specified because the electrical resistance of most conductors increases with an increase in temperature. The unit of electromotive force, the volt, is that electromotive force which will cause a current of one ampere to flow through a resistance of one ohm.

The same as in mechanical motion against a friction heat is developed, so heat is generated whenever an electric current flows through a circuit. In both cases the heat produced represents a loss, unless the mechanical movement or the electric current is produced for heating purposes. In an electric circuit the heat produced in overcoming the resistance is proportional to the square of the current and to the resistance, which may be expressed as an algebraic equation by $H = C^2 R$. This principle is also sometimes employed for measuring electric currents, in combination with the law that heat expands all bodies.

ELECTRIC GENERATORS.

There are two sources of electromotive or current in general commercial use. In the first type, known as chemical generators or batteries, the electric current is produced by the combination of certain chemical elements, thus transforming the chemical energy stored up in these elements into electrical energy. In the second class, called mechanical generators, the electric energy is induced in wires by the motion of some rotary part to which mechanical energy must be applied. In the latter case, therefore, mechanical energy of motion is transformed into electrical energy. We will first consider the former kind of generators.

The simplest form of chemical cell consists of a rod of zinc and a rod of copper immersed in a bath of dilute sulphuric acid. When the upper, exposed ends of the two rods are connected by a wire, a current will flow from the copper rod through the wire to the zinc rod, and as a current makes always a complete circuit, it flows inside the cell from the zinc rod to the copper rod. The copper rod is called the positive pole and the zinc rod the negative, because the current flows from the copper and returns to the zinc. There is, of course, a certain chemical action going on inside the cell to which the current is due, and this chemical action is the combination of zinc with the sulphate radical of the sulphuric acid, forming zinc sulphate which goes into solution. If at the end of a period of activity the cell be examined, it would be found that the zinc had been "eaten" away, and if the electrolyte be then evaporated, the familiar white powder zinc sulphate will remain. The copper rod does not take any active part in the generation of the current, and serves only as a terminal for collecting the current from the electrolyte. It is not consumed and may be used indefinitely, while both the zinc and electrolyte are consumed and must be renewed from time to time. The copper rod may be advantageously replaced with a rod of gas carbon.

A cell in which zinc is reduced to zinc sulphate gives an electromotive force of about 1½ volts, irrespective of the size of the cell. The size of the cell determines, however, the current that may be taken from it, and as the power in an electric circuit is equal to the product of the electromotive force and the current, the electrical power obtainable from a cell depends upon its size, as would be expected.

POLARIZATION.

The above described simple cell is never used in practice, for the reason that if a considerable current is taken from it, its power soon decreases. The generation of the current breaks up the sulphuric acid into a sulphate radical which combines with the zinc, and nascent hydrogen which accumulates on and adheres to the copper or carbon terminal. It prevents a proper contact of this terminal with the electrolyte over its entire surface, thus increasing the internal resistance of the cell, and also sets up a counter electromotive force, thereby reducing the current which the cell will furnish with a given outside resistance. This phenomenon is known under the name of polarization. It can be prevented by the addition to the cell of some chemical substance which readily combines with nascent hydrogen. Such chemicals are nitric acid, bichromate of potash, sal ammoniac, etc., which are known as depolarizers. These depolarizers combine with the hydrogen as fast as it is generated, and thus allow of the electric generation going on continuously.

A visitor at the Brussels automobile show, so it is related, after looking for a long time at the large glass jars for stationary accumulators and asking what they were used for, bought one of the jars, explaining that he wanted to pickle a haunch of deer in it. The incident was the cause of much merriment among the exhibitors in that section of the show.

NEW VEHICLES AND PARTS.

1906 Adams-Farwell Five Cylinder Car.

The Adams Company, of Dubuque, Ia., have increased their line of cars for 1906 by the addition of the five cylinder touring car shown in the photo herewith (Fig. 1). This car is driven by an air cooled motor with five horizontal revolving cylinders, as shown in Fig. 2, which gives a very clear idea of the arrangement. This engine is a development from their first three cylinder engine of 1898. The revolving cylinder type of engine was adopted primarily to insure efficient cooling of large cylinders, but it was found that the centrifugal force materially aids in many other ways the operation of the engine. In this, as in all their models, the engine is located in the rear of the body, just forward of the rear axle, and drives by a short chain to a sprocket on the axle near one side. This construction removes the differential from the centre of the axle, and thus affords a road clearance of 11½ inches, and under the middle of the car 14 inches, which is of great importance in traveling on ordinary country roads.

SPECIFICATIONS AND DIMENSIONS.

Motor, revolving five cylinder air cooled of 5 inches bore by 5 inches stroke, rated at 40-45 horse power; transmission, sliding gear with two sets of clutches giving four forward speeds and one reverse; single chain drive to the differential near the left wheel; jump spark ignition from storage or dry cells; wheel base, 108 inches; gauge, 56 inches; wheels, 34x4¼ inch tires; passenger capacity, five; side entrance tonneau; divided front seats; weight, 2,500 pounds.

BODY.

The body is very solidly built throughout, its frame being made of 2½ inch oak extending from the extreme front of the hood to the rear end. The standard finish is very dark blue with black stripes. It is upholstered in black leather with curled hair and springs. The car has an unusual amount of carrying space, as the entire hood is devoted to that purpose, giving a space 27 inches wide by 20 high by 28 inches long. In addition to this, all the space under the front seat, about 38 inches wide, 25 inches deep and 10 inches high, is available for luggage purposes, being accessible from the tonneau. Below the floor is a space of the same width and length, but only 5½ inches deep, sufficient to carry an extra tire, tubes, pumps, jacks, overalls, etc. The inside of the doors is fitted with large leather pockets covered with tufted flaps to match the other trimmings. The back of the front seats from the level of the door steps to the floor is trimmed with padded leather, and an extra pocket is provided in the leather trimmings at the right of the driver's seat. The tonneau floor is fitted with a velvet carpet pad, while the footboards and the running boards are covered with pyramid rubber matting, the latter being bound with brass. The fenders are of laminated wood.



FIG. 1.—ADAMS-FARWELL CAR.

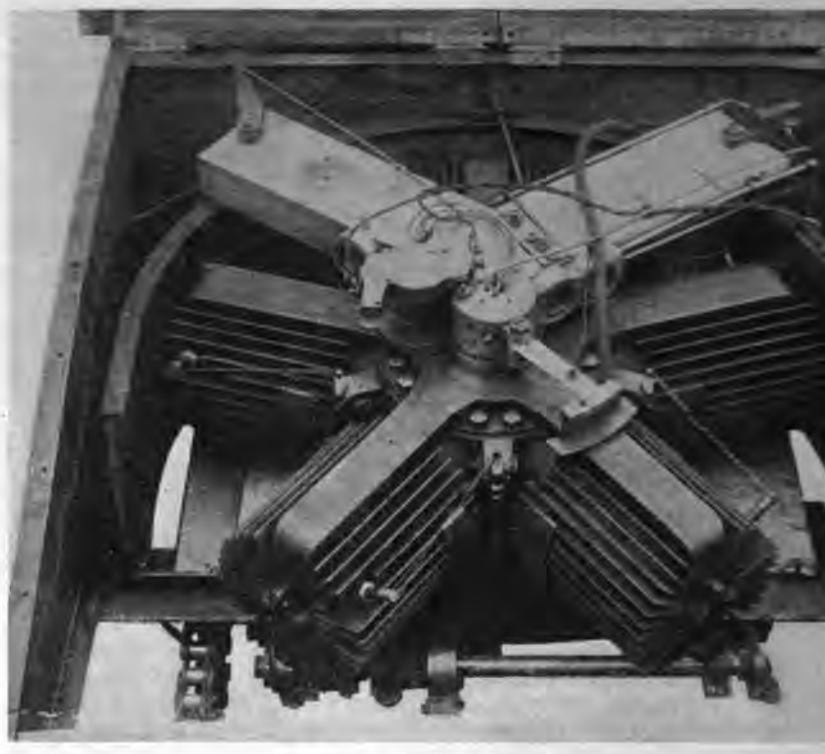


FIG. 2.—FIVE CYLINDER ENGINE.

GENERAL CONSTRUCTION AND OPE THE ENGINE.

The five horizontal cylinders held to the others by four bolts circular bronze plate at the top by in each, and to a steel casting at t by two ⅝ inch bolts in each. Th ders revolve around a stationar one throw crank shaft. In each are the usual piston and conne All the connecting rods engage th tionary crank pin. As the cyli volve about the axis of the shaf connecting rods and pistons about pin, the circles which they describ eccentricity equal to the throw, w sult that although the pistons are around a stationary centre line forced at the same time to reci the cylinders. The bottom ste carries with it a bevel gear, as Fig. 3. This drives a bevel ge shaft in the transmission, which the engine and forms its base. A side of each cylinder is cast a b tube or inlet passage leading to valve in the head. The angul aluminum casting on top of the fastened rigidly to the angle iron the casing which surrounds th This casting is hollow, and conta arm the oil tank and force feed in the other the carburetor. The down around the stationary sha annular hollow in the top bronze then into the passages leading to ders. The joint between this casting on top and the revolving t made by a small bronze ring pu ward by flat springs. Supported gular casting on top is a static

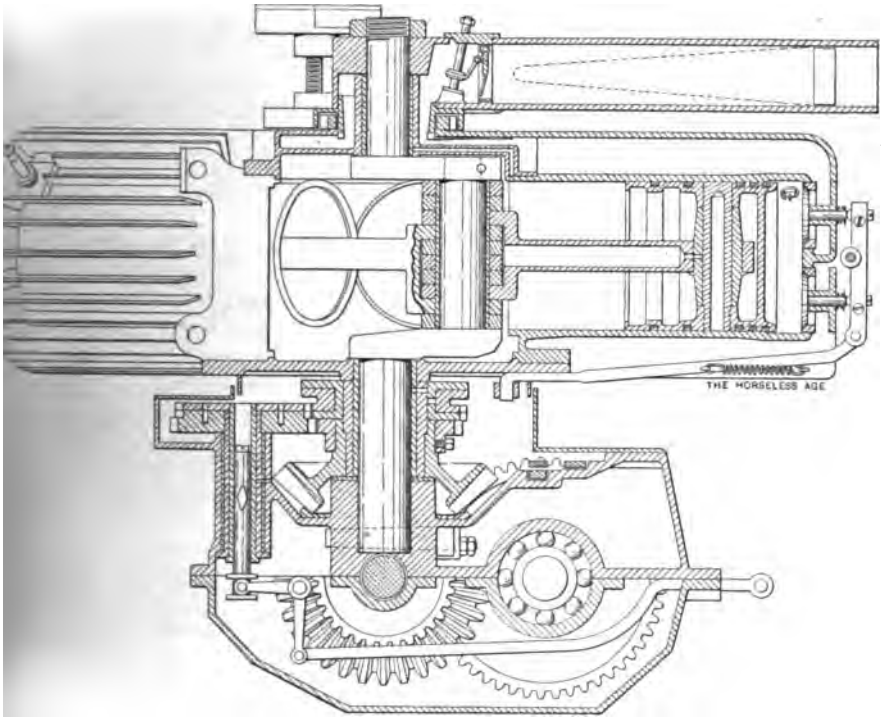


FIG. 3.—SECTIONAL VIEW OF ADAMS-FARWELL FIVE CYLINDER MOTOR.

rying a metal piece to which the high sion wire from the single coil leads. The celain plugs with brass tops, situated at junction of the cylinders, pass under metal piece but do not touch it, and the rent jumps across and reaches the spark gs near the cylinder heads through a ll naked piano wire, one end of which coiled into a spring to make a tension ween the ends and give good contact. s mechanism constitutes a large second- distributer and allows the engine to be rated with a single coil. This was de- ed and in operation more than six years . and is without doubt one of the first lti-cylinder engines in this country to be with a single coil.

ust to the left of the centre on top may seen the automatic timer, which not only nges the time at which the spark takes e but also changes the length of the tact in proportion to the engine speed. erwise the engine speed is controlled by nging the time of closing of the inlet e. instead of by the throttling. As will seen from the construction, the engine ns its own flywheel, dispensing with h dead weight; it has no muffler, as it austs into the space continually swept by cylinders, and it is air cooled without use of a fan. The engine is four cycle, hat two revolutions are required to com- e the suction, compression, explosion exhaust strokes. As the five cylinders alternately as they pass a given point, explosions occur at equal intervals and cylinder explodes before the last has hed its power stroke. This gives more orm torque than is possible with a four der engine. There is no absolute recip- ting motion, but simply relative recipro- ng motion between the piston and ders, due to the eccentricity of the es around which they revolve. The vibration is small and the balance of the engine is almost perfect, as the mass of the piston and connecting rod is never brought to a stop and started in the opposite direction, but swings continuously around its centre. This being the case, the pressure on the bearings is not suddenly changed in direction at each end of the stroke.

DETAILS OF CONSTRUCTION.

The cylinders are cast of gray iron in the special molding machine of their own design. The mold with the pattern in it is first baked so that the iron in pouring never comes in contact with any green sand, and, in fact, the mold is still usually warm when poured. These cylinders have integral heads and 32 very thin longitudinal cooling pins, six of which extend across the head. The crank end of the cylinder, shown in Fig. 4, is milled at an angle of 72 degrees, so the five cylinder ends exactly fit against each other around the circle. The rectangular inlet tube cast integral with the cylinder is also shown.

The cylinder castings are each balanced on a suitable bar, and those of very nearly the same weight are selected for one engine. Thy are finished and bolted together, and then form a wheel which is balanced on a shaft passed through the main bearings. Small pieces of putty are used until the correct balance is obtained. The putty is then replaced by thin strips of metal, which are fastened permanently to the upper inside surface of the cast inlet channels on top of the cylinders. These inlet channels are two inches square, so that these little strips do not interfere with the necessary area of opening. A record of each engine is made, so that if necessary a cylinder can be replaced without throwing the engine out of balance. In Fig. 4, across the fins at the inner end, is shown a strip of metal A. This is a baffle plate, and covers a row of five 5-16 inch holes, which, together with a like set on the opposite side of cylinder, form the auxiliary exhaust at the bottom of the stroke to quickly relieve the pressure and also the heat. Under this strip, and held in position by yokes, is a wire gauze to deaden the exhaust. Two fins are shortened to allow for the spark plug hole. The cylinders are faced and bored while in a jig, to insure duplication, and are finished by light cuts and not ground, the company preferring their method of wearing-in the pistons.

The engine and transmission, which together form a unit, are placed in a testing frame. The pistons are made very tight and gradually worn to a fit without the use of any abrasive, by flooding the engine with lubricating oil and running it under its own power from five to six days. A shaft placed in a position similar to the rear axle is driven by the engine with the chain that is to go on the car, and a dynamometer is attached to the end of the axle so that comparative readings on different engines may be taken. The engine is then made to work hard for six days. At the end of this time, it is claimed, the pistons and cylinders, when hot and under running conditions of

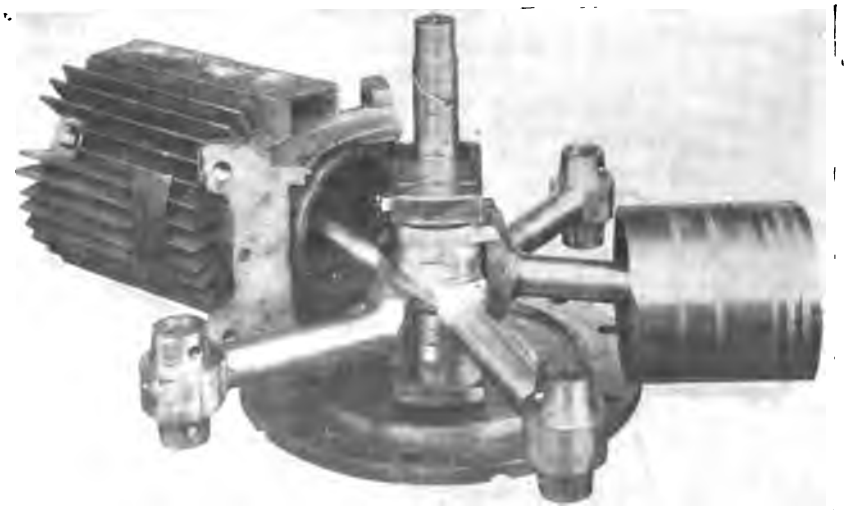


FIG. 4.—SHOWING MANNER OF ASSEMBLING CYLINDERS AND CONNECTING RODS



FIG. 4A.—ADAMS CYLINDER MOLDING MACHINE.

unequal expansion, are a better fit than can possibly be the case when they are ground cold. In addition to this, no emery is left behind in the walls to continue cutting.

The gray iron piston castings are made with a flange at the top for gripping them in a chuck, where they are centred from the inside and a roughing cut is taken on the outside, after which they are heated to a cherry red and put aside to "season" for thirty days. They are then finished and the flange is cut off. Five step-jointed non-eccentric rings are used. These rings are finished by grinding on three sides and are very springy, as the cut is ¾ inch wide. The rings come close to the bottom of their grooves all around, which is not the case with an eccentric ring, especially at the cut. The idea seems to be to get the rings close enough to the bottom of the groove, so that in conjunction with the oil the rings will be tight on the bottom as well as at the sides. Three rings are above the pin and two below, the lowest being about 1 inch from the bottom.

In Fig. 6 is shown a connecting rod with the wrist pin bushing C^4 and crank pin bushings C^5. These rods are of chrome-nickel steel, hand forged and oil treated. They are of circular section and drilled hollow almost to the wrist pin, and then a small hole is drilled through to the bearing surface for oiling the pin. The oil travels through to the pin with certainty under the centrifugal action. The crank end construction of the rod is clearly shown. Each loop has a depth of ½ inch, making a combined depth of 1 inch, which is the bearing surface between the rod and the bushing; but this is not the effective bearing surface at the time of the greatest explosion pressure, for at this time the entire bushing, 5 inches long, turns with the connecting rod, owing to the fact that the friction is independent of the area but directly proportional to the pressure. Thus at the time of the greatest pressure for each rod the bearing is between the bushing and the pin, and not between the bushing and the rod, which becomes a bearing only at the time of least pressure, when the motion is very slight. This bushing has a 1⅝ inch inside diameter, and is made of Cramp's special bearing bronze. The wrist pin bushing is 3 inches long and has a force fit on the connecting rod. It is also held from rotation by screw pins into it from the rod, with their ends cut off. It forms the bearing on the 1 inch diameter, 3½ per cent. nickel steel pin which stands in a vertical position and is drilled almost to the upper end (as shown in Fig. 3), with a ½ inch hole which is not carried through to the top, as in that case the edges of the hole would scrape the upper cylinder wall and rob it of oil. The pin is a force fit, and has a shoulder at the lower end to prevent it from slipping downward, and what slight tendency it might have to rise is prevented by slightly burring the upper edge of the hole. The wrist pin is held from rotating



FIG. 5.—TOP VIEW OF ENGINE.

by a small screw into its end, at ri
to the length, the head of which
notch in the piston boss.

The crank shaft is of chrome-r
hand forged. The upper crank
movable, to allow of assembling th
ing rods, and is held by a tap
shown in Fig. 4. This pin can
removed by screwing the nut on
site end.

VALVE MECHANISM.

Both valves are in the head and
duplicates, including their cag
screw into the cylinder. They
mechanical and operated by on
lever, as shown in Fig. 3. The
these valves are very light, a he
not being necessary, as the val

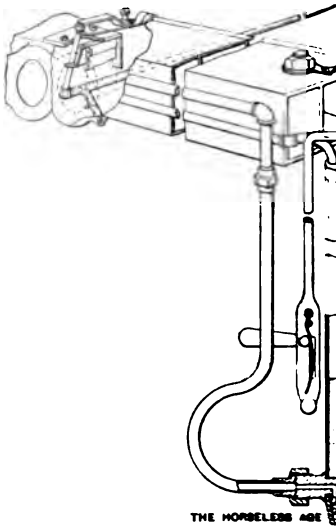


FIG. 5A.—GASOLINE PUMP

close themselves by a centrifuga
all times except in starting, so a
push rod, or, more correctly spe
rod, can be used. The upper va
right hand cylinder is the inle
lower one the exhaust. The in
the push rod is connected to a
lever, the other end of which
double cam just under the botto
plate of the engine. This dou
shown in Fig. 7, and it alone o
ten valves. Its parts move as
except when the time of the clos
inlet valve is varied, when the
slightly changes its positive rela
upper cam. They are driven b
gears beneath them, which mesh
in Fig. 3 with two unconnected ge
G^4, at one side, supported on vert
and driven by a gear G which r
the engine casing, and is located
the cam gears. In the inner sle
carries the upper gear, is a heli
which a pin can be moved up an
a bell crank lever and a rod whi
the controlling foot pedal at the
By this means the gear is sh
through it the lower cam changes i

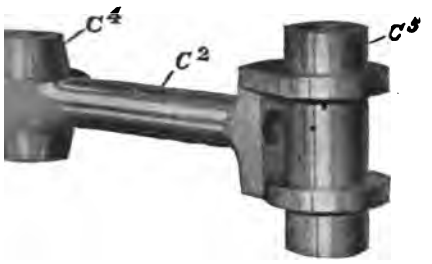


FIG. 6.—CONNECTING ROD.

this in turn changes the time of closing he inlet valve, which can be varied from ctly at the end of the suction stroke to end of the compression stroke. Thus amount of gas may be retained in the nders, and compressed from full charge vn to nothing, and, of course, the com-ssion pressure, the force of the explosion l the engine speed varied accordingly. is is done without in the least changing mixture or losing any of it, as when it forced out of one cylinder on its com-ssion stroke it rushes through the inlet es back to the central annular space and drawn in by some other cylinder and ed. In fact, by this action the mixture



FIG. 7.—CAM.

nds to become a true gas, owing to the eating and churning, and when used gives better explosion. By the train of gears ientioned the cams are made to turn in the ame direction as the engine, but somewhat lower. During one revolution of the engine he bell crank, which operates the valve ush rods, moves only around one-sixth of he periphery of the cam. In spite of the fact hat this double cam operates ten valves, he wear on it is said to be extremely small, owing to the very slow movement of the evers on it and the following conditions, which can be understood by reference to Fig. 3.

. The exhaust valves have no heavy spring, and owing to the auxiliary exhaust there is a very low pressure to open against. The cam in reality does not open the inlet valves at all, but simply allows them to be opened by the centrifugal action of the weight of the push rod, assisted at slow speeds by the very small coiled spring shown. When the inlet valve is closing its cam simply overcomes the centrifugal action of the push rod and allows the valve to close itself again by centrifugal action assisted by the small valve spring, which latter is entirely unnecessary when running at any speed. The centrifugal force increases in proportion to the speed, so that for high speeds, when a snappy, quick action of the valves is desired, the centrifugal force automatically gives this result.

In the accompanying photo, Fig. 5, is shown a closer view of the angular top piece, the left arm of which contains the oiler and tank and the right arm the carburetor. Gasoline is pumped from a 15 gallon tank under the footboards at the front through a pipe into a very small chamber holding about two tablespoonfuls, and covered by a glass plate. The gasoline is forced by an ordinary suction pump with a plunger of leather washers through a double ball check valve. It is driven from a small eccentric on the end of the driven shaft of the transmission, and is located in a well to which the overflow from the small glass covered chamber returns through the lower pipe. This chamber is connected to a needle valve in an adjoining compartment, which is also covered by a glass for inspection. Air enters through the end of the aluminum arm, passes through a linen bag and over the nozzle, by lifting a swinging air valve, which at the same time lifts the needle, allowing the air to take its gasoline. It then passes through a roll of gauze and into the annular ring from which it enters the channels on top of the cylinders, and thence to the valves. The needle can be lifted from the outside for priming.

OILING.

Fig. 8 shows the positive forced feed oiler, the outside of which is a bronze casing fitting into the oil tank. It contains a bronze cylinder rotated by a worm wheel from a worm on the vertical timer shaft. This cylinder carries six plungers and at each end stationary cams which, as the cylinder revolves, force the plungers back and forth in such a way that when they are at the bottom a drop of oil is drawn in and when at the top it is discharged through the tube with which its delivery opening registers. Two tubes receive a double supply of oil. One leads to the top of the cylinders and the other to the crank pin. The oil is carried by centrifugal force the whole length of the cylinder, and in case of excess passes by the piston into the combustion chamber; it does not stop here, however, to be burned, but is immediately thrown out at the valves. The oil to the crank pin works out through holes in the bushing between the connecting rod ends, into the hollow rod and thence

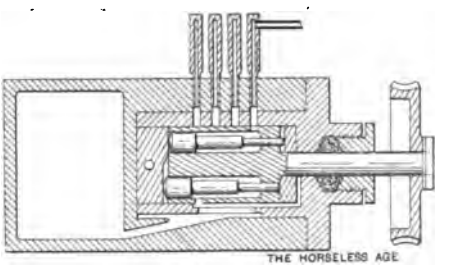


FIG. 8.—OIL PUMP.

travels with certainty to the wrist pin. Some of the crank pin oil works downward and is caught in an annular groove and led to the lower main bearing and the surplus goes into the transmission case below. Of the other two tubes, one leads to the upper crank shaft bearing and the other one connects by a flexible pipe to the cylinders or bypasses back to the tank. The plungers have sufficient stroke to supply the engine and are set at the factory. Thick oil gets to the ends with the same certainty that thin oil does; in fact, it is claimed that even glue will not stay on the cylinders, but crawl to the ends and disappear.

AUTOMATIC SPARK ADVANCE.

The timer is of the double spring contact type, but is automatic, and not only advances the time at which the spark takes place in proportion to the engine speed, but also increases the length of contact. Fig. 9 shows the timer as it is at rest. The contact points on the screw and spring are globules of iridium set in like a jewel. The roller is made of fibre. In dotted lines are shown two weights, pivoted at C and D, one of which carries a projection E. Over these weights is a flat circular plate slotted over the stationary pins C and D, which project through it, and carrying on its under side pins F and G, which engage lugs on the weights, as shown. When running, the governor weights fly outward, giving the upper plate with its camlike projection K a partial rotation against the spring H, and at maximum speed the device assumes the position shown in Fig. 10, in which position the projection E on the weight has added its length to the contact, and the advance in the timing is represented by the distance A—B. When the engine stops the spring H brings

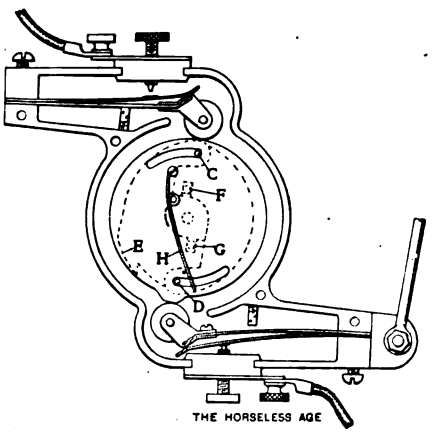


FIG. 9. AUTOMATIC TIMER.

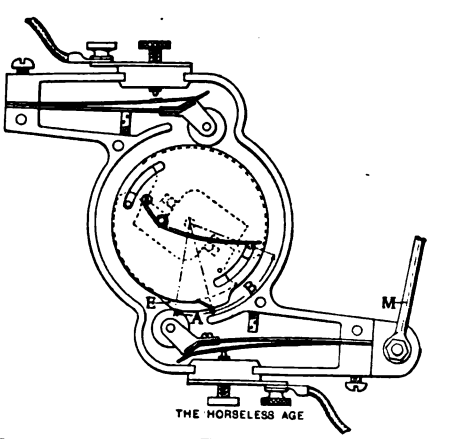


FIG. 10.

the contact projection E back to a slightly retarded position, so that no back kick can occur in starting the engine. Rod M held by a clamp screw holds the timer fixed and gives a chance for adjustment. This leaves nothing for the operator to attend to but the throttle and the change gears.

TRANSMISSION.

The transmission case is of manganese bronze of 80,000 pounds tensile strength and forms the engine support. It is disposed crosswise of the frame and bolted to the side members. This transmission is of the sliding gear type, but is peculiar in having two clutches. Fig. 11 is a plan view showing the large bevel gear on the driving shaft which meshes with the bevel gear at the bottom of the engine. On this same shaft to the right is the clutch for the second and fourth speeds, which speeds are obtained by moving the sliding gear pair on the other shaft to the left or right, respectively; and on the left is the clutch for the first, third and reverse speeds, which are obtained by moving the sliding gear pair on the other shaft to the right or left, respectively, and by moving the upper sliding pinion on a separate stud for the reverse. The aluminum cover has two large hand holes for inspecting the gears, and the bottom pan is of aluminum. Both shafts run in Hess-Bright bearings, except the middle bearing of the driving shaft, which is a Timken roller thrust bearing. The sliding gears are on a squared shaft, which carries the sprocket at its right end and drives through a short chain of 1½ inch pitch and ¾ inch width. All the gears and shafts are made of chrome nickel steel. Near the middle of the squared shaft is a transmission brake consisting of a hemispherical cast iron shell fast to the shaft and covered by a hemispherical bronze cup pivoted at one side and forced into contact by a long bell crank lever. This brake runs in an oil bath, and is used for long coasts to relieve the rear hub brakes. The clutches are thrown in by the two cylindrical cams on the shaft at the front side. These cams operate the two shafts running from them, and are arranged so that fingers project up through the notched rods, so that the gears for speeds 1 and 3 and reverse cannot be shifted until the clutch is released; and the clutch cannot be engaged until the gears are properly in mesh, and the same is true of the right hand end of the transmission for speeds 2 and 4. The advantages claimed for this transmission, outside of the fact that either of the two clutches alone would operate the car successfully, is the fact that the gears of any speed of the left hand end of the transmission may be meshed while any one speed of the right end is still in mesh and its clutch in. This gives many advantages not possessed by the ordinary sliding gear. For example, in cramped positions the reverse at one side and the second speed at the other may be in at one time, and the car can be quickly maneuvered backward and forward by swinging the clutch lever back and forth without shifting any gears at all. In ascending a hill the danger attendant upon missing a gear shift is obviated, as before reaching the steep part and while still on the fourth speed the third or even first could be engaged, so that at the critical time all that is necessary is to shift the clutch lever. When in a crowded place a lower gear may be in mesh on reserve to start the car in case of a stop or to drop down into occasionally without each time having to shift the gears. The range of speeds is very large, the fourth gear giving five and one-half times the speed of the first.

CLUTCH.

The clutch is also different, and might be called a multiple band clutch, as t are used. They are metal to in oil and completely diseng thrown out. This clutch can ly thrown in and will not seiz The second speed is used for st the car will start on the fourth jump. Fig. 12 shows the genera tion. The bronze member A is ri to the driving shaft and carries B and C, which fit into slots i split bronze ring, the constructio is shown to the right. This with piece A. Between the oute and the inner split ring is a cas ring E, forced to rotate with projections fitting into its notche gears are made fast to K, which seen, is gripped between the outs side bronze rings. The spread inner ring is accomplished by inward movement of the wedge against the roller shaped end springlike piece R. The other fi be moved to the right or left for

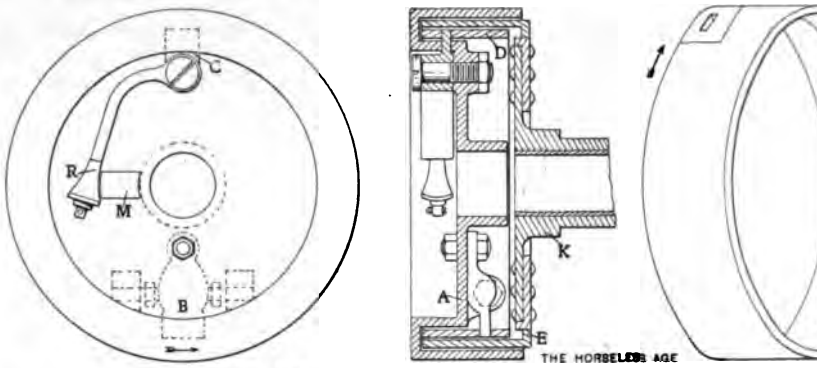


FIG. 12.—ADAMS-FARWELL CLUTCH.

CONTROL.

The steering column tilts inwa easy access to the driver's seat allows the car to be operated by in the other front seat in case of Just below the steering wheel c two short levers, the left one of be raised or lowered and move and back. When lifted and pu ward it meshes the reverse ge down its back position gives the forward position the third speed. lever when back operates the s when forward the fourth speed. lever, projecting from the middle boards, in its forward position e clutch for the second and fourth in its rear position the clutch fo third and reverse speeds. In position it is neutral, and if mo right and rear it puts on the tr brake; and, if desired, makes it tained, by pushing a thumb button The rear hub expanding band bronze against the steel drums gral with the hubs are operated pedal from the dash at either side so that the brakes can be applied front seat. There is, of course lever, and the variable compress trolled by a press pedal, which any desired position in which it

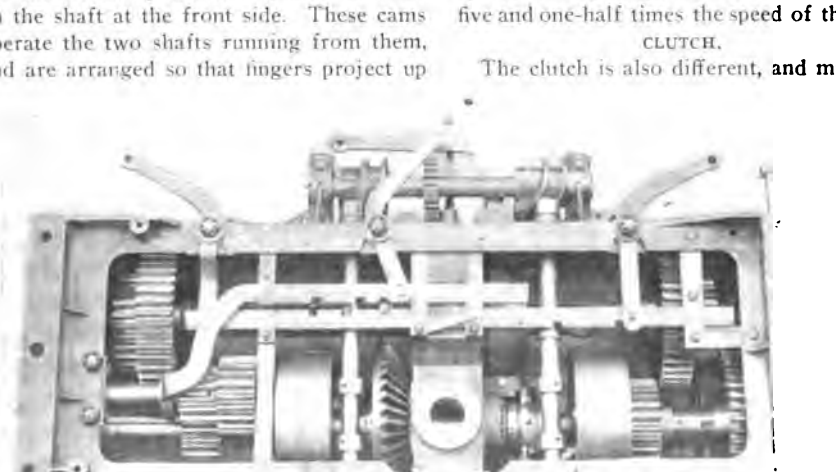


FIG. 11.—TOP VIEW OF ADAMS-FARWELL TRANSMISSION.

ratchet if the heel is raised; otherwise it urns to a slow running position. In rting the engine the variable compres- n is of much assistance, as it allows the gine to be turned easily, and at the same ie in cold weather rushes the mixture m cylinder to cylinder until it is explod- e. The engine is said to start readily h the thermometer below zero and the gine covered with frost. It is started m the front seat by a pull-up lever just the right edge of the floor boards, which ates the engine by means of a ratchet ice on the end of the transmission shaft.

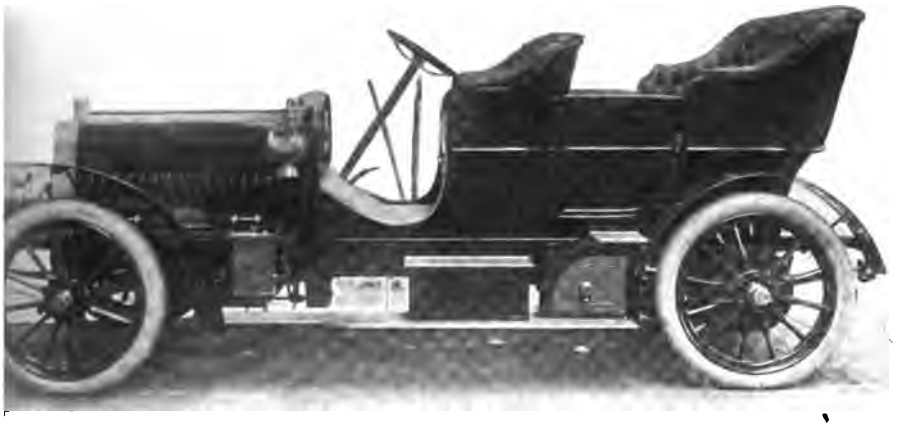
FRAME.

The frame is made of angle steel, 2x2

The storage or dry battery, or both, together with tools and the single coil, are located on the tailboard just inside and close to the engine.

The Berkshire Touring Car.

The Berkshire Automobile Company, of Pittsfield, Mass., manufacture for 1906 a four cylinder car of simple design, the most original feature of which is the Berkshire change speed gear, which is of the sliding shaft type. The motor is rated at 20-24 horse power and the car has three speed forward and reverse change gear and double side chain drive to the rear wheels.



BERKSHIRE TOURING CAR.

hes by ¼ inch thick, and strongly trussed, running board hangers forming the nts for the truss, which consists of a flat el bar on edge. The side members of the me are straight but not parallel, the me being 4 inches narrower at the front n at the rear. There are four cross mem- s of angle steel, 2x2x7-16 inches. The n or spring supports at the ends are de into channels by riveting another piece angle steel to the first, and stiffened by ping the vertical side of this angle into front cross member. The corners are ngthened by gusset plates. All holes are led and the rivets are tight driving fits. bolts through the spring eyes are Swe- n iron, and the eight ½ inch bolts which s through metal bushings to retain the y are of the same material. All nuts adjustments throughout the car are ted.

he springs are semi-elliptic, both front rear, the front being 2x40 inches and rear 2½x44 inches long. The front ngs are under the body and the rear s outside. A specially heavy extra leaf rovided at the top of each spring. This be instantly put into use for heavy ls by a clamping arrangement, which es it a part of the spring.

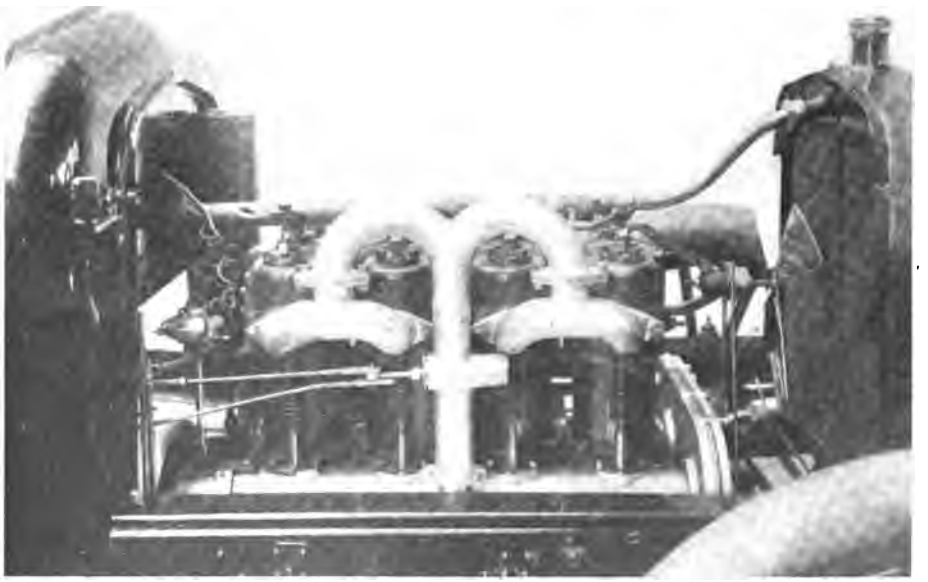
he front axle is solid, of 1¼ inch square ion, and the rear axle is 2 inch steel ng with ⅜ inch walls. All wheels run Timken bearings, the rear ones being ially large. The differential is of the gear type with exceptionally wide ed spurs.

The cylinders are of 4 inches bore by 4½ inches stroke for the 20-24, and 4¾x5½ for the 30-35 horse power type, and are cast singly but integral with water jackets, heads and valve pockets on opposite sides. The openings over the valves are closed by brass screw plugs. The valves are all mechanically operated from cam shafts on opposite sides of the cylinders, and the two sets are interchangeable with each other. The cam shafts are enclosed within the crank casing and each is mounted in five bearings, the same as the crank shaft. The cam shaft gears are located at the forward end of the engine and enclosed in a two part aluminum housing divided vertically, the inner half being bolted to the front of the crank chamber by interior bolts and the outer half bolted to the inner half. The cam shafts can be pulled out from the ends with their bearings. The valves are operated through the intermediary of push rods mounted in brass guides bolted to the top half of the aluminum crank case. The push rods are provided with flat bases serving as cam followers.

The crank shaft is a drop forging and is made with a solid flange, to which the flywheel is bolted. It is mounted in five bearings, consisting of split bronze bushings clamped between the upper and lower half of the case. The pistons are fitted with three eccentric diagonal joint rings. The connecting rods are nickel steel forgings of I section, with a bronze bushing at their upper end and a half bushing and removable cap held in place by four bolts at the lower end.

The carburetor is a 1906 Holley with supplementary air valve, and is located in a low position at the right hand side of the engine. It connects by a vertical aluminum standpipe and manifold to the four inlet valves. The standpipe contains a sliding throttle valve, which connects both to a hand lever on the steering wheel and to a foot accelerator. The gasoline is carried in a 20 gallon galvanized iron tank under the driver's seat at the right, the bottom of the tank being one foot above the inlet to the carburetor, so that there is plenty of head on the carburetor and the pressure of feed does not vary materially from full tank to empty tank. There is a shut off valve with strainer provided at the bottom of the tank.

The jump spark ignition plugs are screwed into the brass plugs over the inlet valves. The ignition current is fur-



BERKSHIRE ENGINE, INLET SIDE.

nished by a double three cell storage battery in a box carried on the right hand running board. A Pittsfield quadruple coil is carried on the dash, and is provided with a three point switch, by which it may be connected to one or the other of the two batteries as desired. A Lacoste internal roller timer is carried at the top of a vertical shaft that is driven by mitre gears from the rear end of the inlet cam shaft. The time of spark is controlled by a lever on a stationary sector on the steering wheel, the ignition lever being the upper one of the two levers mounted on this sector. The high tension ignition cables are carried through a fibre tube rigidly supported from the engine.

A Briscoe cellular radiator with a small aluminum blade fan behind it is mounted upon the front of the frame. The fan is mounted on a ball bearing on a bracket secured to the engine, and is driven by the spring belt from the engine crank shaft. A centrifugal pump is carried at the left side of the engine at the middle of the length thereof and driven through a long, small diameter shaft from a small enclosed spur gear in mesh with the exhaust cam gear. The water is drawn from the bottom of the radiator by the pump and is forced by the pump through a brass manifold into the bottom of the jackets of all the cylinders; it returns from the centre of the head of the jackets through a manifold made of brass fittings to the top of the radiator.

The oiling system is based upon the continuous circulation principle, although all parts are also oiled by splash. A gear oil pump is mounted at the lower end of a vertical shaft driven by mitre gears from the rear end of the inlet cam shaft, this oil pump shaft being in line with the commutator shaft, and the driving pinion being the same for the two. The oil pump draws the oil from a comparatively deep well



BERKSHIRE CHANGE GEAR WITH COVER REMOVED.

formed in the lower half of the crank chamber, and forces it into a one gallon vertical copper tank secured to the dash under the hood. This tank is of substantially cylindrical form, the side attached to the dash being slightly flattened. As the oil is forced into this tank by the pump an air pressure is created, which forces the oil out through the five leads from the tank to the five crank shaft bearings, the crank shaft being drilled to lead the oil to the connecting rod bearings. The crank chamber is provided with the usual gauze covered vent pipe.

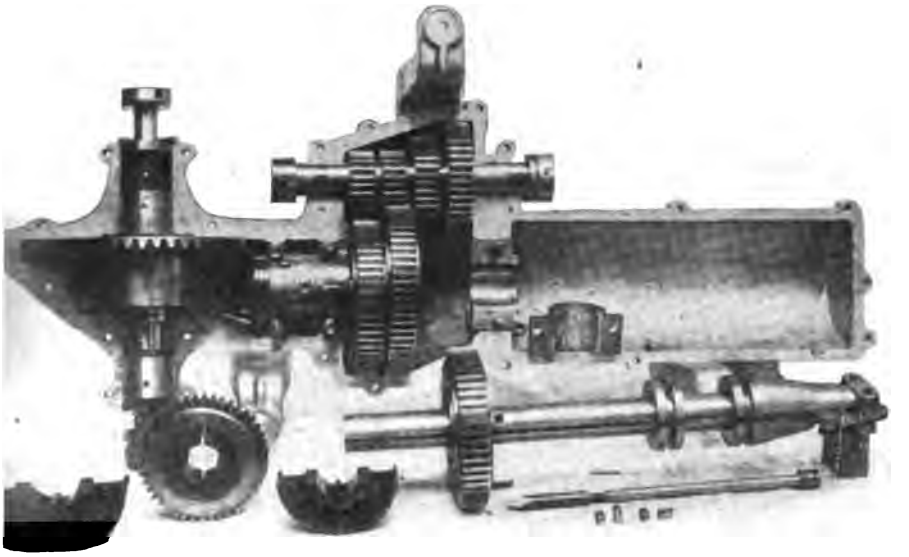
The clutch consists of an inverted cone and a female cast iron cone bolted to the flywheel, the clutch spring being enclosed between the clutch cone and the flywheel. The aluminum cone is bolted to a bronze center carrying the shifting collar. The clutch connects to the change speed gear by a universal coupling consisting of a square broached sleeve and squared shaft ends with curved faces.

The Berkshire transmission is of the internal individual expanding friction type. The live shaft upon which th gears are keyed is always in m the engine. These gears are i mesh with those on the secon which are each provided with a tion over which the ring gears volve. A sliding shaft pass these frictions, which is provid internal and longitudinally mov operated in and out by means cone which opens and closes fingers, the ends of which move forward and backward. As t forced in four small pins are ward from the periphery of shaft, thus opening the friction ing the car. To change the shaft is moved under the other the same operation is repeated verse is accomplished by an i idler. The change speed ge compactly enclosed in two-p num housing, which by mean arms on the lower half is su the subframe. Enclosed in the with the change speed gearing a driving gears and the spur pi ential. The bearings of the c shafts are plain bronze bushed of the jack shaft are of the ball bearing type. The bearin gear case are lubricated by m compression grease cup on the A sheet metal pan extends und engine and gear case, being fast subframe, and additional sh pieces between the main and sub tirely enclose the engine space derneath. The drive to the rea by 1 inch pitch, 5/8 inch roller

The frame is made of presse is narrowed in front and carrie elliptic springs at both ends. T a wheel base of 100 inches and tread. Both axles are solid f circular section in the middle at the ends where the sprin tached. Both sets of brakes rear wheel hubs. The foot bra of steel bands, which are con the steel drums by means of a anism. The emergency brakes,



BERKSHIRE ENGINE, EXHAUST SIDE.



PARTS OF BERKSHIRE CHANGE SPEED GEAR.

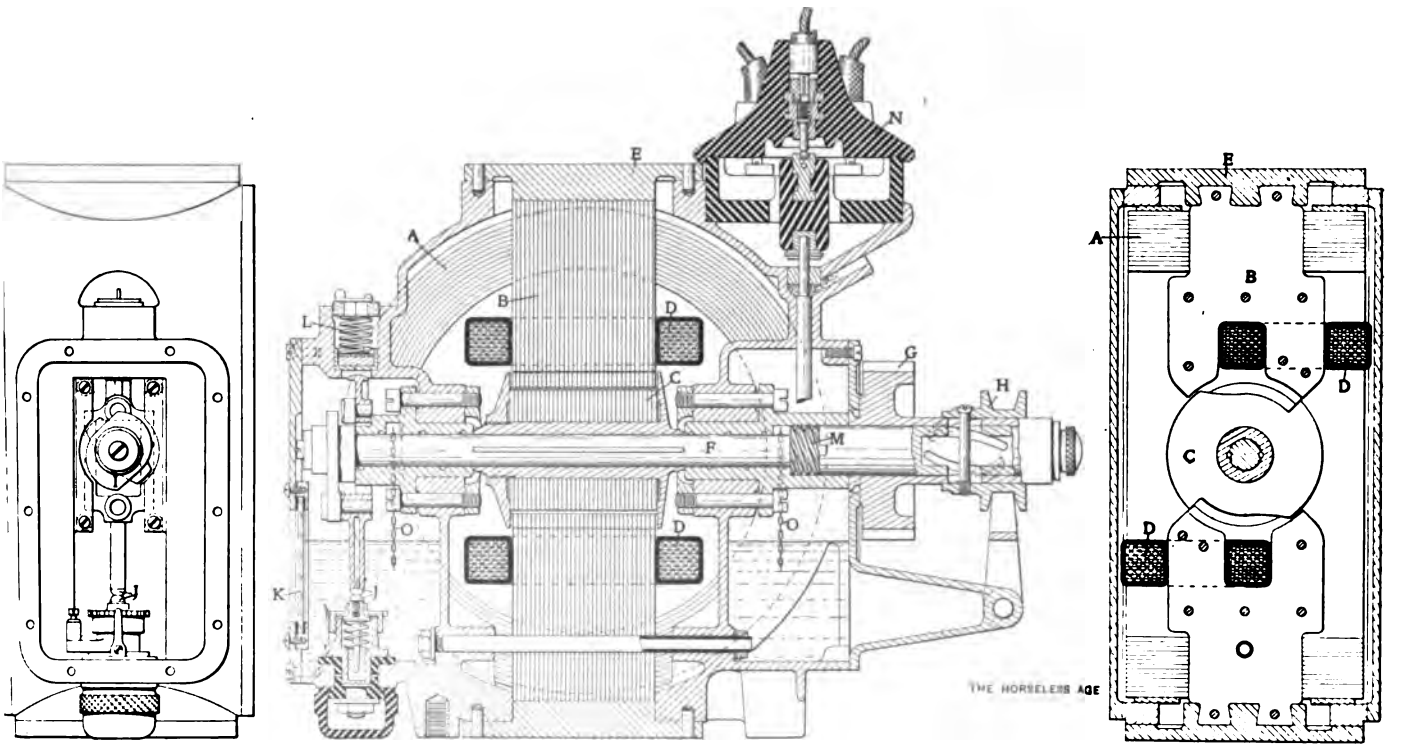
rated by a lever, act on the inside of same drums, consisting of a pair of ı actuated bronze expanding tubes.

'he car is steered by means of a worm l sector irreversible gear, with a 20 h mahogany rim, bronze centre steering eel on top of a steering post with a pol- ed brass casing. The connecting rod, well as the tie rod of the steering gear, tubular, the former being provided with l and socket joints, and the latter locat- in front of the axle. The steering ots are of the Lemoine type. The ıeels are 30 inches in diameter, with 3½ :h tires, and are mounted upon roller bearings. The car is fitted with a cast aluminum curved dash, upon which are mounted only the spark coil and the grease cup for the lubrication of the change gear bearing. The body is of the side entrance type and is designed to carry five passengers. It is of laminated wood construction and upholstered in leather.

The Le Pontois Magneto.

Dr. Leon Le Pontois, of 52 Broadway, New York, has invented a magneto for gasoline engine ignition which deviates considerably from current practice in this line. The magneto generates a low tension alternating current in stationary coils operating on the induction alternator principle. At the moment of maximum induced tension the armature circuit, which is until then short circuited, by a contact maker of special design, is thrown onto the primary winding of an ordinary nonvibrator induction coil, whereby a high tension impulse is produced in the secondary winding. In the case of a multiple cylinder engine the high tension impulses or sparks are distributed in succession to the spark plugs in the separate cylinders.

A striking deviation from conventional practice in the construction of the magneto is represented by the field structure. The permanent magnets are built up of two coils of flat manganese steel ribbon, which are placed at some distance apart and have the pole pieces of laminated steel discs clamped between them at opposite points on the circumference. The field core is magnetized by being placed in the field of a large permanent magnet, which produces poles of opposite sign at opposite points of circumference. The stampings for the pole pieces are made with large square notches slightly to one side of the centre, into which notches are let the armature coils, of which there is one for each pole piece. In this manner only a portion of the total magnetic flux passes through the armature coil and the rest is shunted around it in certain positions of the rotor. The object of providing this magnetic shunt is to protect the permanent magnet against demagnetization in case of an open magnetic circuit, which would occur if the rotor



CIRCUIT BREAKER. LE PONTOIS MAGNETO. TRANSVERSE SECTION.

A, field magnet; B, pole piece; C, rotor; D D, armature coils; E, magneto housing; F, rotor shaft; G, driving pinion; H, sliding collar for timing; I, contact breaker cam; J, contact points of contact breaker; K, window allowing to observe spark at contact breaker; L, contact breaker spring; M, worm gear for driving high tension distributer; N, high tension distributer housing; O O, chain oilers of magneto shaft.

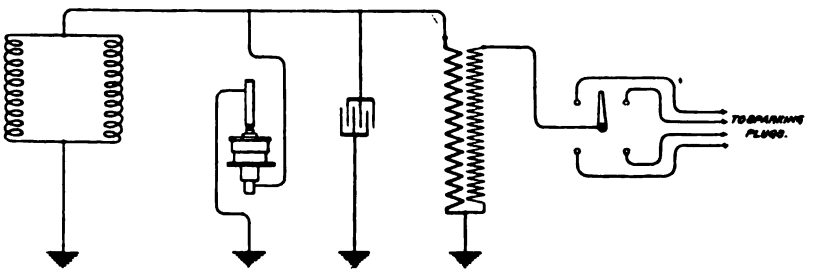


DIAGRAM OF CONNECTIONS OF LE PONTOIS MAGNETO.

should stop in a certain position. In addition the magnetic shunt admits of a greater rate of change of flux through the coils and results therefore in a stronger inductive effect. The rotor consists simply of a core built up of circular discs of sheet iron from which circumferential portions have been cut away. The cut away portions are of such form that the reluctance of the magnetic circuit through the armature coils increases very suddenly and decreases very slowly. This leads to the generation of two alternating current waves of different values, the more important wave having a magnetizing action, thus tending to preserve the strength of the permanent magnets, and even increasing it.

The two armature coils are stationary, and no sliding contact is required for collecting the armature current. The two coils are connected in parallel, one of the junctions being grounded and the other junction being connected to a contact maker, the other terminal of which is also ground. The coils are also connected to a condenser and to the primary of an induction coil, the condenser and induction coil being also grounded, so that the contact maker, condenser and coil primary are all connected in parallel. The contact maker is of unusual construction. It consists of a vertically reciprocating slide positively actuated in guides by cams on the magneto shaft, and provided at its lower end with an iridium contact in line with other iridium contact supported upon a coiled spring in a fitting insulatingly supported in the housing of the magneto. The break occurs between the two iridium contacts, which are submerged in oil. A downwardly extending pin on the lower contact extends into a mercury cup, by which means sliding contacts are done away with.

In the drawings the armature is shown in the position of minimum magnetic flux through the armature. As the sloping face of the notch in the rotor approaches that portion of the pole piece which passes through the armature coil, the magnetic flux through the armature coil increases very gradually, while as the straight edge of the notch recedes from the pole piece, the flux through the armature coil decreases very rapidly. The current induced by the decrease in magnetic flux is therefore by far the stronger, and this current is a magnetizing current, tending to increase the magnetic strength of the magneto.

At the time the maximum electromotive force is induced in the armature coils they are short circuited through the contact maker, so that a very strong current flows in the coil. This current itself tends to further increase the electromotive force induced. The circuit is then suddenly interrupted in the manner already described, and the current is thrown into the primary of the coil, and an impulse is thereby produced in the secondary of the coil which is distributed to the different spark plugs. The condenser is proportioned to counterbalance the self induction of the primary winding of the coil so as to insure electrical resonance.

The high tension distributer consists of a cylindrical chamber of insulating material located on top of the magneto, and its central rotating part is driven from the magneto shaft by means of helical gears at the short vertical shaft. The time of ignition can be varied by means of a sliding sleeve, with a pin passing through the centre of the armature shaft, and varying the angular relation between the driving pinion and the shaft. The pin passes through a spiral slot in the wall of the driving pinion hub and through an opposite spiral slot in the shaft of the magneto. An advance of 110 degrees on the magneto shaft is obtainable. The magneto is entirely encased in a metal housing, and is provided with ring self oilers.

Collapsible Metal Funnel.

R. E. Brown, of Cleveland, has placed on the market a new patent collapsible metal funnel made of heavy brass, 5½ inches wide at the top and 1 inch at the bottom, and with a height of 6½ inches when open. When not in use it is allowed to collapse, and is placed in a brass box with tight fitting cover, which always keeps the funnel free from dust and dirt. It is fitted with a strainer which separates the troublesome dust and small particles from the gasoline purchased while touring. It requires no adjusting, but is ready for use when lifted from the box by the handle.

Johnson Nickel Steel Castings.

Isaac G. Johnson & Co., of Spuyten Duyvil, N. Y., are now producing, in addition to their ordinary steel castings, cast nickel steel, for which extraordinarities are claimed. Both large and castings are made of this metal, the feature of which is its high elas which renders it particularly suit automobile construction. This steel count of this quality of a high elas can be subjected to very severe stra shocks before it will begin to bend way. The nickel steel can be rea hardened and be welded without di it is claimed. Below we give som made on the material used for thes ings, furnished us by the manufac

PHYSICAL RESULTS PER SQUARE INCH.

	Tensile Strength.	Elastic Limit.	Elongation Per Cent. R.	Of Area Per Cent
Test No. 1	78,255	53,240	27.5	44.2
Test No. 2	84,534	58,368	27.0	44.4
Test No. 3	79,765	55,197	28.5	47.2
Test No. 4	87,717	50,227	25.0	42.1
Test No. 5	80,759	55,197	27.0	46.6

New Metal Polish for Automob

The Utility Company, of 231 Gree street, New York city, have recently upon the market the Utility meta powder, which is used for polishing parts of automobiles. The manufa claim that polish in this form is e carry around, while at the same time more effective than the liquid polish free from acids or ammonia. The p is made from a California deposit, to is added a very small amount of a oil; it is then ground into powder a up in boxes for the market. After gasoline is added the polish is ready applied.

New Incorporations.

The Morristown Garage Company, ristown, N. J.—Capital, $50,000. Inc rators, Thos. Reid, John V. Wise and ander Reid.

The Automobile Company of Pa Passaic, N. J.—Capital, $15,000. Inc rators, Alfred B. Watson, Samuel J. son and Edwin M. Squires.

The Napier Automobile and Garage C pany, Los Angeles, Cal.—Capital, $ Directors, J. A. Clairmonte, Frank A Donald and Frank K. Rule.

Brockton Auto Exchange, Brock Mass.—To buy and sell automobiles. C tal, $5,000. Officers, Fred E. Smalley, p dent; M. H. Bates, treasurer.

E. L. M. Auto Company, Springfi Mass.—To manufacture automobiles. C tal, $15,000. Directors, President, Harry Elkins; treasurer, Harry Medcraft.

Kirchdorfer Automobile Company, L ville, Ky.—Capital, $20,000; debt n $10,000. Incorporators, Joseph C. Kir dorfer, Edward Kimmel, F. S. Clark.

The Holmes Motor Company, Gree Conn.—To manufacture motors. Cap $20,000. Incorporators, Chas. E. Whee Wm. K. Holmes, Jr., Henry A. Holmes B. L. Holmes.

MUNICATIONS.

Two Cycle Patent Situation.

or HORSELESS AGE:

the article by F. W. Barker, on page he makes a very good account of the tion in a general way, and while he may ight in conclusions from certain stand-ts, I wish to save your readers from g deceived by the article. In the first it is absolutely essential in a two cycle ie that the exhaust port open in advance he inlet port. Second, unless I am rously mistaken, what an inventor shows is application as well as what he claims reference in future applications. If were not so anyone could take ad-age of an oversight in an application, by differently worded claims procure a nd patent on an invention already pat-d. To all intents and purposes this is Joseph Day claims to have done in Cock patent which was applied for after Sintz patent was issued. Now as to Swiss patent to Sohnlein, the effective of this patent as a reference is at least arly as its publication, or the second of March, 1892, when it appeared in the s "Patent List." A careful investiga-I have made shows that Sintz cannot e completion of his three port engine to the publication of this patent to lein, which is a complete anticipation ith the Sintz and the Cock patents. less the courts rule otherwise, and this oubtful in the face of past procedure, er the Sintz nor the Cock patent is , and the three port engine is open to ublic. E. W. ROBERTS.

ince of Four Cylinder Engines.

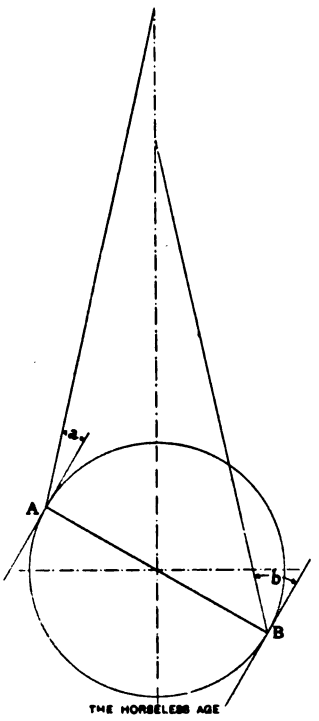
r HORSELESS AGE:

n you inform me whether with a four der engine of the usual construction, g a four throw crank shaft, there is an ciable vibration due to the inertia of ystem when rotated 200 to 300 revolu-per minute by an electric motor belted wheel?

th carefully adjusted pistons and con-g rods of equal weight, and the fly-in balance, can it be demonstrated matically that there is no unbalanced a effect at all?

E. MALLINCKRODT, JR.

a four cylinder engine properly con-ed, with all reciprocating and revolv-arts perfectly balanced, there is still balanced inertia effect, which is due e fact that the two pistons near the end of the cylinders do not travel as as the other two pistons, near the end of the cylinders. When the is in the upper dead centre position iston is at rest for an instant. As the passes on the piston gains speed, and attains its maximum speed when the connecting rod and crank arms make a right angle with each other, which is at less than 90 degrees of crank motion from the upper dead centre. The angle is the smaller the shorter the connecting rod, and with an infinitely long connecting rod it would be 90 degrees. With a connecting rod twice the length of the spoke or four times that of the crank arm it is about 76 degrees (the cotangent of which is .25). Beyond this point the speed of the piston decreases, and in the lower dead centre it becomes zero again. Now, it is directly obvious that if the piston gains a certain maximum speed in 76 degrees of crank revolution and loses this speed during the remaining 104 degrees of a half turn of the crank, its acceleration must be greater during the first portion of the downward stroke than during the last portion, and at any angle of



piston movement from the top dead centre the rate of motion of the piston is greater than at the same angle from the bottom dead centre.

The effect can also be shown graphically. Referring to the diagram, the motion of the piston pin at any instant is in the direction of the tangent to the crank circle at that point. In order to find from the crank pin velocity the piston velocity, the component of the crank pin velocity in the direction of the connecting rod must first be found. Now, it can readily be seen that the tangent to the crank circle at A makes a much smaller angle (a) with the connecting rod than the angle (b) of the tangent to the crank circle at B with the connecting rod to that pin. Hence the component of the piston motion along the connecting rod to pin A is much the greater. As both connecting rods make the same angle with their respective piston centres, the piston velocities are proportional to the velocity components along the connecting rods. The speeds of both pistons are equal when the crank stands at right angles to the piston centre lines. The result is that there is an unbalanced inertia impulse four times per revolution of the crank.—ED.]

Re "Shock Absorber."

Editor HORSELESS AGE:

It appears from statements made to the trade and from certain litigation, instigated by the Hartford Suspension Company, that said firm claims proprietary rights to the above phrase as a trademark.

A client of mine who is manufacturing a shock absorbing auxiliary spring suspension for automobile bodies has been notified by the attorneys for the Hartford Suspension Company to refrain from using the words "Shock Absorber" in his descriptive circulars, etc. The claim set up is so absurd that those familiar with the law will treat it with contempt, but for those of your readers who are in doubt the following facts may prove interesting:

According to the statute:

"No mark which consists merely in words or devices which are descriptive of the goods with which they are used, or of the character or quality of such goods, shall be registered under the terms of this act."

The intent of the law is that no person or concern shall hold the exclusive right to the use of words which may properly be used to describe the goods.

If the Hartford Suspension Company was the first to bring out a device for absorbing shocks created in a vehicle, they are entitled to credit for the innovation, and, as pioneers and good business men, should get a fair share of the business.

The principle of shock absorption is not patentable, so the Hartford Company cannot expect to monopolize all the friction devices, auxiliary springs, dashpots, fluid cushions, air cushions and other devices for absorbing shocks; therefore they should not expect to control the most descriptive words in the English language which can be applied to such means.

In a parallel case, L. H. Harris Drug Company vs. Stucky, Circuit Court, W. D. Penn., where the words "Cramp Cure" were laid claim to, Judge Reed said in his decision:

"No one can claim protection for the exclusive use of a trademark or trade name, which would practically give him a monopoly in the sale of any goods other than those produced or made by himself. If he could the public would be injured rather than protected, for competition would be destroyed. Nor can a generic name or a name merely descriptive of an article of trade, of its qualities, ingredients or characteristics, be employed as a trademark, and the exclusive use of it be entitled to protection." Canal Co. vs. Clark, 13 Wall., 311; Lawrence Manufacturing Co. vs. Tennessee Manufacturing Co., 138 U. S. 537, 11 Sup. Ct. Rep. 396. "The general prop-

osition is well established that words which are merely descriptive of the character, qualities or composition of an article, or of the place where it is manufactured or produced, cannot be monopolized as a trademark."

If the courts were to sustain the words "shock absorber" for shock absorbing devices, we might expect others to lay claim to such terms as "Water Cooler" for radiators, "Exhaust Silencer" for mufflers; "Tire Protector" for puncture proof shoes, etc. In fact a large portion of the dictionary would in time be appropriated by dealers in all kinds of goods, so that peaceable citizens would have to use a foreign language in describing their wares for fear of suits for infringement. F. W. BARKER.

Gear Ratio Query.

Editor HORSELESS AGE:

I am planning a new transmission gear to give three speeds ahead and one reverse, the high speed to be direct. Will you kindly give me the proper ratio of gear for the two speeds ahead—that is, assuming the engine speed to be 400 r. p. m., how many revolutions should the jack shaft make for the low speed, and how many for the intermediate speed? The high speed being a direct drive, the jack shaft would, of course, turn at 400 revolutions per minute when this speed is used.

Are three speeds ahead sufficient for large touring cars, or would four speeds be more desirable? What is the present tendency in the construction of transmissions for touring cars? Is it toward three or four speeds ahead? Is it not true that the horse power of all cars has been so largely increased that a three speed transmission is all that is desirable? A SUBSCRIBER.

[From some data on transmission gears gathered by us about a year ago we found that the average ratio of the high speed to the low in three speed gears is 3:2, and the average ratio of the high speed to the intermediate 1:6; in other words, the intermediate speed is just twice as fast as the low speed.

The present tendency is to use four speed gears for the very largest and most powerful cars, and three speed gears for all ordinary touring cars. Whether a three speed transmission is all that is desirable is a matter of opinion, and depends to a considerable extent upon the circumstances of individual cases.—ED.]

Automatic Carburetors.

Editor HORSELESS AGE:

On page 37 of your Engineering Number Mr. Landau states "that the first practical suggestion of the up to date automatic carburetor was made by Messrs. Bradley & Pidgeon in 1902." It seems to me that this date must be wrong, for it is my recollection that a patent issued to me January 1, 1901, on a form of automatic carburetor was not very broad, because the device shown was not broadly new, and certain it is that Duryea engines were operated by mixing devices employing a nozzle and a float for maintaining the relation of the gasoline level to the nozzle in the winter of 1896-7.

CHARLES E. DURYEA.

[The term "automatic" is here meant as referring to the use of a compensating air valve. The float feed dates back considerably further, and, if we are not mistaken, was also first suggested by Bradley & Pidgeon, although at one time Maybach claimed to have a basic patent on it in England.—ED.]

Four Cylinder, Two Cycle Crank Shafts.

Editor HORSELESS AGE:

Will you kindly give in your valuable journal a sketch of a four cylinder, two cycle motor crank shaft, showing the best way to arrange it for the explosions, both in the vertical and horizontal types? Which type of engine would have the best balance?

ARTHUR HENDEY.

[In a four cylinder two cycle motor it is desirable to have the explosions come at

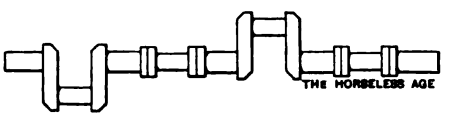


FIG. 1.

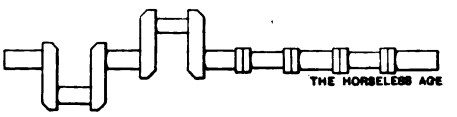


FIG. 2.

equal intervals, and also to have the reciprocating parts in perfect mechanical balance. Both of these features cannot well be combined in one engine, and as we believe that it is most important to have the explosions come at equal intervals, so as to obtain the most uniform torque possible, we should design the crank shaft to give equally spaced explosions. This simply requires that the four cranks be set at quarters. The cranks could still be arranged in two different ways, as each pair of outer cranks can be either at right angles or opposite. The two methods of construction are represented in Figs. 1 and 2, respectively. Of these the construction shown in Fig. 2 is, in our opinion, the preferable one, as the two pistons, which move simultaneously in opposite directions, are closer together, and the two motions, therefore, more nearly neutralize each other. To perfectly balance each other the two pistons should be in line with each other.

On an automobile the horizontal engine, especially if placed with its cylinders lengthwise of the car, will probably give rise to the least vibration, for the reason that the vehicle springs do not "give" or yield as easily in a horizontal plane as in a vertical plane.—ED.]

Wants Algebraical Instruct

Editor HORSELESS AGE:

Inasmuch as a technical automob cation is now being sought by all and a great many are reading carefu that is written in your journal and to understand the technical articles, it not be a good plan to give over pages to the benefit of those of you ers who cannot solve the algebraic pr which are so often used, educating th solving these problems? I believe did this and put everything into one there would be a tremendous sale in number, and it would be still in dema years to come. W. Y.

[As there are a large number of ex text books on algebra and other bra of mathematics to be had, there is no sity for dealing with pure mathema our columns.—ED.]

Views of a Kicker.

Editor HORSELESS AGE:

It seems so queer to me, when I loo the various types of automobiles, tha of the makers continue so persisten trying to build a car with some queer feature, when the popular cry is for ardization. Why the extreme inconsis of the steam car idea? They have twice as much gasoline to make the to propel the car. Why not use gas directly? A steam car is flexible and quietly and smoothly, it is true, but s the four cylinder gasoline car as now Then there are the heat under the seat particularly, the time to get up the danger of gasoline so near a flame the ten thousand complications, the quently burned out boilers, so that it all in all, it is the freakiest freak pie machinery for modern days I know any about.

And the air cooled engine is almos ridiculous—what on earth is the objec the air cooled engine, anyway? It is expensive to maintain, it does get hot burns out, it does explode prematurely all for what? Nothing but to meet freak ideas. Some men always hang stick to old, obsolete ideas and prac can't enthuse on progressive ideas. It patent to the great majority of well balan minds that the water cooled gasoline en (water costs nothing, and a proper solu does not freeze) is the most perfect mot power of the age, that it seems strange body should hang on to the old, incon ent, impracticable notions as they do.

There are dozens of good cars on market that are not yet wholly perfect, could be so easily made wholly perfect—will stick to the old, foolish method placing the gasoline tank at the rear depend on a pump, and thus mar the ne ness of a perfect car he could so easily ha Another will stick to the old individu clutch, two speed transmission or the fool planetary system, and thus spoil

:rwise good car. We are glad to see so
ıy of the bright, progressive, up to date
ıufacturers working toward the proven
best devices and practices and working
ard standardization. By standardiza-
we mean four water cooled cylinders,
ing gear, three speed transmission, roller
·ings, etc. In a few years such cars only
command a sale. KICKER.

'he Automobile Show Question.

tor HORSELESS AGE:

he attendance at the Madison Square
den Automobile Show this year was
y 90 per cent. greater than that at the
w of 1905, an impressive attestation of
growing popularity of motor cars. The
:tion of automobile shows has, however,
erially changed. In years gone by the
ıufacturer was accustomed to put
)ugh one model car for exhibition pur-
:s, and if that met with favorable crit-
n he hurried back to his works and
ıpleted the product as rapidly as possible.
s process was unbusinesslike and a det-
ent to both makers and users, because
former must of necessity hurry deliv-
s in order to forestall cancellation, and
latter were apt to get hold of a model
had been hurriedly inspected, and the
ıble arising from that one machine re-
ted on the reputation of the entire out-

his year manufacturers had gone ahead
ı the production of new models before
show opened. Some of the well known
ı had been demonstrated for weeks. We
ıll one case of a 1906 car that had been
:essfully run over 12,000 miles without
lacements or repairs, before one of its
s was exhibited in the Madison Square
'den. In point of fact, agents of this
cern had placed large orders for these
ı before January of this year.
.s a natural consequence, the exhibition
New York became a dealers' show rather
ı a manufacturers' show, though the
:ers paid the bills. We don't mean by
that there was a failure in making
s directly to the agents during the show
k, but everywhere it was noticeable that
general trend of affairs was for dealers
ıring in individual customers, show them
points of vantage in new models and
e with them in the way of a definite
: for delivery and specifications for
ipment.
he public are pretty well educated in au-
obile construction, so that the prospect-
customer is sure to ask some pertinent
ıtions worthy of a clear and satisfactory
wer, and should the reply be evasive, he
)mes suspicious and desirous of looking
where.
his general knowledge of motor cars on
part of the public is of mutual ad-
tage to all concerned. It enables the
ıufacturer to feel the pulse and require-
its of motordom, and it puts the users of
ı in a position where they will handle
machine in a rational way, thus avoid-
many of the inexcusable difficulties which were experienced by laymen during the first year or so of the present industry.

With the demand constantly increasing and the general interest throughout the country keeping pace with the advance, the question arises, what is to be the future of the great automobile shows? Personally I believe it would be well for us to have a national exhibit in New York city and to do away with, or localize, all other shows, because the expense to the manufacturer of exhibiting in various places during one season is out of proportion to the benefits to be gained in this way. It has occurred to some of us that the problem may possibly be solved in a satisfactory way by having an opening day, as we did when the bicycle was so much in vogue. On the 22d of February wheeldom was awake to the importance of studying new models, and clubs, parties and individuals went from store to store on Bicycle Row, in the various cities of the country, to see what the makers had to offer for the coming season. Why wouldn't this plan solve, for all points outside of New York, the question of local exhibits?

There never was a time, since the beginning of the industry in America, when there were so many good automobiles on the market. There never was a season when it was so difficult for the outsider to get into the automobile business. This fact is well illustrated by the strong and healthy demand for cars of reputation, and the exceeding great difficulty in selling such automobiles as are produced by concerns which have not heretofore demonstrated their ability to produce motor vehicles of value.

ROBERT L. WINKLEY.

Manner of Operating Control Levers.

Editor HORSELESS AGE:

Being a reader of your journal, I would like to ask you how to properly control the speed of a motor car by means of the spark and throttle levers. What I wish to know is this: Suppose you are driving a car at 10 miles per hour and wish to speed it up to 20, 30 or 40 miles per hour, which lever do you advance first, the spark or the throttle? In slowing down which do you draw back first? How can you tell when you are not advancing or retarding the levers right?

H. H. S.

[In speeding up a car by means of the throttle and spark, the throttle is opened first and then the spark is advanced, and in slowing down the car the spark is retarded first and then the throttle closed. When you are going at a slow speed and advance your spark much in order to increase the speed, the engine will begin to hammer, as with the small charge drawn in by the cylinder the power developed is not sufficient to allow the engine to run at a high speed, and consequently the ignition occurs prematurely and causes knocking. On the other hand, if you first open the throttle, the engine will speed up, owing to the greater amount of charge received; this calls for an advance of the spark, and when the spark lever is advanced the engine speed will still further increase.—ED.]

Information Wanted.

Editor HORSELESS AGE:

Can you or any of your readers tell me the best thing to put on a Fisk tire rim to prevent it from rusting? I thought of using shellac, but fear it might stick the tire to the rim on a very hot day. One person told me that aluminum bronze would be all right. I am anxious to find the best thing for the purpose. ENQUIRER.

[We have heard shellac mentioned as the proper thing to apply to rims to prevent them from rusting, and do not believe that you would experience any trouble from sticking of the tire to the rim. Perhaps some of our readers can throw some light on the effectiveness of aluminum bronze or some other rust preventive material.—ED.]

Editor HORSELESS AGE:

Can you tell me where a 10 horse power, double cylinder, opposed horizontal, air cooled motor is manufactured and sold? Also where "Stevedore" transmission rope can be bought or where it is manufactured?

A. J. EKANDER.

[We do not believe that there are any two cylinder, opposed horizontal, air cooled motors of 10 horse power manufactured at the present time. We do not know who manufactures the transmission rope referred to.—ED.]

Two Cycle Motor Bicycles.

Editor HORSELESS AGE:

Will you kindly inform me whether you have ever heard of anyone building a motor cycle with a two cycle motor? If not, I wish you would insert an inquiry in your next issue as to whether anyone ever tried this arrangement and what success he had. Also, will you let me know whether it would be possible to build a two cycle air cooled motor? A. N. B.

[We have seen several mentions of motor cycles equipped with two cycle motors, but are unable at the moment to give you any addresses. We remember having heard of one being built in California, and also know of one French air cooled two cycle motor specially built for motor cycles. It is perfectly possible to make a small two cycle motor air cooled.—ED.]

Wants to Buy American Wood.

Editor HORSELESS AGE:

Desiring to purchase American wood for millwright and all automobile body work, I should like to have the addresses of a number of dealers in wood in your country. I thought there would certainly be some of these among the readers of your journal, and therefore apply to you.

H. J. LAFORCE,
78 bis, Rue de Cormeille,
Levallois-Perr

OUR FOREIGN EXCHANGES.

Overheating in Gasoline Engines.

Perhaps one of the most troublesome ailments a gasoline motor can develop is that known as overheating. It may arise from many different causes, which, unless one is conversant with this type of engine, are not always readily to be diagnosed, and this difficulty naturally becomes proportionately intensified as the number of cylinders becomes greater.

Overheating may be classified essentially under two heads: general and local. The former will be manifested chiefly in a gradual falling off of power, a smoky exhaust, and an abnormally rapid evaporation of the cooling water; while the latter will show itself by irregular or premature firing, and even by the motor continuing to run after the ignition current has been switched off.

If the engine refuses to "pull" strongly—that is, to maintain its full power—the reason may certainly be looked for in overheating, assuming that the lubrication, firing and compression are as they should be. The cylinder, on becoming too hot, not only burns the lubricant, but reduces the effective capacity of the aspirating stroke by attenuating the ingoing charge from the carburetor, thus, in turn, directly reducing the power. Burning of the lubricating oil creates a smoky exhaust of intolerable odor, and, furthermore, brings about a clogging of the piston rings and valves with a hard deposit of carbon, rendering them all more or less inefficient, and tending in other ways to invite the presence of yet more of the ills that the gasoline engine is prone to contract. These effects of overheating are not, however, to be confounded with those of overlubricating, or of employing too rich a mixture, with which they are very similar so far as regards the burning, clogging and smoking; therefore, before making any conclusion, see that the engine has not too much oil in the crank chamber, and that plenty of air goes into the explosive charge. Where it seems that the mixture is too rich in spite of all that can be done in the way of opening the auxiliary air ports, etc., it may be found that the jet or sprayer in use is too large. With the former the size may be reduced by burring over the hole by tapping with a light hammer, and afterward reaming out to correct size; but in the case of a sprayer it is best to fit a spare one having fewer grooves. Another means of reducing the strength of the mixture from the carburetor is to replace the existing inducing tube surrounding the jet with a shorter one or with one of larger diameter, so giving a lower velocity of air, and, consequently, a weaker suction effect on the gasoline nipple.

In local overheating the cause may be looked for within the combustion chamber of the cylinder giving trouble. It will arise very probably in some chance particle of carbon or iron becoming heated and remaining incandescent in much the same manner as a piece of spongy platinum might do. Remove the spark plug and examine it. Should it be coated with carbon, brush it thoroughly with a stiff dry brush, and then with one dipped in gasoline. See that no sharp edges exist elsewhere than at the actual sparking points. Before replacing clean the plug hole by means of a piece of soft wood, working it around the inner edge well to remove any possibly adhering flakes of soot. If a rough burring is felt there, repair this omission of the makers by taking it off with a small hooked tool. Next lift the valve covers, and if anything is discovered having the slightest apparent connection with the object sought for, remove it effectually. Sharp corners and edges of every description should be carefully looked for and rounded off as well as can be done. Also keep a keen eye open for any loose particles that may have got into the cylinder. Indeed, if the engine is new, it should not be started up until thoroughly inspected and found free of "scrap." Motors have been received from the makers in which, glued by the oil put into them, borings, filings, grains of sand, etc., have been discovered, having presumably found their way there during the final handling after testing. Needless to say, anything of this nature must be scrupulously cleared away.

On completing the inspection and effecting what have appeared desirable, replace the plug and valve covers and try the engine. Probably it will now run satisfactorily; but should it not do so still, look again more closely for such faults as referred to, and do not forget that the top of the piston forms one wall of the combustion chamber.

As may be imagined, it is much more difficult to ascertain a cause for general overheating, since it may lie in anything from a slightly leaking pipe joint to a cracked water jacket or broken radiator, and from a mere dirty exhaust box to a worn or fractured exhaust valve cam or lift gear. The first will be shown obviously enough by an abnormally progressive shortage of water. Barring accidents, and with ordinary care, neither the cylinder jackets nor radiator can sustain damage calculated to bring about a serious leakage, so that the circulation pipes (they will be very short and direct in a modern car) may initially be attended to, and then the tank, if a supplementary one is carried, and the pump can be overhauled. In all probability it will be found that if any leakage at all occurs it is at the pipe joints. Usually they are made by means of short pieces of rubber tube or hose secured either by wire wrappings or band clips. Joints of this description deteriorate in a comparatively brief space of time, giving out around the clips or binding, and allowing water to escape. They are cheaply renewed, and ought never to be permitted to get into a really bad condition.

If, while no actual leakage is tected, water is, nevertheless, l and the engine overheats, doubtl culation is at fault. Water will lost by evaporation where the ci sluggish, and steam issuing fro will clearly indicate the state During warm weather, of cours not be easily observed, because may fail to condense into vis but there should be a circulatio to show what is going on. L joints again before doing aught rubber pieces mentioned have a strange tendency to constrict ing at their several layers, an then sagging inwardly, appearing mal on the outside. This, it wi virtually chokes the whole of system, and prevents water flowi the cylinder jackets as freely a do. When obstructions of thi found, the remedy is obvious.

Next to defective joints, th most likely to prove the delinqu able for bad circulation. Whatev it must give a vigorous current the water circuit, and be capabl taining, say, from 3 to 4 inch at least. Take it down, if nec repack or repair; but should i worn, entire renewal is advi "faked" pump may lead to dive none too enjoyable character. tion-driven off the flywheel, mak the friction wheel is in good ord it is held up to its work prope springs employed for this purp low of slip, and, unless the fact borne in mind, may constitute failure hard to account for and

If there should be reason to s some substantial obstruction has the pipes, these, too, must be t and cleared. It is not, perhap that either the pipe fittings or will become excessively coated unless after very long service of the use of extremely hard or In a case of that kind, however, be done to clear the waterways b a caustic soda solution in the pro caustic soda, 2 pounds; hot wate Make up sufficient to fill the wh system, and leave therein for ab hours. Drain off after the ex that time, and flush through water under pressure for a few wash away all sludge thrown do soda. It may be mentioned tha of the circuit made of aluminum protected at the outset from the the caustic soda.

The exhaust valve gear and c now be turned to and overhaule direction one of the most pote of overheating is a restricted ar valve and pipe section given the the first place—a fault happily no frequently met with in modern d was in the earlier days of the pe Should the engine be one in

es are pocketed, as is most likely to be ase, the area of the port leading there- into the cylinder ought not to be less exhaust valve area × 1.5. Of course, n existing engine nothing can be done large this port if undersized; but its s all the way around may be cleaned, thed and nicely rounded, so that the can pass with as little friction as pos-

e lift of the valve is all important, and be carefully noted if throttling is sus- d. In high speed engines it is not to lift the valve to its theoretically opening—i. e., diameter × 0.25—owing e difficulty there would then be experi- l in getting it closed with sufficient lity on the completion of the exhaust e. This, by the way, is one reason valves are, or should be, made so much r than at first sight seems needful; are but partially opened. Hence, since l lift is never employed, even in a new ne, it follows that the least wear be- n the foot of the valve and its lifting results in a more or less serious throt- of the exhaust. The hot gases, being le to escape, overheat the cylinder, un- the inlet valve is also mechanically ated, when they will clearly blow out, y by way of the induction pipe and uretor, which is bad indeed. All that be said here about this matter is that between the valve stem and its lifting anism must be taken up as it develops, rder that the valve may retain its orig- amount of lift. Thus, adjust the screw ided for the purpose, letting the clear- between it and the tail of the stem sure about 1-32 inch. This slight gap vs the tappet to attain a sort of flying ere coming into contact with the valve, h it then opens at maximum speed.

cheap engines cams are got out of t miserably poor material, and in some nces have even been put to work with- the least attempt having been made to len them. They have a strictly limited od of usefulness under such circum- ces, and replacement becomes necessary uite an early stage in the engine's ca- Look, therefore, to the cams, and their condition. When worth the ex- e and trouble of renewal, make the new s of tool steel, and harden them perfect- and finally mount on a new shaft of steel. The small rollers, with which tappets are sometimes furnished, may similarly renewed if desirable.

he valve gear being satisfactory, remove exhaust pipe and silencer if the cause of heating has still to be accounted for. pipe may be sooted and fouled so badly its sectional area is appreciably re- d. To clean it use a swab of cotton te saturated with paraffin oil and at- ed to a suitable length of stout copper . Passed through and through several es, it will clean the pipe in a very few utes.

should be practicable to take the ex- st box apart for cleaning, its many small apertures from chamber to chamber being naturally extremely liable to choke up. When taken adrift these holes can be readily cleared by means of a hard wire brush and petrol, stale spirit being used if economy is of any consideration. At the best of times silencers are rarely as large and efficient as they might be, hence should it be convenient to substitute another of more generous proportions than that removed, do so by all means, and the engine will run the better for the change. And while on the job it will not be amiss to fit a larger exhaust pipe, also bearing in mind that it is, to all intents and purposes, a part of the silencer itself.

Overheating due to unskilled or careless handling is, as a subject, outside the scope of these notes; but in closing it may be mentioned that an excellent axiom for a novice having the welfare of his engine at heart is, "Be liberal with air and sparing with oil." However, let the axiom, like the machine driven, be used intelligently.—*D. W. Gawn, in The English Mechanic.*

Enameling Motor Parts.

With the exception of a few bright or polished details, the steel parts of the mechanism of a car are best protected by a coat of black enamel, and the best of these enamels (which are put up in small stone bottles) are Jetine, Club Black, etc. They are probably as well known among motorists as they are by those who have passed through the cycling stage of self propelled locomotion, so that I need say nothing about them or their usefulness or suitability for the purpose. But those who have used them have, no doubt, frequently concluded that the effect was too nice and new and shiny; in fact, the result is so aggressive as to be objectionable from the point of view of appearance, and this fact has frequently prevented the use of enamel in places where, but for the vulgar newness and brilliancy of the polish, it would be of real value. But all that can easily be overcome. The metal work should first be cleaned with alcohol and then the enamel be applied with a soft camel-hair mop. And, by the way, any air bubbles that form may be ignored, because they will quickly disappear by themselves, but a little practice will result in a surface free from bubbles. The next thing is to allow the enamel to dry for a few minutes, and the length of time in drying, I find, is rather important. If the time has been too short, the next operation will rub up the enamel; if too long the gloss cannot be removed. By experiment I find that the time for drying should be from seven to ten minutes. Then take a pad of soft material—linen is best—saturate it with gasoline, having it thoroughly wet without any dripping, and, with an extremely light movement, go rapidly over the enameled surface. Anyone who has done "spiriting-off" in French polishing or who has seen it done will at once know what is required. The surface can be gone over again with the alcohol should any part have been skipped, and then it should be allowed to stand for a quarter of an hour or more. The result will be a surface of what I may describe as "old black," and it can be rubbed up with a selvyt or soft rag to a moderate or dull polish, which is an improvement and which has none of the aggressiveness of new enamel. The mechanism of a car always does credit to its owner with the black parts thus treated, the bright parts coated with Silico enamel and the aluminum kept spotlessly clean.—*"Magneto," in The Motor.*

The Art of Selling Automobiles.

An amusing work on "How to Sell Motor Cars" has just made its appearance in France. The transactions which take place between buyer and agent readily lend themselves to humorous treatment—but there is, in addition, about this book a degree of candor both rare and entertaining.

"Remember," says the author, "that your client is an enemy you have to defeat. English people look to the gearing, Germans to the engine, Americans merely consider the price. To an Englishman, therefore, you must speak of the robustness of the gears; to a German it is advisable to extol the virtues and excellence of the engine; to the American you need only say that the car is the costliest in the world." Here is another hint, the justice, or injustice, of which will appeal to many a buyer: "Promise everything and refuse nothing. The art of not saying 'No' is half the business of the successful salesman. For example, if a prospective buyer asks you in cold blood if the 10 horse power car will do fifty an hour, reply, 'Special conditions would be necessary,' or 'With that heavy body I rather doubt it.'"

Here is another gem: "Always offer credit to those who do not require it. In a transaction which is hanging fire, it is decisive and sure. Your candor convinces the buyer, and he pays at once." The compiler of this advice seems to have had much personal experience in the art of selling. "Dilate warmly on economy of gasoline consumption," he advises. "It is an irresistible argument, above all to very wealthy buyers, for they will often expend $500 willingly in order to save sixpence." "This," says the author, "is an axiom specially applicable to motoring."

The Races Committee of the Automobile Club of Great Britain and Ireland have definitely fixed the date for the Tourist Trophy Race. It will be run off in the Isle of Man on September 27. Some weeks ago rumor had it that the date would be some time toward the end of May, but presumably it has been decided to adopt the later date on account of the increased time thus given to manufacturers.

Auxiliary Gasoline Tanks.

Many motorists have at one time or another experienced the annoyance of being stranded on their cars in the open country with the fuel tank empty and with many miles between them and the nearest source of supply, while even more cautious drivers must now and again have wished that there were some device on their cars that would save them any anxiety on that score. Some owners of cars have even gone the length of having a second tank fitted to enable them to carry an emergency supply, but as often as not the desired effect is canceled in practice by habitually leaving both cocks open, while even if the auxiliary supply has been scrupulously kept in reserve, the gasoline is apt to become stale and almost useless by the time it is urgently required.

Our diagrammatic drawings show three alternative arrangements, all of which give equivalent results, the main features of Messrs. Soames and Langdon-Davies' invention being that the reserve supply is renewed with fresh gasoline each time that the main tank is refilled, and that some definite act is necessary on the part of the driver before the auxiliary supply can be used. In all these illustrations the letter A is employed to denote the main tank; B denotes the auxiliary reservoir; C represents the filling cap; D indicates the overflow from the reservoir to the main tank; and the letter E is used for that portion of the mechanism which enables the auxiliary supply to be fed into the main tank. The device shown in Fig. 1 is equally applicable either for gravity feed or for pressure feed to the carburetor, while that represented in Fig. 2 is more especially intended for a pressure feed system, and that in Fig. 3 is particularly applicable for gravity feed.

Referring to Fig. 1, it will be seen that the reservoir B lies immediately beneath the filler cap C, inside the main tank A, and that the row of holes D allows the gasoline to flow over into the main tank as soon as the smaller reservoir has been quite filled. When, subsequently, all the fuel has been drawn off from the main tank, the auxiliary supply will remain in the reservoir, because, under ordinary circumstances, there is no other communication between the two tanks than that through the holes D. But it will also be noticed that a valve E^1 is arranged in the bottom of the reservoir B, and that this valve can be opened by means of the rod E, which lies inside the cap C.

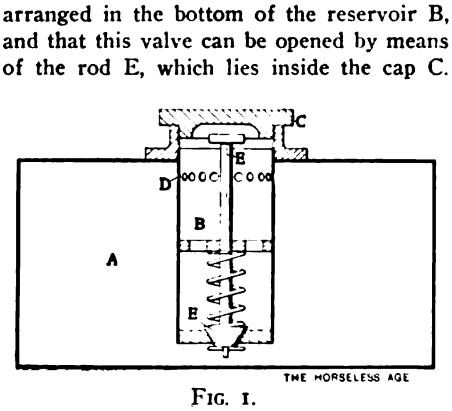


FIG. 1.

Thus it is only necessary to remove the cap C and raise the valve E^1 in order to transfer the reserve supply of gasoline into the main tank. It is neither possible to remove the valve E^1 bodily nor to leave it open, so that this device is practically proof against carelessness of any kind.

In Fig. 2 the filler C may be fitted some distance away from the tank, and the large connecting pipe C^1 enters the top of the reservoir B—which, in this case, is formed by a partition at one end of the tank A. The only connection between the reservoir B and the main body of the tank A is through the pipe D, which passes from the bottom of the former to the top of the latter. There is, however, a vent pipe D^1 which is led from the top of the tank A to the filler cap C, and this allows the air to escape when filling the tank. For filling, the entire cap C is removed; the gasoline which is poured in then flows into the reservoir, and—as soon as the reservoir is full—the gasoline overflows into the main tank. When, afterward, the pressure in the tank

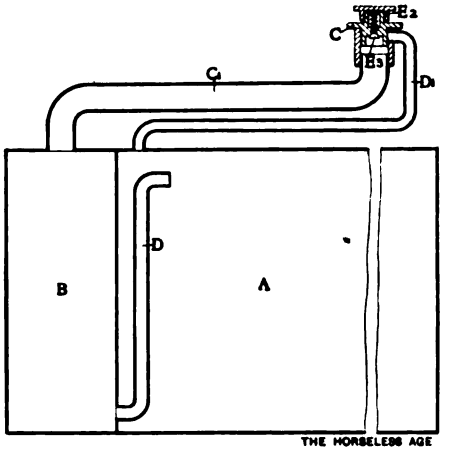


FIG. 2.

has fed the main supply of fuel to the engine in the usual way, the reservoir B still remains full, and this auxiliary supply can only be utilized by first transferring it into the main tank. By the device adopted for this purpose it is unnecessary to remove the filler cap C, the only operation required being that of pumping air into the reservoir B. This is done by removing the small cap E^2 and attaching an ordinary tire pump to the threaded nipple, when air can be forced through the valve E until the gasoline is displaced from the reservoir B into the tank A. As will be seen, the filler cap C closes the vent pipe D, and thus prevents the pumped air from entering direct into the main tank—an arrangement which is obviously essential.

In certain cases this device even enables the pressure to be retained in the tank while transferring the auxiliary supply of fuel from the reservoir to the tank, but on most gasoline cars, of course, the pressure would be lost through the carburetor immediately after the main tank became empty. In connection with this design, if it is used for a gravity feed system, the vent pipe D would have to be replaced by an ordinary

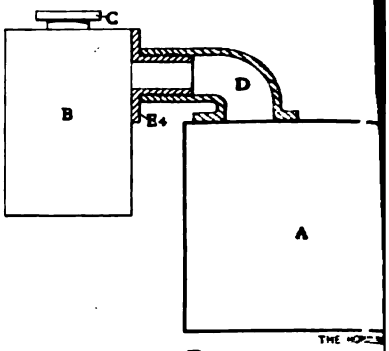


FIG. 3.

vent orifice communicating with the phere.

Comparatively little need be said to explain the device shown in Fig. in this instance the reservoir B is tinct from the tank A, and is me nected to it in such a way that turned upside down and its conte into the tank through the swivel gland if required) E and the pipe reservoir must, however, be turned way up for filling the tank, since cap C is fitted in its upper face, consequently impossible to fill the tank without first filling the reser goes without saying that the co pipe D may be of any required le that it must enter the upper portio reservoir.—*Automotor Journal.*

English Anti-Dust Experime

The Automobile Mutual Protectio ciation and the Roads Improvemen ciation, both of London, are takin steps to prove that dustless roads constructed which will involve less the rate payers than the present dust The joint committee of these two a tions which is dealing with the road e ment is arranging with the Kenty Council to experiment on a section London-Maidstone road, about a mile half in length, between Wrotham He Maidstone. This section will be into lengths of about 500 yards, whic be laid with different materials. The over this road is very heavy for a c main road. The experiment is *inten* provide an object lesson to all highw thorities, as showing the merits and d its of various materials. Isolated e ments have been carried out in variou of the country with dustless materia no two experiments have been made similar conditions, and, therefore, it possible to compare the results with gree of accuracy. This undertaking first definite attempt to treat the subje a scientific basis and to tabulate which will be of value to the whole wo

The members of the joint committe pose to inspect the road in person a early date, and in the meantime are ing arrangements to lay the three *foll* descriptions of road material: (a) K pflaster, a special system of random setts, largely adopted in Westphalia a

ily trafficked districts of Germany. Tarred slag macadam, a very hard slag ned only when a particular brand of iron is being run from the furnaces. Quarite, a patented preparation of tar istone broken and tarred when hot, and in certain definite proportions of va- sizes. This material was used for the cpool Promenade.

her materials will be laid if the com- e are satisfied that they will withstand y traffic. The sections of road at either of the experimental length were re- d by the Kent County Council last au- , and that to the east has been painted tar, so as to render the surface water- f. This will afford an excellent oppor- y to compare the relative dustlessness wear of the granite roads with that of xperimental materials.

New Motor Fire Engine for London.

1 February 3 last the London Fire ade made a final test of the latest addi- to the fire appliances of London before ig it over from the makers. This is a motor fire engine, named "Motor Fire ;, No. 2." It can travel 30 miles an on the level road, and 10 miles an up the steepest hills, while its pump- capacity is 500 gallons per minute. Fit- with double tires and a steam brake, the ne can be brought to a standstill within mparatively short distance. The pump- rials were carried out at the Southwark quarters, while to test the capabilities ie new motor on the road it was driven 70 mile trial by a circuitous route to hin, negotiating the steepest hills in l style. The trials, which were carried under the superintendence of Mr. Gor- the workshops' engineer of the brig- are said to have been in every respect factory. The motor has been built to order of the London County Council by rs. Merryweather, of Greenwich.

Automobile Instruction Plans Abroad.

ie Motor Union of Great Britain and nd during the past few months has giving a great deal of attention to the tion of the provision of training for anic drivers for motor vehicles. It approached the question from two ts of view: (1) to secure the provision roperly equipped workshops in which ical tuition can be given, and also (2) suppression of bogus "schools," which out promises of instruction and em- ment, and fail to give either.

regards the former, the Union has oached some of the more important ical education authorities, with a view scertaining what steps they have taken ie matter, and whether they are pre- d to favorably entertain proposals for ring some of the public money now ted to technical education for the pur- pose of the training of mechanic drivers of motor cars. Sympathetic letters and communications have been received on the matter from the London County Council and from the technical education authorities at Liverpool and Birmingham.

To Discourage Unofficial Trials.

The Automobile Club of Great Britain and Ireland is taking definite action, in conjunction with the trade, to discourage unofficial trials by preventing all cars taking part in such unofficial trials from entering or in any way taking part in any competition organized by or held under the auspices of the club—e. g., the international tourist trophy race. At the same time, the club is thoroughly investigating the question of cost of an entry for an official trial, with the view of reducing the fees, if possible, now charged for officially observing and granting a certificate for a long distance trial. The club points out to the prospective motor buyer that its certificate of performance is a simple and accurate record, and in no way comments upon the performance of the car. At the end of each day's run the car is delivered into the charge of the club officials, who thus have it under observation continuously.

German Automobile Legislation.

In the course of the debate on the estimates in the German Reichstag on February 9, Count von Posadowski, Minister of the Interior, informed the House of an ordinance passed by the Bundesrath dealing with motor traffic, and announced that a bill would be submitted to the Reichstag by which every individual driver would be made strictly answerable to the civil law in the case of accident. Whether personal pecuniary liability, Count von Posadowski continued, would be extended to collective liability in the case of companies would be left over for further consideration. Bearing in mind the extreme importance of automobilism, legislation must be undertaken with great circumspection and technical care.

International Automobile Congress.

The third international automobile congress is to be held at Milan, Italy, from May 24 to May 29, inclusive. The first two international congresses were held in Paris, in 1900 and 1902 respectively. The coming congress will be under the patronage of the King of Italy, and presided over by Frederico Johnson, president of the Italian Touring Club, and Silvio Crespi, of the A. C. of Milan. The programme is as follows: May 24, reception of members and arrival of competitors in the Gold Cup; May 25, opening of the congress; May 26, meetings of the congress; May 27, visit to the Lakes of Lombardy; May 28, meetings of the congress; May 29, closing meeting of the congress members and banquet to visitors.

Auto Accident in Fog.

During a thick fog in Paris on the morning of February 7, a resident of Versailles, M. Baoebouns, who was driving a motor car down the Cours la Reine, suddenly saw, a short distance away, a laundry wagon coming toward him. M. Baoebouns immediately attempted to change the course of the automobile, but owing to the slippery state of the road, the wheels skidded and the car crashed into the van. The latter was overturned, and its occupants, M. Meynard, his wife, and Mlle. Vandel, were thrown out. Madame Meynard escaped unhurt, but her husband sustained a fracture of the skull, while Mlle. Vandel was badly kicked by the horse.

Gas Engine Tests of Engineering Society.

According to the fifty-ninth annual report of the Institution of Mechanical Engineers (Great Britain) the gas engine research in connection with the two specially constructed large gas engines at the University of Birmingham is being carried on by Prof. F. W. Burstall. The effect of changing the compression, other things being constant, is now being investigated. Special arrangements have been found necessary for dealing with the high compression, and the presentation of the next report is therefore not expected during 1906. It is also intended to investigate the law governing the change of gas temperature at various points within the cylinder.

Resilient Wheel Trials.

Revised rules have now been issued for the trials of resilient wheels to be held in France under the auspices of *L'Auto* and the patronage of the Automobile Club of France. There will be two classes, one for ordinary wheels fitted with resilient tires (with the exception of pneumatics in contact with the ground), and the other for wheels in which the resilient medium is interposed between the hub and the felloe. There will be two sub-classes in each class, the first for cars weighing complete with passengers not less than 1,500 kilograms, and having an engine of not more than 314.16 square centimetres piston area, and the other for cars weighing not less than 1,800 kilograms, and having an engine with not more than 490.86 square centimetres piston area. The tests will extend over a distance of over 2,000 kilometres, and will be run in daily stages of 300 kilometres, the duration of the trial being nine days, allowing for one day's rest and possibly an exhibition. All repairs must be made by those on the cars, and an average speed of 30 kilometres per hour must be maintained in order to insure the vehicle being classed. The trials will be held between March 25 and April 16. Each competitor must furnish an observer to serve on some other car. At night all peting cars will be kept in enclosur

New England Telephone and Telegraph Company's Three Ton Truck.

The New England Telephone and Telegraph Company have recently purchased and put into commission a 3 ton gasoline truck, for use in their construction department for Boston and vicinity. The truck is equipped with a two cylinder 20 horse power gasoline engine, with a speed rating of about 10 miles per hour. It is of pleasing design and convenient size for doing the work it was intended for. The body of the truck is 12x6 feet, and fitted with an elevated seat in front for the driver. The body is arranged with side stakes, and the platform is free and clear for receiving such articles for transportation as desired. Underneath the rear end and attached to the body is constructed a substantial double winch, with drawing drums extending out from either side. This winch is operated through a chain drive from the engine and controlled by a clutch, the handle of which is conveniently located near the drums. These drums are used for drawing both light and heavy cables in and out of underground conduits. In this work alone the operating force has been reduced 50 per cent.

A representative of THE HORSELESS AGE had the pleasure of riding upon the truck out to a suburban town and observing its easy control both in running and in performing its work. At a recent trial of its speed, transporting 6,000 pounds of cable, 12 miles was covered in an hour and a quarter, with no perceptible change in speed due to grades. In its operation 300 feet of cable was drawn into an underground conduit in nine minutes, which appeared to be a fair estimate of its working capacity. Both the manager and driver are pleased with the operation of the truck, and they stated that thus far it had given perfect satisfaction.

Commercial Vehicle Notes.

Postmaster Still, of Milwaukee, is said to be considering the establishment of an automobile service to carry mail from trains and the main post office to five sub-stations.

The Cumberland Telephone and Telegraph Company, of Nashville, Tenn., are now using six Ford runabouts as trouble wagons, each of which has been equipped with a tool kit carried at the rear.

Five touring cars have recently been shipped from New York to Jamaica, W. I., to be hired out. The West Indies are now being visited each year by large numbers of Americans, and motoring is the chief recreation furnished.

The project of an automobile line between Quincy, Coldwater and Union City, Mich., is now being discussed, and a stock company is to be formed to take hold of the matter. The Coldwater Commercial Club is said to be interested in the proposition.

An automobile accommodating fifteen to twenty passengers is making round trips daily between Havana and Mariel. It starts from in front of the Hotel Pasaje, Havana, at 7 o'clock every morning, reaching Mariel at about 10:30 a. m. The car leaves Mariel at 12:30 p. m., arriving at the hotel from which it starts at 4 p. m. The distance traversed is about 35 miles each way.

Citizens of Watertown, N. Y., are fighting against the installation of a trolley line on Washington street, being a part of an automobile line. A petition is being circulated for the signatures of those in favor of giving the automobile a trial.

The Anheuser-Busch Brewing Co., St. Louis, Mo., have recently placed an order with the Pope Motor Car Co., Waverley Department, Indianapolis, for a Pope-Waverley electric 1 ton truck with a form of body designed especially for their work.

The Knox Automobile Company, Springfield, Mass., have completed a 4 horse power, 4 ton motor truck for the New England Telephone and Telegraph Company. The truck is made with a winch arrangement, designed especially for drawing wires through underground conduits.

The New Guayule Rubber Industry

The last Mexican official gazette of patents and trademarks contains [illegible] applications for patents on processes for the extraction of this rubber by Americans, Mexicans, and one German. The Continental Rubber Company are now operating their initial $200,000 guayule rubber plant at Torreon, and will make extensive Pimental & Brother have received a ten years Federal concession for securing guayule rubber on Government lands in the States of Durango, Coahuila, Zacatecas, and San Luis Potosi. They are to pay for annual rental for each 17,000 acres marked off. Government inspection is provided to avoid destroying young guayule plants and so perpetuate the industry.—*Consular Report.*



NEW ENGLAND TELEPHONE AND TELEGRAPH COMPANY'S TRUCK DRAWING CABLES THROUGH CONDUITS.

LEGISLATIVE and LEGAL

earing on Frelinghuysen Bill.

RENTON, N. J.—A hearing on the Frehuysen and Jackson automobile bills, n by the Judiciary Committee of the e Senate on Tuesday, February 20, was nded by many prominent automobilists ew Jersey, New York city and Philahia. The attendance was so large that as necessary to hold the hearing in the mbly Chamber instead of in the Senate mber. Among the automobile organizas which sent delegates to the hearing the Automobile Club of America, the omobile Club of New Jersey, the New ey Automobile and Motor Club, the th Jersey Automobile Club, the Autoile Club of Hudson County, the Atlantic Automobile Club, the Monmouth Autoile Club and the Cape May Automobile . Among the organizations represented ng the passage of the Frelinghuysen were the North Branch and Auto Club omerset County, a committee of the d of Agriculture of Somerset County, Harligen Farmers' Club. a committee of Board of Agriculture of Monmouth nty, the Millstone Vigilance Committee omerset County and a great number of bers of the New Jersey Grange.

ilbur F. Sadler, Jr., of the Associated omobile Clubs of New Jersey, was chair- of the forces opposing the bill and inuced the speakers, among whom were of the foremost lawyers in New Jer- The speakers in opposition to the bill : Former Senator Charles A. Reed, nfield; W. H. Spear, Jersey City; Edwin rt Walker, Trenton; R. V. Lindabury, ark; C. T. Terry, New York; Adrian r, Newark, and R. G. Betz, Washing- D. C. The first speaker was former tor Charles A. Reed, representing the mobile Association of Union County. Reed first read a petition which stated the highways were for public use and d be allowed to be so used so long as user recognized the rights of his neigho the same use of the roads. It also ed that the Frelinghuysen bill was a mination against automobilists, and he present law was adequate, requiring nse for users of automobiles that could voked for violation of speed limitation. otested against arrest without warand the hearing of speed violations by ourt lower than the Court of Common

. Reed said he considered the present dequate except that it was difficult to ce. on account of the difficulty of fying machines. He said that what needed was a law that revokes the r's license in case of recklessness. He heavy wagons do as much damage to the roads as automobiles and were not talked about, and he saw no reason why the automobile should be taxed and they not. He said examinations of drivers would be unnecessary if there was a law that would prohibit those who had violated the speed limitations from driving a car again or until after a certain length of time.

W. H. Spear, representing the Hudson County Auto Club, was the next speaker. He said that the automobile had come to stay, and that it was no longer a vehicle of the rich, but had its place in commerce, and it was useless to hamper it with adverse legislation. There is $50,000,000 invested in the auto and kindred industries, and he was sure the New Jersey Legislature desired to protect the property of its citizens. He said there were 14,000 automobiles in New Jersey, and the number of complaints were small in comparison to the number. He did not think a violator of the automobile law should be tried before a justice of the peace, as the justice always gave a judgment adverse to the automobilist, else he would never get another case. The Frelinghuysen bill, he said, was too drastic, and the present law, with some amendments, would be adequate, provided it were enforced.

The third speaker in opposition to the passage of the Frelinghuysen bill was Winthrop E. Scarritt, first vice president of the Associated Automobile Clubs of New Jersey, who said he was speaking for more than 1,000 automobile owners. He said that the passage of the Frelinghuysen bill would tend to discourage automobiling in New Jersey and drive them off the roads. He had consulted an eminent attorney in New Jersey, and that attorney gave his opinion that the bill was undoubtedly unconstitutional. He said that automobilists have a legal right on the highway that is not obtained from the State. Users of horses, he said, drive their fast trotters at their best speeds on the public highway without bell or other warning, and have no means of identification in case of a violation of the speed limitations. The passage of the Frelinghuysen bill would make 14,000 prominent and respected citizens of the State of New Jersey criminals. Criminals because it would be impossible for an automobilist to go on the highway without violating the law, not in the spirit but in the letter. He said the bill was dangerous because it was an admixture of some good features and many bad ones. He objected to placing unreasonable restrictions upon the automobilists in order to correct the evils of a few. He said there was no use of having laws that would not be backed up by public sentiment, and that the Frelinghuysen bill was unreasonable, that public sentiment would not back it up. The present laws had been obeyed by the majority of the automobilists, but the passage of this bill would make unwilling violators of them all.

Edwin Robert Walker, representing the Mercer County Automobile Association, told the Judiciary Committee that the present law had been made up the year before, had been the result of considerable deliberation and argument by those opposing and in favor of the present bill. That both sides had made concessions, and the result was a law that was satisfactory to both sides. The bill now under consideration, however, was an unjust discrimination against the automobilists.

R. V. Lindabury, of Newark, said the bill was oppressive in some of its provisions, and the majority should not be punished for the sins of a few. He said that the automobile had come to stay, and as the science of automobile construction developed the vehicle would become cheaper in price and within the reach of the people who were now in favor of passing the present bill. He said the time would come when all farming machinery would be run by motors and automobile trucks, etc., would do the farming work. Then, he said, these very people who are favoring the passage of the bill would be clamoring for their rights as owners.

C. T. Terry, of New York, representing the National Association of Automobile Manufacturers, said that last year both sides joined and after a great deal of consideration passed a bill that should have embodied all that was practical, and that this law had had only nine months' trial. He thought the old bill had not had a fair trial. He wanted to know if unjust restriction should be imposed upon the innocent for the sins of the guilty few. Also, is it the trouble with the present law that the legislation is inadequate? Is it the fault of the peace officers?

"The present law is not enforced. If the time spent in legislation was spent in enforcing the law there would be no trouble."

He also said that if the laws were always changed the peace officers, constables and officers of the law would never become familiar with the law. In conclusion he stated that the passage of the Frelinghuysen bill would transpose the natural uses of the highways into a purchasable privilege.

Adrian Riker, of Newark, representing the New Jersey Automobile Club, said that horses are responsible for more accidents than automobiles. He quoted statistics to show that horses were responsible for 42 per cent. of the accidents, while automobiles were only responsible for 5 per cent. He pointed out the fact that horses were driven by boys and even girls, and that the butcher boys and grocery boys drove horses and were extremely reckless, but that they did not have to pay a license; did not have to be of a certain age, nor to pass an examination. He also said that under the provisions of the Frelinghuysen bill an automobilist would have to slow up upon approaching a butcher's wagon from behind; did not dare to pass it, and was practically at the mercy of the driver in front, who could practically control the movements of the automobilist.

R. G. Betz, representing the American Federation of Motor Cyclists, made a s speech in opposition to the passage o

bill, saying it would virtually close New Jersey to the motor cyclists.

All the speakers in opposition to the Frelinghuysen bill were loud in their denunciation of the willful violation of the law, the road "hog," and the reckless automobilists, stating that they should be punished.

In favor of the bill the first speaker was Mr. Case, representing the Long Branch Anti-Automobile Club and sponsor of the Frelinghuysen bill. Mr. Case was loud in denunciation of the "auto-maniac," and said the bill had been drawn in the belief that it was the only way to suppress the violations of the law and to reduce the number of casualties. He refuted a statement made by an opponent that the accidents are getting fewer. He said there was great discontent in the rural districts, and that a mother never sent her child to school or on an errand without a shudder for its safety. A characteristic remark was that "the automaniacs want the whole road, all the road, nothing but the road, and everyone else can go to the devil."

State Road Commissioner Hutchinson was the next speaker, and he gave figures to show that the automobiles did a great deal of damage to the roads, that chain and armored tires were especially hard on the roads of New Jersey. He said he thought the cause of the damage to the roads was excessive speed. He did not think that an automobile going at the rate of 10, 15 or even 20 miles per hour did more than ordinary damage, but that large cars weighing from 3,000 to 5,000 pounds, with Samson or chain tires, and going from 40 to 50 miles per hour, should not be permitted on the roads. He said he was in favor of a tax on the horse power of an automobile, provided the money should be used to repair the roads. He said that 90 per cent. of the requests for repairs to roads come from automobilists.

"It is my opinion that the non-residents are the persons who are doing the most damage. They are usually tourists, who are going from one State to another, using our roads simply for the purpose of seeing how much speed they can make, and a large majority of them have no respect for the law. I think much of this trouble can be remedied by licensing the chauffeur and providing that the license can be revoked upon a conviction by a court and be reissued again only after at least six months have expired, so as to make a revoking of the license a part of the penalty."

Mr. Kipp, of Morristown, said he considered the present law as "class legislation." He stated, in explanation, that should a driver of a horse commit a violation of the law it was possible to arrest him at once, but that the automobilist could not be arrested without a warant, and when a warrant was gotten the automobilist would probably be 50 miles away. Mr. Kipp said [illegible]'s strong personal objection was to the [illegible]se, the dust and the objectionable odor of [illegible]ays along the much traveled

Mr. Voorhees, a member of the State Board of Agriculture, made an appeal in favor of the bill, directly in the interest of the farmers. He said there were 34,500 farmers and millions of dollars invested in the farming industry in New Jersey to offer a comparison between the relative value of the farming and the automobile industries and automobiles. He said the farmers paid more taxes, had their money invested as a means of livelihood and not pleasure, as with the automobilists, and were perfectly right in demanding legislation to protect their lives and property. He stated that ofttimes the farms were several miles from the schools, and the children had often to walk or drive over the highway to attend schools, and that the strain on the minds of these children and their parents was terrible.

Chas. Murray, of Jersey City, representing the New Jersey Grange, was the next speaker, and tried to show that those opposing the bill had not really given any serious objection to the passage of the bill. He showed a pamphlet gotten out by the automobile clubs enumerating the objectionable features of the Frelinghuysen bill, and stated that during the hearing hardly anything had been said about these objectionable features, but that they had objected to the bill as a whole, showing that they (the automobilists) did not want any legislation at all, except what suited them.

He was followed by Charles Martens; W. J. Terrill, representing the Burlington County Grange, and Charles Collins, who, owing to the limited time for the hearing, made very short speeches, speaking of the number of people they represented, and that the sentiment of these people was in favor of the passage of the Frelinghuysen bill.

The committee, consisting of Senators Hillery, Wakeley and Minturn, then adjourned, stating that they would take all the matters in consideration. It is impossible to state whether or not the bill will pass, but the majority of automobilists seem to be confident that it will not. Several questions were asked by the chairman of the Senate Judiciary Committee, of those opposing the bill, what they would suggest as amendments to the bill, but none were offered. The automobilists were in favor of leaving the present law stand and adding some necessary amendments.

Jersey Farmers Advocate Strict Laws.

HADDONFIELD, N. J.—Camden County farmers, at a meeting held at the Town Hall February 18, adopted resolutions calling on the Legislature to pass a law forbidding the use of the public roads of the State to motor vehicles capable of a speed greater than 20 miles an hour, also a law that will enable any police officer to arrest without warrant, and that all violators of the law after the first offense shall be punished by imprisonment.

Hearing on Proposed Au Legislation in Massachu

BOSTON, Mass.—On February [illegible] State House, the Committee on [illegible] Bridges of the Massachusetts [illegible] began a hearing on ten bills, eac[illegible] way relating to automobile [illegible] Automobilists, dealers and tow[illegible] from all parts of the State we[illegible] and nearly all the clubs of Mas[illegible] including the Massachusetts Stat[illegible] bile Association, were represente[illegible]

The committee, with Senator [illegible] Hunter as chairman, decided to [illegible] up the bills relating to the distr[illegible] the fees of fines and penalties imp[illegible] owners or operators of moto[illegible] One of the bills was introduced [illegible] sentative Samuel L. Porter, and [illegible] on the petition of Fordis C. Pa[illegible] Parker bill provides that all fine[illegible] for violation of the automobile la[illegible] paid monthly by the courts or tr[illegible] into the treasury of the Commonw[illegible] the Treasurer and Receiver Ge[illegible] apply the money so received to [illegible] priation for the repair of State [illegible] to be expended by the Massachu[illegible] way Commission.

The Parker bill is in the fo[illegible] amendment to the motor vehicle[illegible] viding that the fees received und[illegible] visions of this act shall be pai[illegible] by the secretary of the highway c[illegible] into the treasury of the Comm[illegible] and such expenses as may be ne[illegible] carrying out the provisions of thi[illegible] be paid out of the treasury of [illegible] monwealth; and any unexpende[illegible] thereof shall be added to the a[illegible] propriated for the maintenance or[illegible] tion of State highways by the [illegible] setts Highway Commission.

The hearing was opened by Fra[illegible] tubis, Jr., counsel for the Mas[illegible] State Automobile Association, [illegible] said, were in favor of having the[illegible] voted to the improvement of S[illegible] ways. He claimed that as the [illegible] at present, with the fines goin[illegible] towns, there was an incentive o[illegible] of the town officials to capture as[illegible] tomobilists as possible to make m[illegible] that in many cases the police off[illegible] good pay arresting automobil[illegible] thought that by having the fees [illegible] State Highway Commission for [illegible] in improving the roads, which w[illegible] great benefit to everyone, it woul[illegible] with this graft in the enforcem[illegible] law. Mr. Hurtubis also claimed [illegible] courses were used and traps set [illegible] automobilists; in fact, the metho[illegible] some towns were unfair, as [illegible] sometimes put on a course, or [illegible] only one man to do the timing. [illegible] many cases in the towns of [illegible] Hingham, Leicester, Weston a[illegible] where the officials had been e[illegible] active in such work. One case [illegible] lar at Hopkinton, where an au[illegible]

fined $10 for exceeding the speed limit
ne seconds over a 660 foot course. He
ed many instances where men were
in a district court and yet were ac-
ed in the Superior Court, where the
go to the county.

. Hurtubis said that out of 100,000 li-
d automobiles in the country 12,000
in Massachusetts alone, and that
the case, he believed that, as recom-
led by the Governor, the fines should
ised for the improvement of State
ways.

wis B. Spear, chairman of the Legis-
e Committee of the State Association,
that it would be a satisfaction to know
fines go to the State for the improve-
t of its roads, and that no attempt was
made to enforce the law to bring
nue alone, as he claimed was now the
in many places. He said:

do not believe in doing away with
, for they are necessary to prevent
e of the law, and this abuse is almost
usively confined to professional chauf-
s and some young men who have just
ght a machine and are trying it out."

Spear believed that the professional
iffeurs should be distinguished by their
s, and if they were compelled to pay
fine, as was now the case, the matter of
d would soon be regulated.

Mr. Beatty, of the Springfield Automo-
Club, believed there usually was a feel-
of sympathy between the judge and the
sting officer, and that the automobilist
the small end of the argument.

The Worcester Automobile Club was
resented by B. F. Gay, of Leicester, who
wed the profits that were being made by
town of Leicester, and that the course
en by these towns took the pleasure out
automobiling. He said: "Nearly all
er fines go to the State or county, why
the automobile fines?" Judge Prescott
yes, of Concord, believed that the law
s not administered as a law of safety on
highways, but for the revenue there
s in it. "Take away the fines from the
ns," he said, "and the incentive to en-
ce the law for revenue is removed."

E. A. Gilmore, of the Boston Automobile
alers' Association, in speaking of the late
dden tour, said that there were only
o cases where there was trouble—in
ver, N. H., the tourists were warned,
ile in Leicester they were arrested.

A rising vote was then taken and 24
re in favor of the new bills.

In opposition to these bills appeared W.
Bouve, of Hingham, who said he had
ned and driven horses all his life, and
it now he had been obliged to give them
because of the reckless driving of au-
mobiles. He told the committee that in
ingham the roads used the most for au-
mobiling were not State highways but
re paid for by the town, and thought
at the fines should go to the towns that
re injured, to be used for repairing
eir roads. He argued that the bills be-
re the committee were designed to bene-
fit a privileged class at the expense of
towns and cities who have to suffer.

Selectman Channing Smith of Leicester
objected to having the streets made a
race course, and cited several accidents in
his town due to automobiles. He denied
that the town officers arrested automobil-
ists as a business, and that only in cases
where machines were being run over 18
miles an hour were they stopped. He of-
fered four suggestions. First, that the
town control the disposition of the fines;
second, that the penalty be made a fine or
a jail sentence; third, that a tax of $1
be levied on each horse power of the ma-
chine; fourth, that a system be devised for
marking dealers' machines, to enable the
authorities to know who is responsible at
the time of their use.

J. M. Marshall said that Rockport was
opposed to any change, and he believed
that the automobilists were trying to pre-
vent the enforcement of the law. J.
Briggs, of Bourne, told the difficulties his
town had with automobiles, and was not
in favor of any change in the law.
Others to speak against the bills were Al-
fred L. Cutting, of Weston; Chairman
Kilhan, of the Board of Selectmen of
Reading; Representative Tarbell, of East
Brookfield; Representative Bell, of Leices-
ter, and J. H. Carlton, of Sandwich.

A rising vote was then taken, which
showed fourteen against the bill, but on ac-
count of the length of the hearing this
could not be considered fair, for many of
those present at the beginning had left.
The committee adjourned until Wednes-
day morning, February 28, when bills rela-
tive to the change in speed laws will be
taken up.

Report on Washington, D. C., Automobile Bill.

WASHINGTON, D. C.—Through the cour-
tesy of the secretary of the Board of Com-
missioners of the District of Columbia the
correspondent of THE HORSELESS AGE has
been able to secure the following complete
report of the commissioners on H. R. Bill
No. 12,310, regulating the speed of automo-
biles in the District of Columbia, etc.

FEBRUARY 19, 1906.

Hon. J. W. Babcock, Chairman Committee on the District of Columbia, House of Representatives:

DEAR SIR—The Commissioners of the Dis-
trict of Columbia, to whom was referred
H. R. Bill 12,310, entitled "A bill regulating
the speed of automobiles in the District of
Columbia, and for other purposes," have
the honor to report thereon as follows:

The Commissioners early recognized the
necessity of regulating the use of the public
thoroughfares by automobiles, and adopted
a series of regulations relating to the rate
of speed, the use of signal warnings, the
display of lamps, the identification of each
machine by a number, etc., the validity of
these regulations being promptly sustained
as the result of a test case brought into
court. As experience developed their inade-
quacy to meet every exigency, the regula-
tions were amended, until now they are be-
lieved by the Commissioners to afford am-
ple safeguard to the public if they are im-
plicitly obeyed and all violations rigorously
punished. The measure under considera-
tion, in fact, does not materially add to the
existing regulations, while it omits many
features which experience has shown to be
essential. These regulations, it is true, al-
ready have the force and effect of law, but
the Commissioners believe that it would be
wise to give them Congressional sanction,
and the substitute bill herewith transmitted
embodies this suggestion.

The most serious objection to the auto-
mobile is the speed at which it is frequently
driven on the public thoroughfares. The
abatement of this evil is entrusted to a de-
tail of bicycle policemen. The activity of
this force is shown by the fact that during
the calendar year 1905 there were between
400 and 500 arrests for infractions of the
automobile regulations, of which 246 were
prosecutions based upon violations of the
speed limit. An analysis of these latter cases
shows that fifteen persons were twice, four
persons were three times, and two persons
were four times arrested and convicted of
violating the speed regulations.

The amount of fines collected during the
year from these 246 violators of the speed
law was $2,268. It is, perhaps, proper to
remark at this point that, although the regu-
lations provide a maximum fine of $40, this
sum was assessed only once during the year,
the average fine being less than $10. The
repetition of the offense did not, apparently,
determine the amount of the fine. The gen-
eral practice seems to have been to impose
a penalty of $5 for the first offense, $10 for
the second and $20 for the third. In more
than one instance, however, the first offense
was penalized more heavily than the sec-
ond, while the operator, who was arrested
four times, was made to pay $40 for the
first offense and only $5 for the second.

It is evident, therefore, that the police
court takes cognizance of the circumstances
surrounding the offense rather than of the
repetition of the violation.

Although the commissioners believe that
a rigorous enforcement of the penalty pro-
vided by the regulations would go far
toward restraining the fast running of au-
tomobiles, they appreciate that occasion
might arise wherein the imposition of a fine
for overspeeding would be totally inade-
quate as a punishment. Several of the
States have already recognized this fact, and
provide imprisonment as an alternative.
The laws of these States, briefly stated, are
as follows:

ALABAMA.—$25 to $100 for first offense;
$50 to $200 for subsequent offense, or thirty
days to six months' imprisonment.

CONNECTICUT.—$200 or under, or thirty
days in jail.

ILLINOIS.—$25 to $200, or three months'
imprisonment, or both.

MAINE.—$50, or ten days' imprisonment.

MISSOURI.—$100 to $1,000, or imprisonment from thirty days to six months, or both.

NEW YORK.—First offense not over $100; second offense, $50 to $100, or imprisonment not exceeding thirty days, or both; third offense, $100 to $250, and imprisonment not exceeding thirty days.

PENNSYLVANIA.—$10 to $100, or thirty days' imprisonment.

RHODE ISLAND.—Not exceeding $20 or three months' imprisonment.

VERMONT.—Not exceeding $100 or fifteen days' imprisoment, or both.

The Commissioners are informed that sentences of imprisonment are rarely or ever imposed in these States, which indicates that would be reckless automobilists have a wholesome fear of involuntary confinement. The Commissioners believe that an imprisonment law ought to be enacted for the District of Columbia; but suggest that the mandatory language of the proposed measure might well be amended so as to conform with the statutes of the States mentioned. With the possibility of imprisonment constantly menacing violators of the speed regulations, it is believed that the tendency to overspeeding will be effectually checked.

It will be observed that the proposed bill of the Commissioners includes horse drawn vehicles. This inclusion is not only for the purpose of avoiding any charge of discrimination against owners and operators of automobiles, which charge might be made the basis of a legal effort to overthrow wise and necessary legislation, but is also based upon the facts shown by an examination of the public records. During the calendar year 1905 there were 275 arrests and convictions for fast driving. This is an evil which is unquestionably on the increase in the District of Columbia, and Commissioners are of the opinion that careless and reckless drivers ought also to suffer adequate penalty.

The Commissioners also request that they be given authority to revoke the license or permit granted to any owner or operator of an automobile after said owner or operator shall have been twice convicted in the police court of violating the speed regulations, provided such revocation shall be deemed necessary for public safety.

A copy of the automobile regulations now in force is herewith transmitted.

Very respectfully,

(Signed) H. B. F. MACFARLAND,

President of the Board of Commissioners of the District of Columbia.

A BILL

Regulating the speed of motor bicycles, automobiles and horse drawn vehicles in the District of Columbia, and for other purposes.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That all police regulations of the District of Columbia ng to motor cycles, automobiles and rawn vehicles hitherto promulgated by the Commissioners of the District of Columbia in operation at the time of the final approval of this act are hereby given the full force and effect of laws enacted by the Congress of the United States; and the said Commissioners are authorized and directed to alter, amend or modify the same whenever, in their judgment, such action is necessary for public safety.

Sec. 2. That prosecutions for violation of the provisions of the regulations referred to in the above section shall be on information filed in the police court of the District of Columbia by the corporation counsel or any of his assistants. For conviction of the violation of any of the provisions of said regulations, other than those which pertain to the limit of speed, a fine of not less than $1 nor more than $40 shall be imposed. For conviction of the violation of any regulation or regulations limiting speed there shall be imposed for the first offense a fine of not less than $5 nor more than $50; for the second offense a fine of not less than $20 nor more than $100, or imprisonment not exceeding thirty days; and for the third offense a fine of not less than $50 and not more than $250 or imprisonment for not less than ten days nor more than one year.

Sec. 3. The Commissioners of the District of Columbia may revoke the license or permit granted to owners or operators of automobiles whenever said owners or operators shall have been convicted in the police court of violating the regulation or regulations pertaining to the limit of speed, whenever such revocation shall, in their judgment, be in the interest of public safety.

Proposed Amendments to Maryland Automobile Law.

BALTIMORE, Md.—A bill has been introduced in the House, and referred to the Judiciary Committee, which has the approval of the Automobile Club of Maryland, and was prepared after a consultation with representatives of the Hagerstown Automobile Club. The bill contains many new features designed for the benefit of automobilists using the highways of Maryland, while at the same time every effort has been made to concede to the rest of the public everything that is its due, and particularly to enact provisions discouraging the driving of automobiles in reckless disregard of the rights of others. Following is a summary of the changes as compared with the present law:

Non-residents who are not required to have licenses where they live are permitted to remain in Maryland not over twenty-four hours without a State license. Non-residents who are required to register where they live, must display their license number with the initials of their home State. Dealers are permitted to register all their vehicles under one number. Upon the sale of a motor vehicle the licenses expires, except that the purchaser may use the old number for a period of five days with the written consent of the former owner. Under the present law any number of licen be carried on a car.

The speed limit in cities and increased from 6 to 12 m. p. h. country from 10 to 20 m. p. h.

Upon approaching a horse, t of the motor vehicle must give warning of his approach and speed to 12 miles an hour. Upo becoming frightened or at the request of the driver thereof, t bilist must stop and give the dr control the horse. In meeting h by ladies and children the autom use extreme care, and, if requ and lead the horse by. Soundi while passing a horse is prohibit other hand, the driver of the give the automobilist room t persons take the risk attending horses by the roadside unatten

County commissioners and commissioners may in their di aside specific public highways tests or contests, the same to b under proper restrictions for th convenience of the public. The racing on the public highway from $50 to $100. It is a misd unauthorized persons to dama fere with automobiles left una being for the protection of th well as of the owner of the m

The bill removes the power of the peace to imprison offend poses that power in the judges inal courts. The right of app from sentences imposed by ju peace. The proceeds of fines the road funds. A person arr charge of violating the automob leave his automobile in the cus justice or officer as security f costs. Hired chaffeurs requir license, and in case they violat law the license may be revoked.

FRANKFORT, Ky.—Frazer's bi automobilists to take out licens county they traverse, has been the House.

Trade Literature Rec

R. E. Brown, Cleveland, trated circular of a patent colla fuunel.

H. S. Moore, Cleveland, trated circular describing th Moore special car.

Timken Roller Bearing Axl Canton, Ohio.—Illustrated catal of the automobile department.

E. C. Walker Company, Loui "A New Era in Steam," an booklet describing the produc factory.

An automobile show is to be Auditorium, Omaha, Neb., Apr sive. The arrangements will b by a committee of local dealers

MINOR MENTION



Lavigne Manufacturing Company of
are negotiating for a new factory.
'isher, 302-310 Fort street West, De-
ıas begun the manufacture of auto-
bodies.

.. Kennedy is the new manager and
'er of the Detroit Auto Vehicle Com-
Mr. Lind having resigned.

k Brothers Motor Car Company, Al-
n, Pa., are planning to enlarge their
the work to begin on May 1.

Portland (Me.) Automobile and Boat Show will be held in the Audi- from February 27 to March 3.

Ariel Motor Car Company, of Bos-
re said to have taken a factory at
:port, Conn., which they will occupy
March 1.

farmers of Lake County, Indiana, formed the Lake County Protective iation, to facilitate the arrest of vio- of the speed laws.

Cleveland Auto Top and Trimming ıny, who recently incorporated with ital stock of $5,000, are moving to 7 Vincent street, Cleveland.

Central Garage, of Indianapolis, is installing a plant for the manufac- ›f water regulators, thermostats, pilot for steam cars and also of siren horns.

oad from Davis to Turner Falls, Ind. is being entirely rebuilt of concrete, 'hen finished furnishes a span of level for automobiles for 6 miles in ı.

ıs. B. Newby, formerly with the Na- Motor Vehicle Company, of Indian- , Ind., is now the assistant manager : Indiana Automobile Company of the city.

John A. Hawkins, president of the land Automobile Company, Pittsburg, esigned, and retires from the business. c Saupe has been selected as his ssor.

e Pittsburg Auto Tire Repair Com- has opened a repair shop at 5810 onette street, Pittsburg, where all will be done by the French and Ger- methods.

the advertisement of the Thomas B. :y Company in our issue of February ıe price of the Type III surrey was ieously given as $1,300. It should been $1,350.

e Pope Motor Car Company, Waver- Department, recently received a cable : from Lieut. A. Cappillina, Florence, , for twenty of their Model 36 speed tic road wagons.

ıe Motor Top Company, of New York, recently been incorporated to take over ıusiness of the Auto Top Company, of York. The new concern has taken ıuilding formerly occupied by the Lin- coln Carriage and Automobile Company, 216 West Fiftieth street.

W. J. Davis, of Bridgeport, Conn., begins his duties as superintendent of the Berkshire Automobile Company's plant at Pittsfield, Mass., March 1.

Percy F. Megargle and Dave Fassett, the transcontinental tourists, are reported to be continuing their return journey to New York and when last heard of had left Gallup, N. M.

The general sales offices of the Electric Rubber Manufacuring Company, of Rutherford, N. J., have been removed to 253 West Forty-seventh street, New York. D. D. Martin is sales manager.

The mechanical branch of the Association of Licensed Automobile Manufacturers will hold a meeting at the Association rooms, New York, March 2. The board of managers will meet March 9.

P. F. Rockett has been elected president of the Zim-Rock Automobile Company, New York, and Clarence McKenzie, vice president and treasurer. The company handles the Stoddard-Dayton car.

Theodore P. Meinhard has resigned his position as assistant superintendent of the auto department of the St. Louis Car Company, and after March 1 will be the manager of the Motor Vehicle Garage Company, of Buffalo.

The Rushmore Dynamo Works, of Plainfield, N. J., have opened a branch at 1328 Michigan avenue, in Chicago's Automobile Row. A full stock of straight and flaring front lights, as well as gas generators, will be carried.

Beltz & Delavie, 314 Fourth avenue, Pittsburg, after April 1 will occupy larger quarters at 524 Penn avenue, and intend to increase their line of automobile, bicycle and rubber goods. They desire to receive manufacturers' catalogues, price lists and trade discounts.

B. V. Covert, of Lockport, N. Y., and a number of local capitalists have purchased the interests of the Lockport parties in the Covert Motor Vehicle Company, Lockport, N. Y. The new company will resume operations in the present location. The Rochester office will be discontinued.

Ferdinand Sternberg, for some time past manager of the Cleveland branch of Charles E. Miller's automobile supply house, of New York, will shortly take charge of the Detroit branch. W. H. Pedersen, of the New York office, will take Mr. Sternberg's place in Cleveland.

The Northern Manufacturing Company of Detroit has recently changed its name to Northern Motor Car Company and elected the following officers: Wm. T. Barbour, president; G. B. Gunderson, vice president; V. M. Gunderson, secretary and treasurer, and Chas. B. King, superintendent.

An automobile school for practical instruction in the use and care of automobiles has been opened at Portland, Me., by the H. J. Willard Company. The school is under the direction of Benj. R. Tillson, who has been in charge of the company's garage during the past year. Lessons will be given at 642 Congress street and 18 Forest avenue.

The Shelby Rubber Company, Shelbyville, Ind., has incorporated for the manufacture of auto tires. The officers are: President, D. F. Randolph, Waldron, Ind.; vice president, J. F. Meloy, Shelbyville, Ind.; secretary, O. S. Peck, Shelbyville, Ind.; treasurer, George Walker, Adams, Ind.; directors, the officers and James Howe, Flatrock, Ind.; Wilbur Wright, Adams, Ind., and one directorship yet to be filled. Greensburg, Ind., has offered the company a free site with a building said to be worth $10,000.

The New Orleans Autocar and Boat Company has been organized with $250,000 capital stock for the manufacture of automobiles and launches and gasoline engines for launches. W. L. Judson, of Chicago, will be the practical man, and T. W. Castleman, of New Orleans, is the organizer of the company. Sixty thousand dollars stock is reported already taken. The new concern will make a specialty of a car for muddy roads—the kind most in evidence in that part of the country. It will not be driven by chain, but by a wire cable enclosed in flax.

Agency and Garage Notes.

W. A. Duncan has secured the agency for the Ford cars in Rolla, North Dakota.

A new garage is being erected at 207 Church street, Poughkeepsie, N. Y., by G. H. Barnes.

A three story garage, 40x170 feet, is being erected at 1238 Michigan avenue, Chicago, by Avon Glahn.

A two story garage, 70x200 feet, is being erected at 821 Third avenue, Louisville, Ky., by Longest Brothers.

The Indiana Automobile Company, of Indianapolis, Ind., will act as agents during the coming season for the Winton, Oldsmobile and Thomas cars.

On March 1 Oscar M. Bergstrom will start in business under the name of the Aerocar Company of Minneapolis, having acquired the Aerocar agency for that city.

Richardson Brothers will open an auto warehouse at the corner of First street South and Fourth avenue West, Aberdeen, S. Dak., and will buy, sell and repair machines.

H. M. Eastman & Co. are erecting a garage, 30x90 feet, in the rear of 521 Main street, in connection with which they will conduct a repair shop. The Cadillac car will be handled by them in that section.

Peck & White, Fall River, Mass.; Peoria Automobile Company, Peoria, Ill.; L. W. Pond Machine and Foundry Company, Worcester, Mass., and the Hampden Auto Company, Westfield, Mass., will handle the Pope-Waverley line for 1906.

Frank E. Howes and H. Lawrence Ridings have started a garage at 128 Lafayette street, Utica, N. Y., having recently been appointed agents for the Reo and Ford

cars. The business will be run under the name of the Standard Auto Company.

The Michigan Automobile Exchange has just been opened on Michigan avenue in Detroit.

The Mulkey-Merell Company have acquired the agency for this season for the Reliance car.

Chas. H. Corston has opened a garage and repair shop on Jefferson avenue, Detroit, Mich.

F. O. Babbitt and T. B. Matthews, of Fitchburg, Mass., will open a garage and repair shop on Willow street.

The Reo Motor agency for Detroit has just been opened at 289 Jefferson avenue, with John Wood as manager.

The Whitcomb Automobile Company, Ninth street S. E., Cleveland, Ohio, have built a one story brick addition to their plant.

Edward A. Jenkins, Hays and Kelley streets, Pittsburg, has been appointed representative for the Reliance Motor Car Company, of Detroit.

The Columbus Automobile Company, Columbus, Ohio, has moved to 691-695 North High street and will handle the Olds machines the coming season.

The Elmer Automobile Company, of Hartford, Conn., have opened a garage at 1100 Main street, having acquired the Ford and Rambler agencies for that city.

A garage exclusively for electric automobiles is almost completed at Los Angeles, Cal. W. K. Cowan will turn over his business to the new firm as soon as the garage is opened.

The following new agencies for the White steam car in Michigan have recently been established: Donald Stewart, Traverse City; Wm. Gay, Grand Rapids, and A. V. Campbell, Kalamazoo.

A new two story garage, 90x110 feet, at the corner of High and Allyn streets, is being erected by the Miner Garage Company, of Hartford, Conn. The structure will be ready for occupancy about April 1.

C. S. Henshaw, the Boston representative of the Thomas "flyer," has leased a front portion of the Park Square Automobile Building for a temporary garage until he decides on a permanent location.

The Wayne Automobile Company closed the following agencies last week: Dante Cusi, of the City of Mexico, in Michoacan, Mex.; Clyde A. Gates, Fort Dodge, Iowa, and H. R. Manecke, Decatur, Ill., for Macon County.

R. E. Fulton, formerly assistant manager of the Pope Manufacturing Company's New York agency, has severed his connection with that concern, and is now general manager of the Mercedes Import Company, of New York city.

The Automobile Equipment Company, of Detroit, have taken the agency for Jones speedometers, Hawley carburetors, Autocoil Company's autocoils, Witherbee ignition apparatus, Mosler's spark plugs and the Gray-Hawley Manufacturing Company's products.

The Cleveland Automobile Show.

The first automobile show held in Cleveland under the management of the Cleveland Automobile Dealers' Association, February 19 to 24 inclusive, was favored with ideal weather conditions. The armory was most tastefully decorated with red, white and blue bunting in the form of streamers leading from the centre overhead to each side of the building, and wall hangings of purple and white material and presented to the Cleveland public on the opening night, when 2,600 incandescent lights were turned on, a brilliant effect. Robertson's military band dispensed choice music continuously throughout the week. The main floor space of the armory measures 140x208 feet, and is provided with a gallery 20 feet wide all round, one end being fitted with tiers of chairs for spectators. The attendance was from 7,000 to 10,000 a day, it was claimed. There were twenty-seven exhibitors on the main floor and forty-two in the gallery, and the exhibits comprised 133 complete automobiles and chassis. A total of seventy-one cars were used for demonstrating purposes. Following is a list of exhibitors:

Main Floor.—Winton Motor Carriage Company, R. H. Magoon Motor Car Company, White Sewing Machine Company, Hipp-Reitz & Hall, Cleveland Motor Car Company, Royal Motor Car Company, T. C. Whitcomb Automobile Company, Reo Motor Car Company, Gaeth Auto Works, Chisholm & Philips Automobilium Co., F. B. Stearns Company, Holmes-Booth Auto Company, H. S. Moore, Central Automobile Company, Central Automobile Company, Rauch & Lang Carriage Company, Aerocar Company, Auto Shock Company, McGeorge Manufacturing Company, Ohio Motor Car Company, Ford Motor Company, Price Brothers Carriage Company, Standard Automobile Company, Palmer Automobile Company, Paxson Motor Car Company, F. E. Drake, Collins & Sons and Sprague Umbrella Company.

Gallery.—C. H. Lodder, Hartford Suspension Company, Wm. Cramp & Sons, Bassett-Presby Company, Ohio Rubber Company, Cleveland Tool and Supply Comapny, I. Lehman, Heinze Electric Company, Teel Manufacturing Company, R. H. Smith Manufacturing Company, Joseph W. Jones, Edmund & Jones Manufacturing Company, Oliver Manufacturing Company, Never-Miss-Spark Plug Company, Telagiel System Company, Ohio Blower Company, Excelsior Spark Plug Company, Firestone Tire and Rubber Company, S. F. Bowser & Co., Strong, Carlisle & Hammond Company, Standard Welding Company, Homer Commutator Company, Columbia Lubricants Company, W. H. Brown, Wyandotte Production and Refining Company, Pennsylvania Rubber Company, W. D. Strong Company, Badger Brass Manufacturing Company, Veeder Manufacturing Company, Collister Sayle, C. S. Splitdorf, Gray & Davis, Warner Instrument Company, National Carbon Company, Chas. E. Miller, C. T. Ham Manufacturing Company, R. E. Brown and Edward S. George.

Fire at Pierce Factory.

A fire occurred on Sunday night, February 25, in the plant of the George N. Pierce Company in Buffalo, which destroyed one of the outlying buildings containing the automobile storage, motor testing, bicycle assembling and storage repair departments. We are informed by the company that the effect of the fire will be to seriously disturb their bicycle business, but will only temporarily interfere with the shipment of touring cars. The loss is covered by insurance.

Club Notes.

MACON (GA.) A. C.

This club was formed for the purpose of protecting its members against unjust prosecution, as well as for social purposes. The club's first run will be held the latter part of March.

CAMDEN (N. J.) A. A.

Automobilists of Camden have formed the above association for social purposes and to seek the general improvement of the roads in south Jersey. The officers are: President, S. W. Sparks; vice-president, Geo. H. Rhedymeyer; secretary, H. G. Hillinger; treasurer, John T. Dorant.

COLUMBUS AUTOMOBILE CLUB.

At a meeting of the Columbus (Ohio) Automobile Club last week the proposed automobile law now before the Legislature was fully discussed. It was decided that the club would make no serious objections to it, although some of the members thought that the penalties provided were a little heavier than necessary to procure enforcement.

Suburban Automobile Club for Pittsburg.

A suburban automobile club for Pittsburg is now assured. At a meeting held February 19 it was decided to build a club house the coming spring near the banks of the Allegheny River somewhere on the way to Freeport. Canoeing and motor boat sports will be introduced. The following committee was appointed to locate a site: E. J. Kent, C. M. Miller, J. F. Lanahan and A. L. Banker. The State Federation of Motor Clubs was discussed and the following committee appointed to the Philadelphia meeting, which will be held March 1: Paul C. Wolff and Dr. John H. Hawkins.

The show in the National Export Building at Philadelphia, held under the auspices of the Philadelphia Automobile Trade Association, was opened on Saturday evening last at 7:30 o'clock. All the local dealers were represented and a large crowd attended. Music was rendered by the Providence band on a band stand in the centre of the main hall.

MOTOR VEHICLE PATENTS.

Patents of February 6, 1906.

811,533. Control of Automobile Motors.—Edward H. Anderson, Schenectady, N. Y. Filed June 29, 1905.

811,543. Fountain Sight Feed.—Harry J. Carle, Chicago, Ill. Filed March 24, 1905.

811,618. Carburetor for Hydrocarbon Engines.—Charles H. Claudel, Argenteuil, France. Filed May 26, 1904.

811,630. Bearing.—Charles Glover, New Britain, Conn. Filed October 10, 1905.

811,640. Oil Feeding Device.—Thomas J. Kehoe, Fort Wayne, Ind. Filed June 9, 1905.

811,646. Vehicle Wheel Tire.—John H. Lorimer, Philadelphia, Pa. Filed April 15, 1905.

811,656. Spark Coil.—Charles P. L. Noxon, Syracuse, N. Y. Filed September 26, 1904.

811,666. Speed Indicator.—Saul Schulhoff, Philadelphia, Pa. Filed September 21, 1905.

811,708. Ball Bearing.—Samuel S. Eveland, Philadelphia, Pa. Filed September 21, 1905.

811,731. Lifting Jack.—Hugh M. Marsh, Chicago, Ill. Filed October 4, 1905.

811,732. Armor for Pneumatic Tires.—Alanson A. Moore, Detroit, Mich. Filed February 21, 1905.

811,757. Gas Engine.—Vincent G. Apple, Dayton, Ohio. Filed December 5, 1904.

811,809. Explosive Engine.—Joseph A. Williams, Cleveland, Ohio. Filed September 27, 1904.

811,888. Explosive Engine.—Joseph A. Williams, Cleveland, Ohio. Filed January 5, 1905.

811,917. Lubricator.—Joseph Hanson, Inwood, Ia. Filed October 23, 1905.

811,928. Safety Starting Device for Gas Engines.—Alvin S. Johnson, Minneapolis, Minn. Filed May 14, 1904.

811,955. Reversing Mechanism for Explosive Engines.—Edwin B. Robertson, East Norwalk, Conn. Filed February 20, 1905.

812,094. Starting Crank for Engines.—George B. Selden, Jr., Rochester, N. Y. Filed January 30, 1905.

812,118. Driving Axle for Automobile Vehicles.—Jules E. G. Denis and Louis M. J. de Boisse, Paris, France. Filed June 14, 1904.

812,129. Automobile.—Ben E. Hervey, Spokane, Wash. Filed August 15, 1905.

812,137. Traction Engine.—Wilbur S. Kelley, Newton, Ia. Filed October 17, 1904.

812,143. Spring Hub for Vehicles.—William M. Leffort, Providence, R. I. Filed September 20, 1905.

812,165. Tire.—John L. Connable, Chattanooga, Tenn.; Caroline Augusta Connable. Filed April 3, 1901.

12,449. (Reissue.) Electrically Propelled Vehicle.—Russell Thayer, Philadelphia, Pa. Filed July 29, 1905.

Patents of February 13, 1906.

812,259. Tire Protector.—John E. Caps, Kansas City, Mo. Filed January 31, 1905.

812,261. Lubricator. — Charles C. Dodge, Bloomfield, N. J. Filed November 29, 1904.

812,304. Explosive Gas Engine.—Edward G. Shortt, Carthage, N. Y. Filed September 24, 1902.

812,321. Vehicle Tire.—Hugh R. Auld, Boston, Mass. Filed February 13, 1905.

812,338. Motor Driven Vehicle.—Hans T. Hansen, Wauwatosa, Wis. Filed April 15, 1905.

812,345. Transmission Gearing.—Emil Huber, Detroit, Mich. Filed November 15, 1902.

812,373. Pneumatic Tire Protector.—Lester L. Sidwell, Rivera, Cal. Filed September 23, 1904.

812,427. Wheel Tire for Automobiles.—Herman Kerngood, Baltimore, Md., and Harry A. Taylor, New York, N. Y. Filed July 3, 1905.

812,502. Traction Wheel.—Fred E. Knight, Troy, Pa. Filed May 1, 1905.

812,563. Vehicle Wheel.—Maurice G. Heitz-Boyer, Paris, France. Filed July 25, 1905.

812,573. Automobile.—Hermann Lemp, Lynn, Mass. Filed June 9, 1904.

812,580. Lifting Jack. — Hugh M. Marsh, Chicago, Ill. Filed October 4, 1905.

812,584. Starting Mechanism for Gas Engines.—Vernon B. Miller, Philadelphia, Pa. Filed February 28, 1905.

812,600. Wheel for Plow Locomotives.—Heinrich Schnell, Cologne, Germany. Filed March 29, 1905.

812,605. Rubber Tire Guard.—Lewis Slama, Humboldt, Neb. Filed July 6, 1905.

812,607. Induction Coil.—John Splitdorf, New York, N. Y. Filed November 15, 1904.

812,622. Electrical Igniter for Internal Combustion Engines.—William H. Walter, New York, N. Y. Filed March 24, 1902.

812,629. Vehicle Wheel.—Manuel G. Babio, New York, N. Y. Filed August 31, 1905.

812,636. Variable Stroke Crank.—John G. Callan, Lynn, Mass. Filed July 11, 1904.

812,664. Transmission Gear for Motor Vehicles.—Theodore P. Meinhard, St. Louis, Mo. Filed August 7, 1905.

812,698. Elastic Tire for Vehicle Wheels.—Theodore Sterne, Paris, France. Filed June 23, 1905.

812,726. Locking Device for Automobiles. — Alexander Churchward, New York, N. Y. Filed June 30, 1904.

812,729. Variable Speed Device.—John A. De Vito, Roxbury, Mass. Filed May 3, 1905.

812,753. Carburetor for Hydrocarbon Engines.—Wesley Kouns, Salina, Kan. Filed October 20, 1904.

812,759. Wheel Tire. — William A. Loudon, Chicago, Ill. Filed May 1, 1903. Renewed January 16, 1905.

12,450. (Reissue). Rim for Rubber Tired Wheels.—Orson L. Pickard, Toledo, Ohio. Filed November 25, 1905. Serial No. 289,354.

37,827. (Design Patent.) Frame of Radiators for Automobiles.—Lindley D. Hubbell, Hartford, Conn. Filed July 24, 1905.

Patents Issued February 20, 1906.

812,886. Variable Speed Gearing.—Willard T. Sears, Philadelphia, Pa. Filed April 24, 1905.

812,893. Wheel Tire.—Eugene F. Sobers, Bethlehem, Pa. Filed September 19, 1905.

812,930. Wind Shield for Vehicles.—George W. Kerr, Springfield, Mass. Filed March 1, 1905.

813,037. Throttling Governor. — Harry C. Clay, Columbus, Ind. Filed August 25, 1905.

813,043. Valve Controlling Mechanism for Explosive Engines.—David F. Graham and Frank A. Fox, Stamford, Conn. Filed March 11, 1903.

813,044. Motor Vehicle.—Peter E. Hanson, Galveston, Tex. Filed June 24, 1905.

813,058. Automobile.—William T. Penrose, Spokane, Wash. Filed June 26, 1905.

813,068. Explosive Engine Starting Mechanism.—Henry J. Wiegand, Milwaukee, Wis. Filed May 21, 1904.

813,081. Sparking Igniter for Explosive Engines.—George Cormack, Jr., and Frederick C. Zumdahl, Rockford, Ill. Filed February 5, 1904.

813,104. Sparking Device.—Harry A. Miller, Los Angeles, Cal. Filed January 14, 1905.

813,175. Automobile Frame.—Albert E. Schaff and Frank S. Davis, Toledo, Ohio. Filed August 27, 1904.

813,185. Speed Indicator. — Bernhard Volkmar, New York, N. Y. Filed July 21, 1905.

813,186. Steering Gear for Automobiles.—Jesse Warrington, Indianapolis, Ind. Filed June 29, 1904.

813,203. Muffler.—Gustave E. Franquist, New York, N. Y. Filed September 13, 1905.

813,213. Motor Propelled Vehicle.—Warren S. Johnson, Milwaukee, Wis. Filed November 10, 1904.

813,231. Snow Shoe for Wheels.—Frank W. Nightingale, Quincy, Mass. Filed April 22, 1905.

813,250. Internal Combustion Engine.—Clarence M. Steele, Statesville, N. C. Filed April 7, 1905.

813,316. Automatic Cut-off for Explosive Engines.—Max Münzel, Brunswick, Germany. Filed January 6, 1905.

813,341. Reversing Mechanism.—Irving

G. Yoders, Washington, Pa. Filed February 25, 1905.

813,369. Clutch.—Archibald H. Ehle and Jesse H. Nice, Philadelphia, Pa. Filed July 22, 1905.

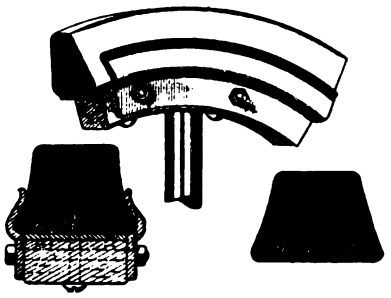
813,382. Vehicle Wheel Rim.—Isaac Hodgson, Minneapolis, Minn. Filed June 6, 1905.

813,388. Equalizing Device for Vehicle Springs.—John A. Roth, Hannibal, Ohio. Filed February 28, 1905.

Review of Specifications.

810,921. Tire for Vehicle Wheels.—Abednego Dewes, New York, N. Y., January 30, 1906. Filed July 20, 1905.

The solid flexible tire for vehicle wheels forming the subject of this invention comprises a strip or core permanently embedded in the base portion or surface of the flexible body of the tire that seats on the periphery of the felly of the wheel, said strip or core being of a hard, tough nature capable of intimate connection with the material of the tire

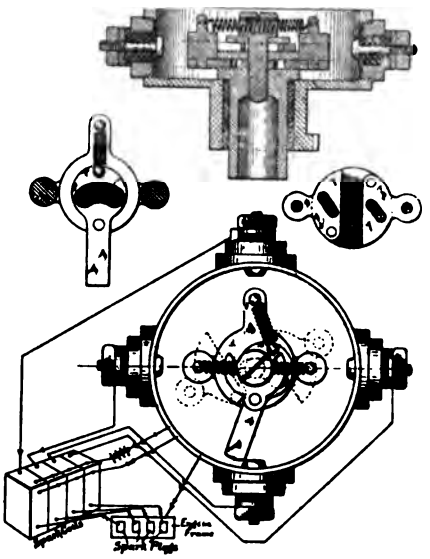


No. 810,921.

as it is formed or molded around the core and submitted to a setting process, as by vulcanization. The strip or core is preferably composed of layers of canvas or other suitable fabric and a vulcanizable material compressed to such an extent as to afford a firm anchorage for screws, which, with the tire applied to a wheel, are passed through the felly and screwed into it, thereby firmly holding the flexible tire on the periphery of the felly. It is formed with a plurality of undercut recesses at each of its side edges, thereby providing two or more locking means at each side of the flexible tire for those portions thereof which lie between the undercut recesses of the core and the clamping faces of side flanges which are secured to the sides of the felly by bolts or other suitable means, and which are formed at their outer parts to extend beyond the periphery of the felly to embrace side extensions or beads formed at the lower parts of the flexible tire.

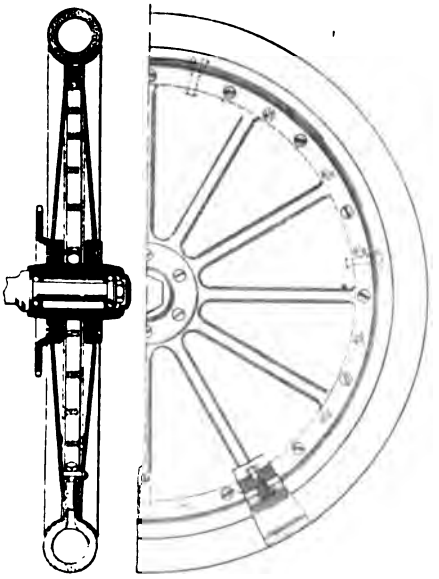
810,963. Electric Igniter.—Homer N. Motsinger, Pendleton, Ind. January 30, 1906. Filed May 31, 1904.

The specifications of this patent show an ignition timer in which the time of



No. 810,963.

the spark is automatically regulated according to the speed of the engine by means of what is essentially a flywheel governor incorporated in its construction, and in which the weights tend, through the medium of pins and slots and their governing springs, to advance or retard the end of the revolving radial contact member with respect to the stationary contact pieces on the containing case. The first claim is: In an electric igniter, the combination of a casing carrying one or more terminals projecting beyond the path of movement of a contact arm, a shaft journaled in said casing, a plate rotatably mounted on the shaft, the said contact arm pivoted upon said plate eccentrically with relation to the shaft and extending substantially radially to cooperate with the casing terminals, yielding means for holding said arm in normal position, speed controlled means carried by said shaft, and connections between said speed controlled means and said

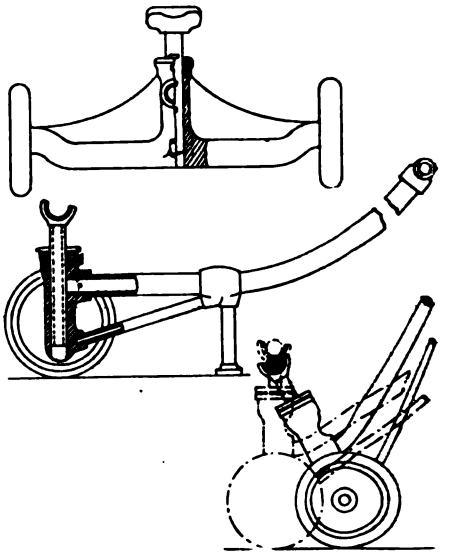


No. 811,112.

plate whereby the plate will be angularly shifted by movement of the speed controlled means.

811,112. Automobile Wheel.—Earl A. Wheeler and William Heckert, Sharon, Pa. January 30, 1906. Filed December 29, 1904.

This patent relates to a vehicle wheel in which separable half rings are used which together constitute the complete grooved rim for reception of the tight fitting tube, these half rims being secured to an interposed ring, to which the tire is also attached by fastenings engaging the under portion of the tire. The first claim is: A wheel having two separable half rims which together constitute a complete grooved rim, an interposed ring to which said half rims are secured, at least one of said half rims being detachably



No. 811,116.

connected to said ring, and a flexible tire fitted in said rim and attached to said ring by fastenings engaging the under portion of the tire.

811,116. Jack for Lifting and Transporting Motor Cars, Etc.—Henry Adams, Tunbridge Wells, England. January 30, 1906. Filed March 11, 1905.

According to the specifications the jack covered by this patent is essentially a column or strut mounted upon wheels and provided with a claw, axle rest, or its equivalent, and a suitable shaft or handle lever or other operating device, so that when said column or strut is tilted out of its normal vertical position, so as to engage the claw under the axle of the vehicle, said column may be again raised to its vertical position (by means of the shaft or other operating device), thereby raising the vehicle upon said jack, which being on on wheels enables the same, with the vehicle, to be manœuvered about as desired.

The automobile patents now issued mostly relate to detail parts or accessories, while up to a few years ago they usually covered the car complete.

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Horseless Age

VOLUME 17 MARCH 7, 1906 NUMBER 10

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Winton Model K Owners Tell Their Experiences

Mr. A. L. Stark, Elyria, Ohio, has been using his Winton Model K since September 30, 1905. He says: "I have driven 1,600 miles without a single adjustment and without trouble of any kind. Have not spent five cents for repairs. Nobody can do better than buy a Winton K."

Mr. J. M. Cox, Dayton, Ohio, who has been using a Model K since early November, says: "I have driven cars for five seasons and owned three big cars, but the K is the most perfect piece of machinery I have ever seen. Not a penny spent for repairs. No car in America at the price approaches the K."

Mr. Wm. H. Childs, Williamsport, Pa.: "I have driven my Winton Model K 2,300 miles since November 10 over our hills and bad roads, seldom using the low gear, and without making an adjustment or finding any defect in workmanship or material. It is worth $5,000 to me."

Just compare the $2,500 Winton Model K with any car on the market selling at $3,500 or higher.

Detailed information can be secured at Winton branches in New York, Boston, Philadelphia, Chicago and London, at Winton sales agencies in all important places, or by writing for "The Motor Car Dissected" to

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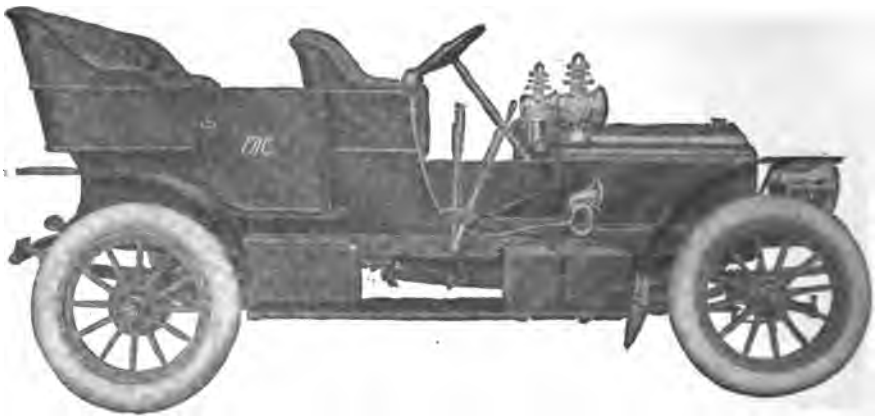
Member A. L. A. M. CLEVELAND, OHIO, U. S. A.

Mention HORSELESS AGE

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Ill-Matched Horses Draw Badly

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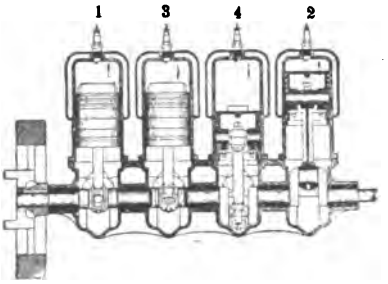


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Motor Piston Pins.

By Thos. J. Fay, E. E.

"Floating" pins in automobile motors are directly responsible for a large percentage of the serious mishaps that occur to such motors. The piston pins are subjected to unusual and rapidly varying strains, and it is not to be wondered at that they occasionally go wrong. Nevertheless, of the pins that give trouble, many of them will be found to have been faulty in one way or another. Sometimes the fault is with the material, sometimes it is due to defective design, while quite frequently the method of fastening the pins is insecure.

Of the many possible methods of fastening pins in place, there are hardly any that

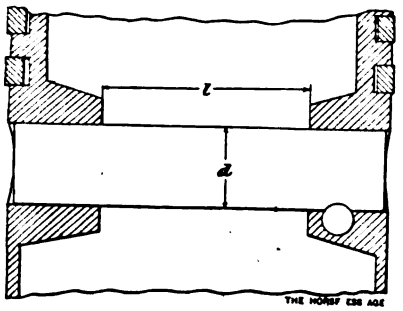


Fig. 1.

will not serve the purpose if the work is done well, but unfortunately the mechanic is not always as skilled and as careful as is desirable. Sometimes the pressure on the pins is too great, and again the method of lubrication is ineffective, so that no oil reaches the pin. In any case, a "floating" piston pin may cause a great deal of damage in a short time, and a cylinder that has been scored by such a pin requires to be rebored before anything like the normal compression can be secured again in the cylinder. It is here, of course, supposed that the cylinder walls are thick enough to allow of reboring, which is not always the case in automobile motors.

A number of illustrations are presented in connection with this article, with the object of showing the various methods employed by designers for locking the piston pins securely in place. Fig. 1 shows a pin of solid round section, presumably of small diameter, which is likely to give trouble on account of the high pressure per square inch of bearing surface. The effective bearing surface is equal to the projected area $l \times d$ of the journal portion of the pin, provided the bearing extends the whole length l of

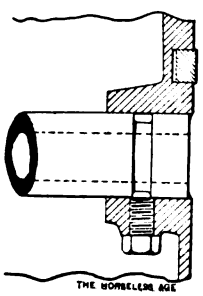


Fig. 2.

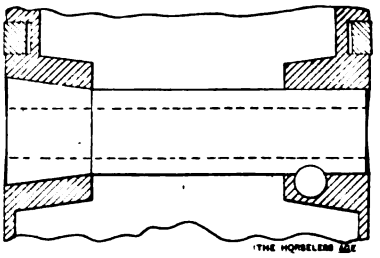


Fig. 3.

the pin, which is not always the case. The fastening shown in Fig. 1 (and also in Figs. 2, 3 and 4) is one of the most secure devices that has yet been applied to this purpose. It consists essentially of a bolt passing through the piston boss and cutting through the pin to a depth of about three-sixteenths of an inch, for a piston of average size. The nut on the bolt is castellated and is prevented from rattling off by means of a split pin. This method of securing the bolt and nut is plainly shown in Fig. 5, which shows the details of construction as found in one of the best makes of foreign motors.

Fig. 2 differs from Fig. 1 in that the pin is lightened by having a hole drilled clear through it from end to end, the diameter of the hole being about one-half that of the pin. Figs. 3 and 4 show pins with one end tapered, so that the pin, in case the fastening means should become ineffective, could float only to one side. The writer does not consider the tapering of the pin to be of any value, for if the locking bolt does its work

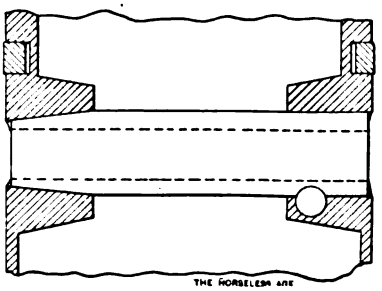


Fig. 4.

a plain pin cannot float out; whereas, if the locking pin fails to do its work properly a taper pin will float out even quicker than a plain pin, because the pressure comes on an inclined plane, as it were, and a small component of it tends to force the pin sideways.

Fig. 5, as before stated, shows the details of the locking bolt, and attention is called to the fact that the piston wall is perforated at opposite points to allow of inserting the bolt and turning up the nut. There is no objection to these holes in the piston wall; and, indeed, it has long been the practice of many designers to reduce the weight of pistons by drilling numerous holes through the wall below the piston rings.

Fig. 6 shows a very common method of locking piston pins in place, and has something to be said in its favor. Some designers use two such locking screws, one in each of the piston bosses, while some go even a little further and lock the pin with two cap screws, which in turn are locked

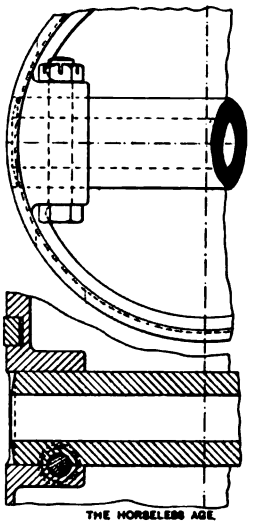


Fig. 5.

by passing a piece of wire through holes in the heads of the screws, the wire being long enough to reach from one screw to the other and hugging the piston wall to pass around the connecting rod. Fig. 7 shows a locking means which has much to com-

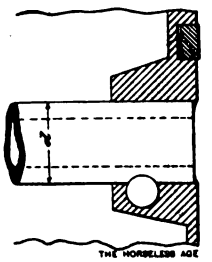


Fig. 6.

mend it for simplicity and reliability, while the locking device shown in Fig. 8 is less secure, because the cotter pin, as a rule, is not a snug fit, and the little play is sure to engender more. In connection with Fig. 8, it should be pointed out that in the drawing the pin is rotated through an angle of 90° to show the ends spread out.

Fig. 9 shows still another method of locking the pin, which to the writer appears to be rather too elaborate; nevertheless, it is used and seems to work.

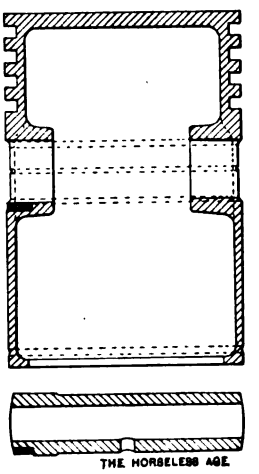


Fig. 7.

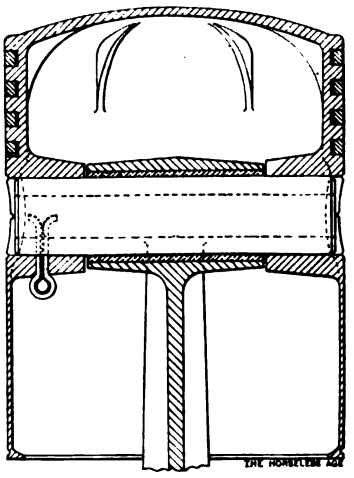


FIG. 8.

The pins, of course, should be made as strong as possible, yet, as weight is an important consideration, the best material must be used. Only a short time ago tool steel was considered the very best material for the purpose, for the reason that the pins are subjected to considerable heat and also to quite high pressure, a maximum pressure of



FIG. 10.—TOOL STEEL PIN BROKEN IN SERVICE.

1,200 pounds per square inch of projected area being very common. Fig. 10 shows a tool steel piston pin broken in service, and is only one of a considerable number of broken pins of this material that have come to the writer's notice. Piston pins should not be made of a material so likely to sudden rupture as treated tool steel. Carbon steel would hardly serve the purpose either, although oil tempered 45 point carbon steel, with not over .02 per cent. phosphorus, is able to bear considerable shock stresses. Water quenched at 850° C. and reheated to 550° C. this steel affords a tensile strength of 150,000 pounds per square inch and an elastic limit of 90,000 pounds; it shows an elongation of 10 per cent. in a specimen 8 inches long and a contraction of area of 55 per cent. In the writer's opinion this material, at 3 cents per pound, when properly treated is better for piston pins than the far more expensive tool steel. But even better results are demanded than are obtainable with carbon steel.

Fig. 11 shows a ruptured forging of "Government specification" nickel steel, which has a tensile strength of 223,000 pounds per square inch and an elastic limit of 190,000 pounds when oil tempered to 950° and annealed to 570° C. While the physical qualities of this material are excellent, it does not stand up under shock stresses in the same way as nickel-chrome steel and vanadium steel. A piston pin of nickel-chrome steel is shown in Fig. 12, and this is believed to be the best material for this purpose at present available. Nickel-chrome steel of the following composition is well adapted to the purpose:

Carbon	.25
Nickel	3.40
Chromium	1.50
Silicon	.21
Sulphur	.024
Phosphorus	.012
Manganese	.36

This product will serve the purpose extremely well if heated to about 950° C., quenched in cottonseed oil and reheated to about 570° C., and cooled in lime ashes, or even in the atmosphere.

Vanadium and Wolfram steels may also be used for this purpose, and specimens of the latter metal are shown in Figs. 13 and 14. Vanadium raises the tensile strength and the elastic limit of steel, but it unfavorably affects the elongation if present in any considerable amount. Wolfram steel should be preferably used in the natural state, without treatment, and this can well be done, as the material as it comes from the mill shows a tensile strength of 150,000 pounds and an elastic limit of 151,000 pounds. Treatment seriously reduces the elongation, as in the case of tool steel.

In the design of piston pins it is hardly practicable to fix the dimensions on the basis of strength of the material, for if the pin is made of treated alloy steel the limit of pressure that may be allowed on the projected area fixes the minimum diameter of the pin. With the proper material the maximum pressure on the projected area may be as high as 1,200 pounds per square

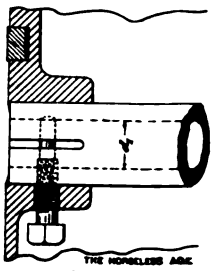


FIG. 9.

inch, but it is preferable to limit the pressure to 800 pounds per square inch. The pins may be bored out to about one-half the outside diameter, and the connecting rod bearings should be about 60 per cent. of the whole length of the pin. It would, of course, be possible to check the strength of the pin by applying the beam formula, considering the pin as a beam uniformly loaded and fixed at both ends, but such a



FIG. 11.—GOVERNMENT SPECIFICATION NICKEL STEEL SHOWING FRACTURE.

method is of little value, owing to the nature of the service.

Consul General Guenther, of Frankfort, writes that the colonial economical committee of Germany has sent the botanist Carl Grossmann to Venezuela to study the growth of the rubber mistletoe plant, which is a native of that country, and to procure seeds of the plant for cultivation in Germany's African colonies. Some of the varieties of the rubber mistletoe yield 20 per cent. of rubber of the volume of the dried fruit. The colonial committee has also sent the gardener and botanist Mr. Deistel, of the Kameroon colony, to Java and British India to study the botanical gardens in those tropical regions with a view to applying his experience to the fields and gardens of the German colonies.

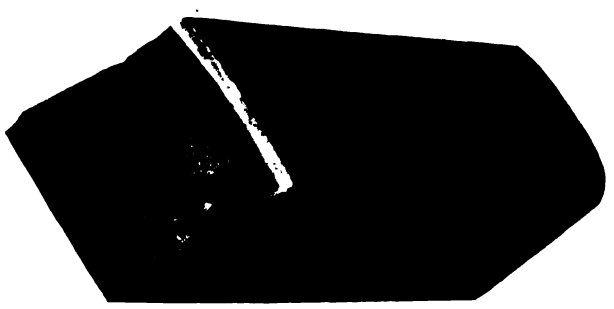


FIG. 12.—NICKEL CHROME STEEL SHOWING FRACTURE.

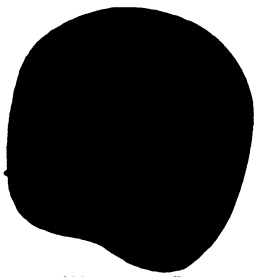


FIG. 13.—WOLFRAM STEEL.

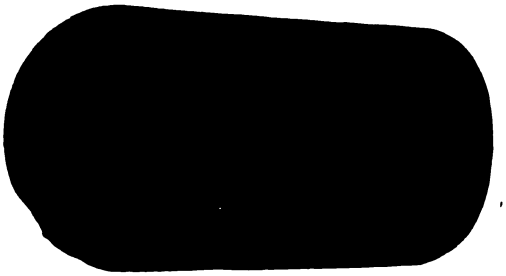


FIG. 14.—WOLFRAM STEEL BROKEN IN SERVICE.

Gasoline Car Maintenance.

By J. S. V. Bickford.

Many men are frightened from buying an automobile by fear of breakdowns and repair bills on the one hand, or the hire of an expensive mechanic on the other. To employ an expensive mechanic is not always satisfactory to the man who has no mechanical knowledge. He has no means of finding out for himself whether the man is competent or not, or whether breakdowns and delays are the fault of the car or the man; and to some people who do not make constant use of their car it goes against the grain to see expensive hired help (as I believe you call what in England we call servants) kicking its heels about the place half its time idle; and not only that, but such idleness exercises a demoralizing influence on all the other people employed about the place. I know that this sort of consideration has deterred many people on this side of the water from buying automobiles, and I have no doubt that it has in America also. If, however, he does not employ a good man, the user with no mechanical knowledge is in constant fear of being stalled by the roadside through some trivial defect.

I believe that if he goes the right way to work these fears are in a great measure groundless. Of course, if a man is going to drive the car himself at all times he is certain to have some derangement sooner or later, and some application on his part in order to master the rudiments of electric ignition, etc., are essential; but a very little will serve to fit him out to meet most ordinary emergencies. The one thing necessary, however, is that the car should be kept in fair order. I have some hopes that the following few notes may be found useful to this end.

In order to keep a car in good order it must be carefully looked after, which means that all its parts which are liable to derangement have to be inspected at frequent intervals. A good man does this sort of thing by instinct, but it is by no means impossible to so arrange matters that an intelligent boy can do nine-tenths of what is necessary.

Even the most competent men will overlook points at some time, and the result is trouble. My method is to make a careful list of all the parts of the car which require looking at. If the private owner wants this sort of thing done, I should suggest that he obtain the services of one of the maker's men for a few days and get him to write out the list. Supplement this by the answer which the maker himself will furnish to the same question, and then have a few dozen copies of the list printed. You will be quite surprised to what a length it will extend. I have one applying to a 6 horse power gasoline car, and there are over 120 points which require attention once a fortnight.

To make the list one takes first the ignition system, and follows the low tension wires right round the circuit, listing by name every terminal on it. It is the working loose of these terminals which causes the missing which usually bothers the beginner so much. The engine of a good car will to a great extent take care of itself, but batteries have to be changed, and if the terminals are not screwed up tight they work loose and cause missing which the amateur can in no wise locate. The list of terminals in this circuit will be as follows for a car having two accumulators. Battery voltage test: No. 1 battery, No. 1 cell; No. 1 battery, No. 2 cell; No. 2 battery, No. 1 cell; No. 2 battery, No. 1 cell. Terminals: Battery, 4; switch, 3; commutator (two cylinder engine), 2; coil, 4; ground, 1; high tension system, 4. Remove plug and examine the points. In the same way one traces up the gasoline leads, lists the lubricators, etc.

All these details are printed in columns, and the party who is entrusted with the examination ticks them off. This is essential to prevent carelessness, and the method can be used as follows: When the boy (say) who has to do the looking over is about to start work, the boss comes along when he is not looking and loosens a battery terminal on the list, and preferably one out of sight. He then waits till the inspection is over, and notices whether this terminal is marked as right or wrong. If the former, the boy gets into hot water, and knows it is not much use monkeying with the boss. This sort of examination does a great deal to minimize the chances of failure. I made one myself the other day on a car which was in good running order and giving its owner satisfaction. I found, among other things, seven loose terminals, including three out of the whole four battery binding screws and the two commutator screws; two loose connecting rod bolts and a brake wanting adjustment. The whole thing, including rectifying, took three-quarters of an hour, and the result is that the car has run without a hitch since, whereas it would have been missing intolerably by this time had the work not been carried out.

Of course, this sort of looking after could only be done with a really good car. Where the machinery requires to be tinkered with every few days a good repair man is essential, and my advice to the owner would be to sell that car at the earliest possible moment. I do not know what the prices range at in the United States, but on this side of the water a thoroughly sound car for a medical man can be bought for about $1,500, or possibly even as low as $1,000, but I hardly think I should care to recommend anything much under $1,225. At this figure a really reliable car may be had which will run excellently with the sort of attention I am describing.

Then there is another point. In addition to the dashboard oilers provided there are usually about one hundred little holes which require a single drop of oil once every two days or so; such places as the little drag link bearings, which hold the ends of the springs to the scroll iron; the bearings through which the brake rods work, etc. All these should be most carefully listed.

To make this list, proceed as before by writing the maker and thoroughly worrying him till you get a good answer out of him, and then take the job on yourself.

Get someone to move everything on the car which is movable. Start, say, with the clutch. Get your assistant to move this up and down when the floor boards are up and trace up the motion. Wherever one rod turns on another or in a bearing, look for the oil hole and list it and number it. Thus, in the case we have taken, it will be found in all probability that the clutch pedal works on a long rod fastened to the foot of the dashboard. Look out for some way of getting oil into this tube between the long, tube like bearing of the clutch and the rod on which it works. At the other end of this tube will be fastened a little lever, to the end of which a rod is linked. This link wants oil—list that; at the other end, perhaps, there is another link; that wants oil. Then comes the clutch fork, that works on a bearing somewhere (its fulcrum). Look out for the oil hole here. Lastly, look how the jaws of the fork are oiled where they engage the grooved collar on the clutch shaft. In this way trace up every movement and look out for the oil hole (likely enough there will not be one and you must do the best you can by wasting ten times the oil you use on the outside of the shaft in the hope that some will get in) wherever one part moves in contact with another, fast or slow. This list could then be printed or typewritten and several copies kept, for they will inevitably get dirty in use, and the car should be lubricated by this list once a week at least, i. e., say, once in every 200 miles. By this means a host of most unpleasant squeaks will be avoided.

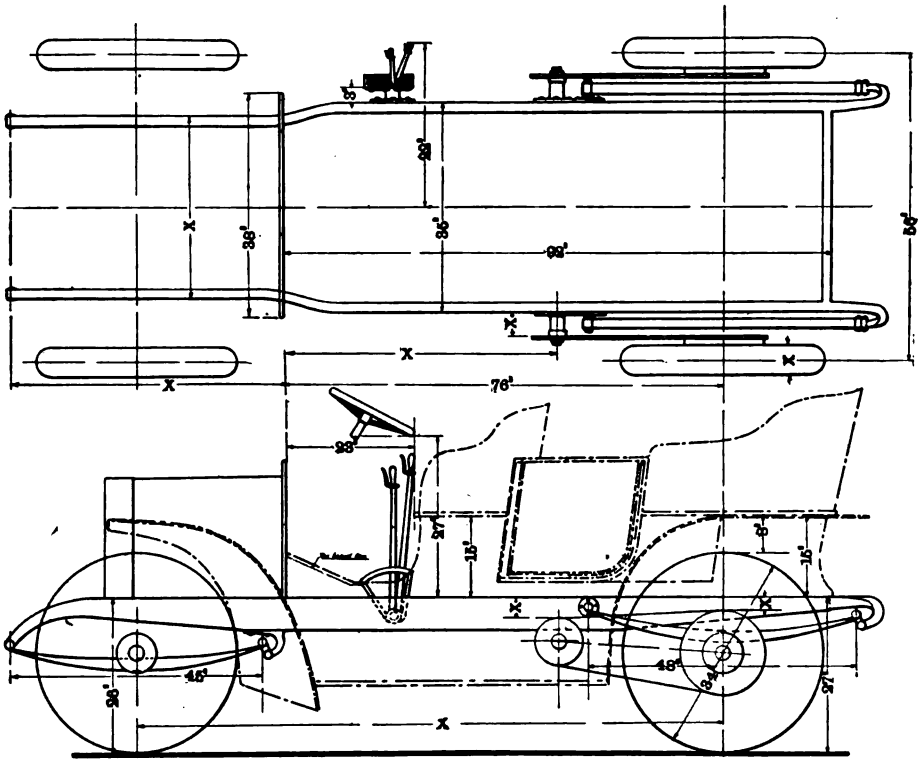
In going over this list it will be found very convenient to use an oil can of the "locomotive" pattern, fitted with an oil pump. With this instrument a drop of oil can be forced in an upward direction; it is often very difficult to get even a cycle oil can into some of the under parts of a car, to oil a part which cannot be reached from above. A notable example is the inside of the spring bearings of the front dumb irons. The only way of getting oil to them is to squirt it in. It is a tip worth remembering, however, not to leave this oil can about a shop where two or three youngsters are employed; it will shoot a jet of oil 10 or 15 feet, and as a weapon of offence is very popular with the juvenile workman and does not tend to improve either the appearance or the temper of the shop.

A German inventor, Herr Raupp, of Mainz, has invented an automatic gas lighter based upon the property of aluminum by virtue of which its electrical conductivity greatly increases when it is subjected to light rays.

Chassis Dimensions from the Body Designer's Standpoint.

By E. S.

In the development of the automobile many hard problems and obstacles had to be overcome, and so manifold were these problems that but few, if any, realized the immensity thereof. The nature of an automobile is manifold, and in order to make a first class car many different kinds of technical talents are required, including that of the body designer. In the early stages of automobile development all had but a faint realization of the requirements for a successful automobile, and one had but very little regard for the other fellow's work, with the result that the automobile was anything but a satisfactory product. Since then the successful designers have realized and learned what an automobile has to withstand, and have also learned that it requires the best kind of materials and mechanical workmanship, as well as artistic design, well projected and with tasteful and elegant finish. Yet there is perhaps even now room for improvement, and in many cases also room for a better understanding between the designer of the machine proper and the man who designs the body. The two parties should understand the requirements and conditions of each other's work and co-operate, with the object of producing as satisfactory an automobile as possible. The time has arrived that the body, which is paramount as far as appearance is concerned, cannot be negelected, but requires to be artistically designed, properly constructed, well proportioned and finished, and must be roomy and comfortable. In order to accomplish these objects, the ideal chassis, from the body designer's point of view, is one that is so made up that it gives him full freedom to design and develop a tasteful body, well proportioned and comfortable for the number of persons the automobile is intended to carry. The body designer is, therefore, mainly interested in those parts of the chassis that will determine or interfere with the development of the body, such as the length and width of the frame from the dashboard to the rear end, and anything that projects above the frame from the dashboard to the rear end of the frame, and such other things as steering wheels, side levers, rear wheels, sprockets, sprocket pinions and driving chains, etc. The cut herewith shows an outline sketch of a frame in side and plain view, showing positions of wheels and springs, etc., and also showing in side view in dot and dash outline a plain and practical tonneau body with fenders (mudguards) and running boards. The views also show the relation of the body to some other parts secured to the chassis. This body is intended for five cccupants, two in the front seat and three in the rear seat.



Frame Proportions for Side Entrance Body.

The distance from the dashboard to the centre of the rear wheels for a body of this style should not be less than 76 inches, the width of the main frame should not be less than 35 inches, and for the full length of frame from the dashboard to the rear end 92 inches is proper for this kind of body.

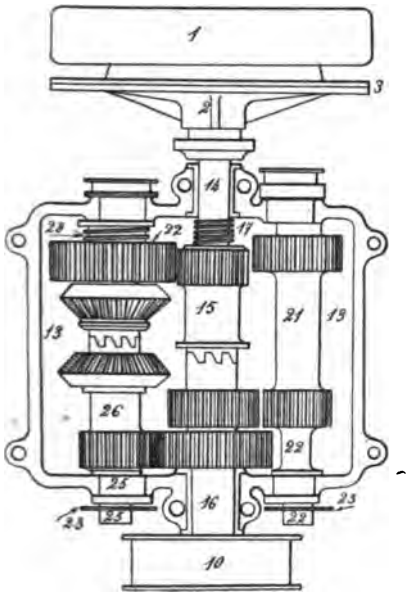
A badly located steering post is very annoying to the body designer, because it interferes with the position of the front seat, as well as the height of the lower part of the body and the front boards of the front seat. The height from the frame to the lower edge of the steering wheel should not be less than 27 inches, while the distance from the dashboard to the rear edge of the steering wheel and the rearward position of side levers should be about 23 inches when the distance from the dasboard to centre of rear wheel is 76 inches. When the distance to the rear wheels is greater, the distance from the dashboard to the rear edge of steering wheel and side levers may also be increased. A good practice is to have the toe board permanently fixed to or integral with the chassis, instead of with the body. The height of the frame in relation to the wheels should be such that with the proper height of the body the rear fenders do not require to be raised above the lower line of the seat, and yet have sufficient clearance for spring action. In the accompanying sketch are given some dimensions which give the proper height of wheels, frame, lower body and the correct position of the rear fender. As some manufacturers use more flexible springs than others, the space between the wheels and fenders should be in proportion to the flexibility of the springs, and the distance from the dashboard to the rear wheels should be such that a well proportioned door can swing open at right angles without striking the fender. In cases where the body designer is unable to see and measure up the chassis, a good practice is to send him an outline sketch like that accompanying this article, with dimensions, excepting those of the body. It is also well to show and dimension all parts that may project above the level of the frame from the dashboard to the rear end. The x marks on the sketch indicate that definite dimensions are to be inserted, but that more or less latitude is allowable in these places so far as the construction and appearance of the body are concerned.

Some recent improvements in the Edison alkaline storage cell are described in the *Scientific American*. Actual use of some 175 sets of automobile batteries has demonstrated that there is a loss in capacity, due to the separation of the active material from the containing flat cases of the nickel plate. A new form of briquette, consisting of a rolled tube of perforated, nickel plated sheet steel, is soon to be used. These tubes are tightly packed with active material by a special machine, and they are then clamped into place in the plate by means of their twisted ends. The tubes are made from a small sheet of metal, which is rolled into the tubular shape and has its two ends joined together. Thus there is a joint running the entire length of each tube, but by twisting the ends of the tube and clamping them, it is impossible for any appreciable expansion of the latter to occur, and separate it from the active material within. A new form of binder other than flake graphite has been discovered, and this, together with the new construction, is said to increase the total capacity of the cell from 10 to about 15 watt hours per pound of complete cell.

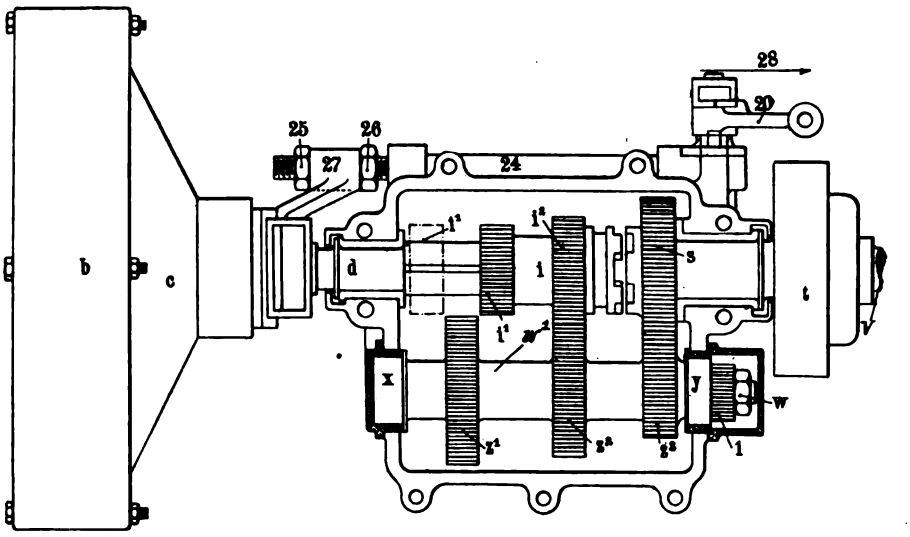
The Renault Direct Drive Patents.

By F. W. Barker.

The feature of direct shaft drive for high speed and speed changes through laterally movable gears have been covered in two United States patents by Louis Renault, viz., No. 660,924, of October 30, 1900, filed July 22, 1899, and No. 725,482, of April 14, 1903, filed November 29, 1901.

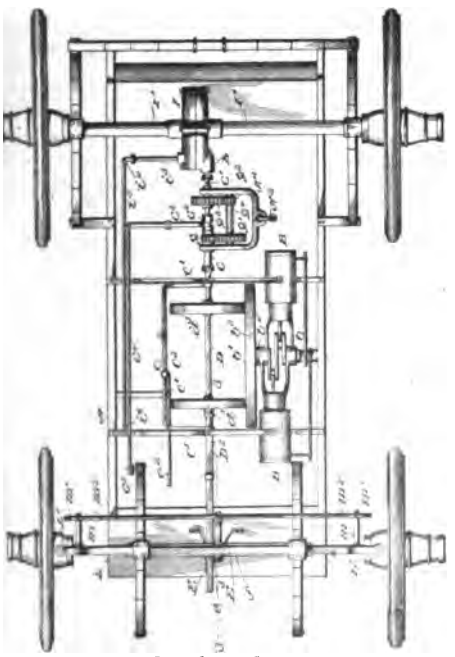


No. 660,924.



No. 725,482.

In the first patent the shaft 14 carries a splined pinion 15, which has end teeth adapted to mesh with corresponding teeth on a double pinion 16, that is loose on shaft 14. When in this engagement the drive is direct from the friction clutch, through Cardan joints (not shown) to the differential. Upon sliding the pinion 15 against spring 17, out of engagement with pinions 16, either the shaft 21 or shaft 26 (both being mounted eccentrically) may be swung toward shaft 14, to bring their pinions into mesh with the pinions 15 and 16, thereby transmitting motion from the splined pinion 15 to the loose pinions 16, at the desired speed. The left hand bevel gear is splined to its shaft and shown clutched to the right hand, loose bevel gear. Means are provided for unlocking these bevels and interposing an idle bevel between them, whereby the direction of motion transmitted is reversed.



No. 607,318.

1. In gearing for motor vehicles, the combination of friction clutch mechanism forming a coupling, a brake working with one section of the coupling, means for actuating the brake and coupling in unison, and means for transmitting the movement of the coupling section with which the brake is connected.

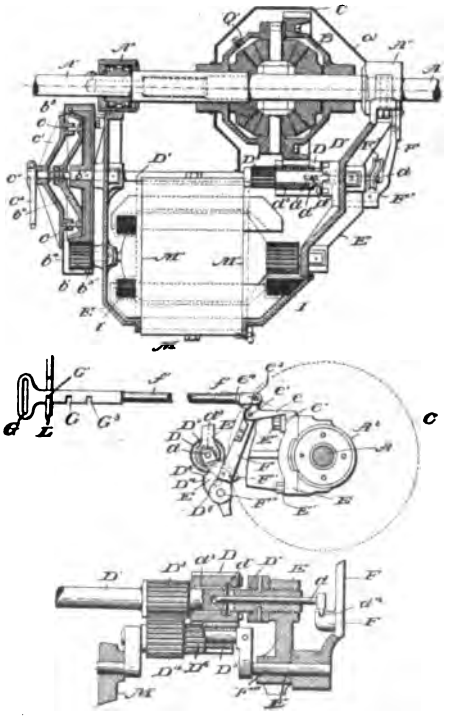
2. In gearing for motor vehicles the combination of clutch and brake mechanisms, a toothed wheel and a shaft connecting the clutch and brake mechanisms with the toothed wheel, the connections of the shaft being such as to permit the independent play of the clutch and brake mechanisms with respect to the toothed wheel.

3. In a gearing for motor vehicles the combination of a primary movement member driven from the motor, a clutch working with said member, a shaft driven by the clutch, the shaft being in two sections with a releasable connection between them, variable speed gear for driving the sections of the shaft and movement transmitting devices in connection with said shaft.

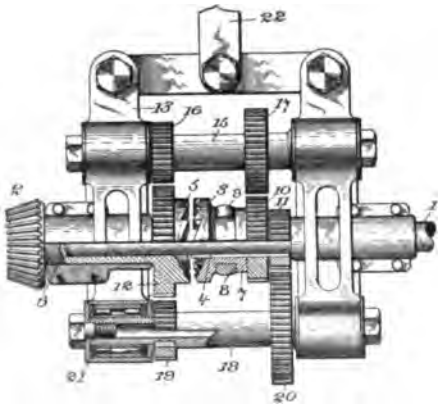
4. The combination of a shaft formed in two sections, a clutch connecting the sections with each other, an eccentrically mounted shaft, movable eccentrically toward and from the first named shaft, gears fastened to the several shafts, and means for operating the clutch and for throwing the eccentric shaft in unison with each other.

5. The combination with a casing, of a shaft mounted therein and formed in two sections, a clutch connecting the sections, a shaft mounted in the casing, means in connection with the shaft for throwing the clutch, a third shaft eccentrically mounted in the casing and movable toward and from the first named shaft, gear wheels attached to the first named shaft and to the eccentric shaft, and means for throwing said eccentric shaft, such means having connection with the second named shaft.

Renault's second patent differs but slightly from the foregoing in its essentials, the main difference being the use of a single gear carrying shaft W, adapted to move toward the main, direct driving shaft *d*, instead of two such shafts as required in the first patent. When shaft W is moved laterally to mesh gear Z^2 with gear S, the pinion *i* having been unclutched from pinion



No. 645,902.



No. 659,390.

S, and caused to slide along shaft *d*, then, according to the degree of sliding movement given pinion *i*, either gears i^2 and Z^2 intermesh to give the middle speed, or gears *i'* and Z' intermesh to give the low speed. An idler carried by an eccentrically mounted shaft is adapted to be interposed between gears *i'* and Z' to provide the reverse.

The claims are as follows:

1. In a speed changing gear for motor vehicles the combination with a motor shaft, of a high speed gear directly driven by said shaft, a low speed gear consisting of a plurality of gear wheels caused to engage by lateral shifting movements, and means for producing rearward travel.

2. In a speed changing gear for motor vehicles, the combination with a motor shaft, of a high speed gear directly driven by said shaft, a low speed gear consisting of a series of gear wheels caused to engage by lateral shifting movements, and means comprising a single rack and a spur pinion interposable between said gear wheels and the speed changing wheels for producing backward travel.

There appears to be very few earlier patents that in any way foreshadow the ideas of the direct drive, and possibly the Renault patents may prove to be valuable property. As showing what has been done by earlier inventors leading up to the Renault device, these patents are noted:

Worth No. 607,318, of July 12, 1898, filed September 22, 1897.

The gears *g*, g^3, being loose on their shaft, are always in mesh, respectively, with the gears g', g^2, that are fast on their shaft g^1. Either one of the gears *g*, g^3, is made fast to shaft G by the double faced clutch G^2, and the power thus amplified.

Sperry No. 645,902, of March 20, 1900, filed August 25, 1898.

A loose gear D on shaft D' is made fast thereto by axial clutch D", the gear D always being in mesh with the gear C of planetary system to drive the compound axle A A'. The shaft D^5, carrying loosely the gears D^4, D^6 (which are fast to each other), is adapted to swing toward shaft D' to mesh said gears D^3, D^4 and D, D^6, whereby, when the gear D is unclutched, the leverage is increased on the low speed.

Fischer No. 659,390, of October 9, 1900, filed February 19, 1900.

The driving shaft 1 connects axially with the driven shaft 6 by the opposed clutches 3, 5. A frame B, mounted in guides 14, carries the change speed gears 16, 17, and 19, 20, meshing either set with the gears on the driving and driven shafts, when the latter are disconnected, as may be desired.

As will be observed, the essential features of the Renault first patent, No. 660,924, can be read in the first claim of his second patent, No. 725,482. Under these circumstances it is doubtful whether said claim can be sustained, because the courts have time and again held a patent bad which attempted to cover broadly features disclosed and insufficiently covered in an earlier patent: Miller vs. Bridgeport Brass Company, 104 U. S. 350.

Commercial Motor Traffic.

A sufficient period of time has now elapsed to permit us to form an accurate impression of the cost and commercial efficiency of heavy motor traffic, to compare its advantages and disadvantages—if any—with its chief competitors, the railways and horse drawn vehicles. For public passenger service the motor omnibus has become an institution in and about London. Already 250 of these vehicles may now be seen threading their way among congested traffic with facility, and the number is growing daily. It is true that breakdowns are still by no means uncommon, but many of these are probably due to want of mechanical knowledge on the part of the drivers. It is perhaps remarkable that failures are not more numerous, for the average driver can know but little of the complex mechanism of which he has charge. A four cylinder gasoline engine, as usually adopted in omnibuses, has eight valves and their attendant parts to be kept in the best of order. Then there are clutches which are liable to act too fiercely or to slip, either of which faults is equally unpleasant in busy thoroughfares with times to be strictly kept. Then there is the change speed gearing, which requires careful handling and is always liable to derangement by an unskillful driver. If we add to these items the ignition apparatus, whether magneto—as is usual—or batteries and their attendant connections and sparking plugs, carburetors which are liable to choke if a portion of grit the size of a pin head finds its way into the fuel tank, a good idea of the delicacy of handling and all round knowledge required may be formed. It says much for the workmanship employed by motor car engineers that troubles are not more frequent.

For the transport of merchandise the driving difficulties are not so great. This does not necessitate the constant stopping and starting, which is equally destructive of horseflesh and steel. The difficulty which has hitherto beset carriers of merchandise by heavy motor vehicles is the want of freight. To work under the best paying conditions these must be constantly loaded, as the working expenses are much the same whether running light or carrying their maximum loads. The expense of carrying a full load in one direction is frequently nearly doubled by the vehicles having to return empty. Still, under such unfavorable conditions the cost of a motor service can be frequently made to compare favorably with one in which the haulage is done by horseflesh.

The ideal conditions of operation for heavy steam traffic are over distances of from 30 to 40 miles, with loads from 4 to 8 tons both out and return. Under such conditions of work the cost per ton mile, and the advantage of one handling, must result in economy. An instance of an average service of steam wagons is furnished by the corporation of a northern city. In this case three wagons are used to convey oil a distance of 6 miles to one of the gas works. For some time the vehicles have made, on an average, three return journeys per day on five days of each week, and one return trip on Saturdays. The weight of oil on each journey is 117 cwt. The tank to hold the oil weighs 25 cwt. Each wagon, therefore, travels 36 miles per day, with a gross load of 142 cwt. in one direction, or, say, for 18 miles, and with a load of only 25 cwt. on the return 18 miles. The total weekly mileage is then 192 miles, that is, 96 miles in either direction. The following figures show how the cost of operation works out:

Work done $\frac{96 \times 142}{20} = 681.6$ ton miles per outward journey.

Work done $\frac{96 \times 25}{20} = 120$ ton miles per homeward journey.

Thus 681.6 + 120 = 801 ton miles per week per wagon. The cost per week is as follows: Driver and assistant, £2 17s.; fuel—coke—19s.; oil, water, etc., 5s.; repairs—10 per cent. of cost per annum—£1; depreciation, 15 per cent. per annum, £1 10s.; insurance, 10s.; total, £7 1s. Dividing this amount —£7 1s.—by 801, the cost per ton mile is found to be 2.1d. A simple arithmetical calculation shows that, if only a fraction of the outgoing load could be insured on the return journey, the cost of transport would be materially reduced. If, say, in the case of brewers' work, a return load of empty casks weighing perhaps 25 cwt. could be relied upon, the cost would be brought down to 1.8d. per ton mile.

Since the introduction of the higher tare limit for motor wagons, there has been a marked decrease in the number of breakdowns and wheel troubles, owing to the strengthening up of vital parts. There is, however, still room for improvement in the direction of noiselessness, and the fitting of spark arresters. When working with a high blast much discomfort is frequently caused to other users of the roads by the emission of sparks and ashes from the chimneys of steam vehicles.—*The Engineer.*

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The Gasoline Storage Question.

The motorist is not the only person in the world of automobiling who is directly experiencing legal difficulties, although that which detrimentally affects one class interested in motoring or the automobile industry necessarily has a damaging influence on the other classes. For example, whatever restricts the liberty of the road in use by the autoist is, of course, felt by the manufacturer. The same principle applies in placing restrictions on the garage keeper; that which hinders the keeper of a garage in the storage of automobiles inconveniences the automobile owner. A case of this kind recently occurred in New Jersey.

The Court of Chancery at Jersey City in New Jersey, upon complaint against the maintaining of a garage on a certain boulevard, recently handed down an order which determined that one-half pint of gasoline was all that may safely be left in an automobile stored in a garage. The order enjoined the storage by the defendants of gasoline in the building occupied by them as a garage until the further order of the court, but it was provided that, until the court's further order, the defendants could allow sufficient gasoline to remain in automobiles about to enter the building under their own power, but the amount of gasoline allowed to remain in the vehicles was fixed at not more than one-half pint for each vehicle. The court also authorized the complainants at all proper times and from time to time to inspect the gasoline tanks of automobiles about to enter the building or those actually within the garage, for the purpose of ascertaining the amount of gasoline contained in them.

The action of the court in the case under consideration is drastic and oppressive. If the restraining order is made final, and should be upheld by the highest court of resort, there would be a situation of great hardship calling for immediate legislation. However, it does not seem that this could be the case, but whatever may be the result of this particular instance of restricting the storage of gasoline by garage keepers, the order granted constitutes a reminder to those interested in motoring that it might be well to take action in forestalling similar occurrences by advocating proper legislative measures.

That the storage of gasoline and other inflammable substances should be regulated is not denied. The State has the power, of course, to control the storage of the keeping of combustible and inflammable matter, under its police authority, and should seek through the Legislature and the courts the protection of the public safety. But eagerness to protect the safety of the public should not be carried beyond reason.

It was not long ago when an automobile was prohibited from entering or remaining upon a ferryboat under its own power, because under an act of Congress this could not be done. The fire was required to be extinguished before entering the vessel and could not be relighted until after leaving it. In a case which arose under the act of Congress in question, it was held that an automobile in which the motive power was generated by passing an electric spark through a compressed mixture of gasoline and air in the cylinder, causing intermittent explosions, constituted a fire while the vehicle was under motion from its own power. (See The Texas, 134 Fed. Rep. 909.) The decision placed the automobilist in a sorrowful plight, but there was a remedy. Congress recognized the need of immediate legislation, and passed an act which allowed automobiles to enter the vessel by their own power. Automobiles are now expressly permitted by Congress to be carried by steam passenger vessels, *and they are not limited to the carrying of one-half pint of gasoline while on board.* What reason is there, may we ask, for fixing such

a limit where the gasoline is stored on land, and there is no fire?

The maintenance of a garage on a public highway is not a nuisance. The business of a garage keeper is "perfectly lawful and legitimate," as said by Mr. Justice Woodward, of the Appellate Division of the Supreme Court of the State of New York (Stein vs. Lyon, 91 App. Div. 593).

Litigation concerning the storage and keeping of gasoline is increasing, and from the outlook it seems as though the motorist will be confronted with another problem—"the gasoline storage question."

The Proposed Outdoor Show.

The American Motor Car Manufacturers' Association next fall will put into practice an idea long advocated by one of its members—that of an outdoor show. The outdoor feature is, however, hardly of as much interest as the date of the show announced. In September and October, at which period the show is planned to be held, the selling season has come to an end, and agency appointments for the coming year are in order. From the competition among manufacturers with respect to agency deals manifested last fall it was to be expected that the smaller firms would raise their voice in favor of earlier shows, as in individual demonstrations they can hardly compete with the large concerns. The date alone will make the proposed outdoor show a trade show, where agents are appointed rather than cars sold to the public. Possibly a few sales of cars to private customers may be made at this show, as there are exceptions to every rule; but the great body of the public will not buy at that time of the year, because the driving season is too nearly at an end, and it would be possible to make little use of the car that year after it was delivered. It might be worth something to the prospective purchaser to be sure of having a car on hand as soon as the roads dry up in the spring, but the average man prefers to have his money on interest, rather than to have a car in the stable four or five months before he can use it.

All agents are at present divided into two camps, representing licensed and unlicensed manufacturers, respectively. At the end of each year, however, there is a migration from one camp to the other, and it may be expected that this migration the coming fall will be influenced by the proposed outdoor show. The show is announced as open to the industry generally, but after the sharp division of the trade at the recent shows in New York it is hardly to be expected that the outdoor show will be patronized by any but independent manufacturers. This will give that faction of the trade an advantage in some respects, and it would not be surprising to hear of a competing fall trade show organized by the rival faction. This would not necessarily be an outdoor show, for, aside from the saving in expense as compared with an indoor show, no particular advantage is apparent in the outdoor feature. On the contrary, if the weather should turn out bad, it would be almost certain to seriously interfere with the success of the show, though it must be admitted that in the fall the weather is usually dependable.

The location of the show, it appears, has not yet been decided upon, but probably some central city, Detroit or Chicago, will be selected, for the reason that the majority of the independent manufacturers are situated in the middle West, and also because these cities are more accessible to dealers from all parts of the country. In view of the fact that most of the prominent manufacturers will probably have their new models completed some time in September, and be ready to make propositions to dealers four months before the opening of the national shows, we have no doubt that the proposed outdoor show will prove a success. It is desirable that a definite date be fixed as early as possible, in order that prospective exhibitors may know when they must have their models completed.

Guarantees.

The majority of automobile manufacturers still use the standard form of guarantee, extending over a period of sixty days from the date of bill of lading, which was issued by the National Association of Automobile Manufacturers several years ago. The number of firms who offer a full year's guarantee is, however, constantly increasing. It must be admitted that sixty days is a very short period to warrant the efficient service of a machine of the character of an automobile, as in the case where the purchaser lives at a considerable distance from the factory, and is a novice in automobile driving, he will hardly be able to get much use out of his car before the guarantee expires. Moreover, now that deliveries in some cases begin in January and February, many purchasers of pleasure cars are prevented by weather conditions from driving their machines to any extent while they are still warranted by the manufacturers.

In practice, however, not all the firms who give only a sixty days' guarantee decline to make good any defects in their cars developing after that period has elapsed. On the contrary, most of the well reputed manufacturers are extremely liberal with respect to the free renewal of parts that fail in service during the first season's use, through no direct fault of the owner. Such action always creates a very favorable impression with the customer, who realizes that the firm are doing better than they have bound themselves to do, and manufacturers adopting this policy soon achieve a reputation for standing behind their goods. As a result of the extensive adoption of this policy, the relations between manufacturers and purchasers are now usually much better than they were a few years ago. Those who pursue the policy referred to might almost equally well give a full year's guarantee on their cars, but cases arise where the trouble is largely due to improper handling, when it is well not to be bound by a guarantee. Moreover, the manufacturer does not get the same credit for supplying repair parts free of charge as when the car is guaranteed for only sixty days. The one year guarantee is likely to impress the purchaser most before he gets his car, while the sixty days' guarantee, very liberally interpreted, is likely to impress him most after he has made his purchase, and may make him a continual customer or a living advertisement.

One year appears to be a reasonable time for the manufacturer to warrant an expensive machine like an automobile, and probably this will eventually become the standard period of guarantee for automobiles. At the same time we are approaching the ideal of such perfect construction that with ordinary care no repairs or replacements of moment are necessary during the first year of a car's use, so that the guarantee loses all value.

Driving from the Left Hand Side.

Repeated attempts have been made both in this country and abroad to break with the old practice of having the driver of the car sit at the right hand side of the seat in driving. We remember some cars built by a pioneer Western manufacturer prior to 1900 which had the steering tiller and change gear lever near the left hand side, and another pioneer American manufacturer

ered to the left hand control system un-
bout two years ago. This control sys-
at least as applied to the earlier vehi-
is based on thoroughly sound princi-

The law of the road requires all vehi-
to keep to the right, and in passing an-
r vehicle going in the opposite direc-
the driver, if seated on the left, would
n the side toward the passing vehicle
could much better observe the distance
een the projecting parts of the two
which would tend to avoid collisions.
vertaking a car the driver of the faster
g vehicle, if seated on the left, would,
ourse, be on the off side, but the driver
ie vehicle overtaken would then be on
near side, and whether left hand or
hand control is used, only one of the
rs would be on the near side.

any owners and drivers of modern
ng cars prefer, however, to sit on the
hand side, because in that case the
hand is free for operating the side
s, and where there are two of these
s, as in most modern touring cars, one
ps with a composite motion, it re-
s considerable dexterity to handle them
rly in an emergency. The right arm
o usually stronger than the left, but
s of less consequence, as comparatively
power is required in changing the
, and also in applying the brakes, if
are properly constructed. Perhaps the
arrangement with left hand control
l be to have the gear lever on the
ng post and only a single lever (for
nergency brake) on the side of the car
operated by the left hand.

h the advantages and disadvantages of
and control stand out most promi-
in city driving. In passing through
s crowded with traffic the driver must
tread his way through narrow pas-
and being seated on the near side
materially aid in avoiding collisions.
however, also required to make fre-
use of the control levers, and they
therefore, be in such a position that
an be operated rapidly and with cer-

Considering all the facts, a number
ms manufacturing cars designed
ly for city use seem to have come to
nclusion that for this purpose the left
ontrol has the balance of advantages.
ve in mind particularly an American
acturer producing a two cylinder gas-
ar specially intended for town driv-
d a French manufacturer who exhib-
"town car" with left hand control at
e London and Paris shows.

"The United States Trade Reports."

We regret to observe that a number of firms in the automobile business are being imposed upon by the United States Trade Reports, of Cincinnati, one of the most notorious fake sheets printed in this country. The method of the publishers of these "reports" is somewhat as follows: An article, written in pencil, and headed "Editorial from the United States Trade Reports," is sent to a firm of manufacturers or agents, and they are informed that it will appear in an early issue of the publication named. They are also requested to order a certain number of copies of the issue in which the article is to appear, which are offered at about 15 cents a copy, the actual price varying according to the number of copies ordered. The articles relate to the product of the manufacturer addressed and invariably pronounce it absolutely the best in the market, so found after "the most thorough investigation for the benefit of 'our numerous readers' (?)." The party addressed is given to understand that the article will be published whether any copies are ordered or not, but we have been told that several firms addressed who knew the "Reports," and did not feel that they wanted to buy any copies, never did see the proposed editorial appear.

The exact style adopted by the Reports may be judged from the following, which is a portion of an editorial submitted to a New York agency:

"Lately we have been making an investigation so that we could name to interested readers the firm or concern selling the BEST make of spark plugs for automobiles. We were very careful to obtain the most positive information, such as we always obtain, however, and with the result that we are now prepared to advise our interested readers to address the ——— Company, general office and salesrooms in the United States, ——— West ———, New York city; main works at Paris, France. They are the sole agents for the United States for the ———. We find that the ——— spark plugs, which are imported direct by the ——— Company, are generally conceded as being the best in the market. They have been fully tested by time and experience, and have proved, beyond all question, that their quality, efficiency and reliability cannot be equaled by any other make of spark plugs. As a matter of fact, all electrical appliances manufactured by the ——— are absolutely perfect and can be depended on absolutely," etc.

The manager of the firm addressed informs us that he has not ordered any copies, and as he has sent the original pencil copy of the proposed editorial to us, it is just possible that the readers of the United States Trade Reports will never learn who makes the best spark plug. They have been duly informed, however, who makes the best metal polish for automobiles (and other purposes), and the best automobile storage battery, and possibly the publishers of the Reports have trapped many other innocents in the automobile business who have not seen fit to remember us in distributing the copies purchased by them, for, it need hardly be mentioned, the United States Trade Reports are not on our exchange list, and the only copies we receive come to us through the manufacturers whose fame has been so loudly proclaimed through the columns of the Reports.

It is strange that any intelligent man, such as we should expect the manager of a manufacturing concern to be, should be gulled by such a barefaced swindle as that practiced by the United States Trade Reports. The price asked for the sheets is outrageously high, and it must be obvious to the manufacturer that the pretended investigation of his products is a pure fiction. Possibly some who are aware of this latter fact purchase the sheet in the hope of deceiving the public. If such be the case, they fully deserve to be made the victims of Trade Reports publishers and the laughing stock of the few whom their copies reach. Some people to whom the proposed editorials of the United States Trade Reports have been submitted have been inclined to believe they were issued by the United States Government, and we are strongly of the opinion that the Government is warranted in proceeding against the fakirs for the use of the name.

Automobiling in Hawaii.

A reader of THE HORSELESS AGE who is a resident of Honolulu ventures the opinion that there will be very little use for commercial automobiles in that country for some years to come, because the need for transportation has been provided for by railroads and flumes. Hawaii is a rainy, adobe country, and the roads through the plantations are not macadamized. Besides, freight charges on automobiles to the islands are very high, and the cost for mechanical work is very high also. Again, the distance to the United States is so great that it takes two or three months to get spare parts.

It is, however, a fine country for touring, as the roads from place to place are macadamized, and the scenery is beautiful and entirely different from that of any other part of the world. One should bring spare parts for machines and plenty of the best hard service tires, as the volcanic rocks used for macadamizing are very gritty.

There are four islands where there are good roads, and the cost for freight on an automobile from one to another is $10. The cost for first class steamer passage, including everything, is about 6 cents per mile. The climate is the best on earth, neither too hot nor too cold. People go there from Alaska to get warm, and from Manila to get cool. The country is all hilly, but most of the grades are easy; occasionally 10 per cent. slopes are met. One shoul
good hill climbing machine.

LESSONS of THE ROAD

Over the Allegheny Mountains in a Second Hand Automobile.

By F. P. A.

I was no tyro when I purchased the car with which this tour was made, as I was one of the pioneers in this automobile game, having had two years' experience with a steamer and one with a single cylinder gasoline car. When my friend and adviser informed me that A—— desired to sell his touring car, a finely built, powerful car, that had cost him nearly $2,800, I asked, "What is the matter with it?" and was informed that the garage people where it was stored could not make it run or did not want to make it run, as they were trying to sell A—— a car of another make for which they were the agents.

My friend said, "There is nothing wrong with the car, except for defects due to neglect." He advised me to buy it and bring it to his shop, and he would fix it so as to give me good service, and he thought I could get it cheap. I took a look at it and it was only my confidence in my friend that made me look a second time. The tires were all flat, two being worn out; the engine could not be turned over and was covered with dust and rust, and a sad looking sight. I asked the polite garage man the price and was informed that it was $1,500. I told him to guess again, and, as he was a personal (?) friend of mine, he asked me to wait a minute and he would see if he could not get a special price for me. I waited, and, after a few minutes' conversation over the 'phone, he informed me that I could have the car for $1,000. I told him he had another guess coming and walked out, thinking the incident closed. How wise in my ignorance!

About a week later my friend asked me what I would give for the car, and I told him $500. He said he thought he could get it for me, and, after a few minutes' talk with the owner over the 'phone, told me to go and get my car. I did so, hauling it to my friend's shop with my old single cylinder car, and told him to go to work on it. He did so, and in less than two weeks' time I was doing stunts all over the country, perfectly delighted with my purchase. My bill was $62, which included extra work of putting on a dynamo and an odometer. I was not yet out of the woods, however, as I was obliged to purchase two tires, at a cost of $68. I was then ready for any old trip, having two extra cases and four extra inner tubes. This climax occurred early in June.

OUR TOURING PREPARATIONS.

All winter long I had been studying road maps, touring books and Government charts, gathering all information possible for my contemplated trip to Michigan. I had little anticipated making it in an expensive touring car, but had intended using my single cylinder in an attempt to cross the Allegheny Mountains. Having disposed of my single cylinder car, my brother and I hurried our preparations for the long and difficult trip.

The tonneau was removed, and on the backboard which took its place a brass rail was fastened, that held two dress suit cases securely. The body was filled with everything we could think of or any of our friends could suggest. We had a complete catalogue in it, and when weighed the scales balanced nicely at 350 pounds. Our total weight, loaded and with both of us aboard, was 2,750 pounds.

WE ARE OFF.

On a bright, beautiful June morning we were off. How fine we felt and how nicely the car ran! Up and down the hills of the splendid limestone pikes of Maryland we raced, generally on the high speed. Twenty-five miles out we broke the high speed clutch lever (made out of brass). Shades of night cover us securely while we anathematize the maker of that brass lever! We worked along on our second speed to Mount Airy, where we wired and 'phoned for an hour, finally succeeding in getting a new lever made of steel, but too late to put in that evening. Odometer reading, 40 miles.

The next day we found that the lever did not fit, and worked half a day over it. Finally at noon we got off. After breaking our starting chain a couple of times, requiring half an hour each time to repair, we made Gettysburg without any mishap to ourselves; but we frightened the driver of a six mule team so badly that he fell off his saddle mule and allowed his team to run away. Letting his team go, he started toward us, evidently intending to make trouble. As we knew we were in no way at fault—the team having barely seen us, being on another road and going in a different direction—I determined not to be delayed by this man, and we drove on. Greatly to our relief no complaint was made, and we were allowed to proceed in peace.

The roads from Washington to Gettysburg are simply grand; no more beautiful ride can be found than this one. Odometer, 80 miles.

Next morning we got an early start and were prepared to "eat up the roads" and make up for lost time; but, alas and alack, "man proposes," etc. Two miles out something happened. Our engine choked up, snorted and died. In vain we tried to start it. After working four hours, a rocker arm spring, worth 15 cents, was found broken. A kind farmer near where we were laid up sent his little girl to us with offers of assistance. At noon time, seeing us still at work in the hot sun, he again sent the girl, this time with a pitcher of delicious cool milk and some cake, and with further offers of assistance. How good it all was—the milk, the cake, the sympathy! We accepted all, and asked him to haul us into his barn for the night. Then with his horse and buggy we drove to the city and wired for the extra spring, in the meantime improving our opportunity to get a Pennsylvania license, for which we put up $5, refusing to tip the constable who administered the oath.

The next day we waited for the spring that would not come, improving our time by driving over the battleground with the horse of the generous farmer. Learning that the battle of Gettysburg was not fought in a single day, we kept up our hopes and spirits. Next day the spring came, and an hour was spent putting it in; but still the engine refused to run. We finally gave up and wired for our repair man in Washington to come to our rescue. He arrived on the evening train, and at once went to work. With my brother and myself holding lamps for him, he looked and acted like a fiend in his eager work over the machine, trying first the ignition system, then the carburetor, then the valves, and in less than fifteen minutes he said the cylinder head must be removed, which in this engine is cast solid for the two cylinders, and quite an undertaking. I suggested waiting until the next day, but he would not listen to me, and in twenty minutes I was helping him lift the head off. A quick inspection by him, and "There is your trouble," he said. An internal rupture of the gasket allowed the compressed gas to escape from one cylinder into the other. In an hour the head was replaced, with a new gasket, and the engine started. Without waiting for lights, hat, coat or anything else my crazy repair man went racing down the road at 40 miles an hour trying the machine, having barely given me time enough to jump in. "Why don't you go through in a day? This thing runs fine," he said. Leaving him at the depot I said, "How much?" "Ten dollars; next time it will cost you more, as the railroad fare will be more."

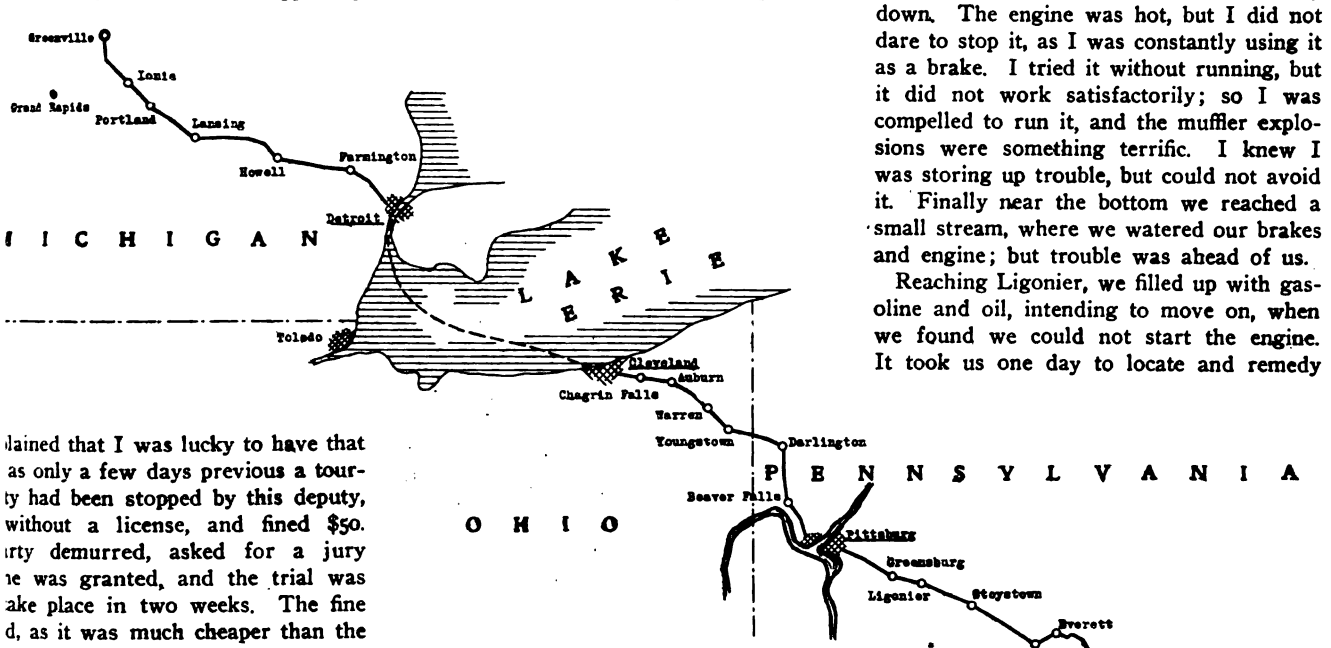
The next morning we spent in showing our gratitude to the farmer's family by giving all a good ride, and at 10 o'clock we were off for the Blue Ridge Mountains, that showed dimly in front of us. What a grand ride we had that day! It was worth all our worry and delay. Three ranges we crossed, none of them difficult; the roads were excellent, and when we pulled up at Everett that night we had covered 70 miles of our journey without a hitch, and were glad we were alive. Odometer, 150.

Rounding up to our hotel in grand style that evening, the front gallery being full of onlookers, I saw the street was too narrow to make the turn, so I threw out my clutch and applied my foot brake, but the car paid no attention to it, and before I could think of anything else to do into the gallery we went with a big bump. Everybody jumped to their feet, but no one was hurt. I reversed and backed out; the incident caused caustic comments from my brother and much amusement for the crowd. Examina-

lisclosed that all of my brakes were
The last ridge we had come down
8 miles long, and full of "break-
that must be taken at slow speed.
ınt application of the brakes is nec-
to run down one of these hills,
ss is slow and fatiguing, and ordi-
better time can be made up than
these hills.

MUST HAVE A LICENSE.

we stopped for lunch at Chambers-
ı roughly dressed individual stepped
me and said, "Let me see your
." "Who are you?" I asked. He
, "I am the deputy sheriff of this
." After a look at my license he
ı few pleasant remarks and moved
The village oracle then stepped up



ılained that I was lucky to have that
as only a few days previous a tour-
ty had been stopped by this deputy,
without a license, and fined $50.
ırty demurred, asked for a jury
ıe was granted, and the trial was
ake place in two weeks. The fine
d, as it was much cheaper than the
ıd expense of the trial.

repairing one set of brakes next
got off at 10 o'clock, but had only
short distance before we noticed
mething was wrong—the engine
loggy, and nothing I could do
to improve it. With the main
f the Alleghenies in front of us,
ipect was not very promising, con-
y we reluctantly turned back to
l and went to work on the invalid.
ot enumerate what I did or what I
t I worked on that engine until
k in the evening before I located
ıble. It was lost motion in the
lvancer, which in my engine opens
for starting. A blacksmith fixed
e in fifteen minutes, and we were
e engine ran like a "scared wolf,"
l it stood by us when we com-
the ascent of the main ridge of the
ıies. Eight miles up—up with not
; place in the entire distance; not a
that 8 miles where a single set
s will hold a machine for an in-
ıp, up, up we went, everything
fine, engine strong. Up we went
ıe second speed; the road is fine,
goes up! After we were about
up my brother remarked that it
was about as monotonous a ride as he had ever taken. "Confusion seize you," said I; "if you cannot appreciate the grand work this engine is doing, get out and walk!" Only once, just before reaching the top, did we come down to our low speed.

I will attempt no scenic description, only advise any lover of the grand to take this trip. From the top of this mountain a panorama is disclosed that is equaled by nothing I have ever seen in the Rocky Mountains, where I spent ten years of my life.

We finally stopped for the night at Stoyestown, a wild mining town on the side of the mountain, and it stood us well in hand to be good natured to the crowd that surrounded us as we pulled up before the hotel in the gathering dusk of night. "Give us a ride, old man?" was about the first greeting I received, as I waited for my brother to make arrangements at the hotel. (We always made it a rule to secure prices before unloading, and it saved us many a dollar.) As my brother came out indicating our stable, I smiled at my half drunken bully as I told him to get in. In he climbed, warning all loafers away. And away I went in safety. For was I not protected by the biggest bully in town? and he said I was all right. Odometer, 170 miles.

SOME CLIMBING.

I had some difficulty in starting the engine for our next day's run, but finally got off, and almost at once got busy on Laurel Hill. This is the worst proposition on the entire route from Washington to Pittsburg. Many expressed their doubts of our ability to make it; but our courage was good, and at it we went. It is 20 miles—8 up and 12 down. The road is not well cared for, is rough and full of loose stones, but the bed is always hard, and no one with a good climber need hesitate trying it. But do not try it without a sprag. We were near the top, slowly crawling along on our slow speed, when looking ahead I saw the roadbed was smooth rock, steep as the roof of a house. It seemed impossible that any wheel could hold on that slippery rock. I knew my brakes and engine combined could not hold me if I should commence to slide back. I did not dare to stop. Calling to my brother to get something to block the wheels with in case of failure, I continued on, coaxing the engine all I knew how, and to my surprise we moved right up over this steep rock without a hitch or slip. It was with a big sigh of relief that soon after I beheld the summit of Laurel Hill. The engine was hot and no water available. After a long rest we started down. What a ride! My brakes were on fire before I was half way down. The engine was hot, but I did not dare to stop it, as I was constantly using it as a brake. I tried it without running, but it did not work satisfactorily; so I was compelled to run it, and the muffler explosions were something terrific. I knew I was storing up trouble, but could not avoid it. Finally near the bottom we reached a small stream, where we watered our brakes and engine; but trouble was ahead of us.

Reaching Ligonier, we filled up with gasoline and oil, intending to move on, when we found we could not start the engine. It took us one day to locate and remedy our trouble, which this time proved to be a leaky stuffing box of the pump, located in the crank box, thus filling the latter with water, flooding the engine.

As we pulled out of Ligonier the next day we were cautioned that we had better not break down again for the next 40 miles, as there were no railroads, repair shops, blacksmith shops or assistance of any kind to be had in that distance. It certainly was a wild, rough country, but the roads in the main were good, although we found many short, steep pitches as we left the graded roads of the mountains. With our late start we only made Greensburg. Odometer, 230.

We were now out of the mountain
expected to make better time. W
do it! We made the run to

without further accident than breaking the small bolt that holds the starting sprocket to its shaft. As we needed several little repairs, we ran into an East Liberty repair shop for the day. Here I procured a starting chain that never caused me a moment's trouble, and is still doing satisfactory duty, replacing the light bicycle chain that cost us so much time and trouble. Repair bill, $13. Odometer, 275.

The next morning we were on the road with a guide to pilot us through the Smoky City. Over the beautiful Grant boulevard, down into the busy streets, across the bridge, and then our troubles commenced. It had been raining two weeks, with scarcely any intermission, and on the first unpaved hill we came to we became stalled. Out we climbed into the mud and wound our rear wheels with five-eighth inch rope, that we had fortunately brought with us. With the ropes on, mud had no terror for us until we went into a puddle that threatened to pull off our radiator. Altogether we had a hard time of it. We wore out two sets of ropes; were in and out all day removing and putting on ropes, for we could not run on paved streets with ropes on. We finally pulled up at Darlington with a very hot engine and a leaking radiator. Odometer, 316.

Next day we were delayed until noon patching up the water system. One of my old cases showed signs of failing and we tried wiring it with telephone wire, but it was no use. Then we tried canvas bandage; failure. Finally, when we were well out of the mud and on an excellent road, running 25 miles an hour—bang went the tire! The chauffeur threw out his clutch, applied his emergency brakes, and we stopped in good shape. One of our extra cases was soon on and we were off again. Roads were slow and we started late, so the best we could make was Youngstown. Odometer, 343. We remained laid up in that city all day; weak batteries seemed to be our trouble, but it took a long time to find it. Repair bill, $9.75.

The next day we were again on the road with troubles around us. First our second weak tire gave out; we replaced that. We were nearing Cleveland when we were startled by a most unearthly noise from the engine. Thinking of hot boxes, etc., we stopped and examined everything carefully; found nothing. Started the engine again, only to have our hearts' strings torn loose by the horrible noise. As it was getting late, we laid up for the night, completely worn out and getting a trifle discouraged. That night I dreamed I was in a six days' walking contest that had been declared a draw and had to be walked again, and I was on my second walk. How tired I was! Odometer, 398.

A careful hunt the next morning disclosed the trouble in my pump. A little ...cker gasket on its face plate relieved ...flanges and everything was again O. K. Starting for Cleveland, one cylinder hesitated for a while, then quit work and at the first hill we were stalled. In trying to start the engine, it back fired and tore two teeth out of the small starting sprocket. We were too tired to say much, and were taking a much needed rest, when a country boy with a horse and buggy appeared. We finally succeeded in getting him to try to haul us to the city. It looked like impossibility, but we hoped to meet something better as we approached the city. By dint of much help from us the poor horse had succeeded in hauling us to the top of the small hill when we were delightfully startled by the familiar honk of an automobile. Looking around, we saw one of



In Front of the George Washington Monument.

those dear steamers coming, full of a gay party out for an airing. Having explained our trouble, the owner kindly consented to give me a helping hand, and the poor horse was replaced by the steamer. As soon as we were well under motion I applied the high speed clutch and soon had one cylinder going; but it was a long time before the second one consented to work. In the meantime that steamer was hauling us through the sand like a perfect fiend, throwing up a cloud of dust that was blinding. Finally, with both cylinders running nicely, we bade our generous automobilist goodby.

Hot, tired and dirty, a whiff from the lake decided us. Hailing a newsboy, we told him to jump in and direct us to the C. & D. dock, and down the big hill we rolled onto the dock and booked for Detroit. The captain took a good look at us and then said: "Come with me and I will give you a bath." Willingly we went. How good the water felt! A bath, a high ball, a shave, a meal, and we felt that we still had some fight in us. But another trouble suddenly dawned on us; we were "broke." Carefully we husbanded our finances and by not paying freight on the ... our money last. Odometer, 4...

A delicious sleep on the c... Lake Erie made us feel ver... morning as we signed our ... hotel and walked into the b... without a cent in our po... breakfast we "hit" a friend ... released our car. We were ... now, so I took the engi... ground in the exhaust valve ... ing them dressed in a la... were badly pitted), put in a ... cleaned up the combustion ... overhauled the sparking ... took me two and a half day... day we were off about noo... most abominable plank ...

Farmington, 12 miles of ... left that we struck a fine gr... went flying, making Lansi... hitch. Odometer, 95 from ... day we made home. After ... the roads are very sandy a... on it was slow work, the ... places reaching half way ... Care must be taken in dr... road, as autos skid dang... However, we came out all ... I ran the machine into my ... that night I felt that I nev... see it again. Odometer, ...

REMARKS.

After basking in the co... Michigan for a few week... came on again. I commen... ful study of my engine, t... defects that had made ther... fest during the trip one ... finding remedies as follows: ... gine and poor mixture were ... installing a new carburetor ... a marked improvement bot... of starting and the control ... The poor circulation was ... due to too much clearance ... of the centrifugal pump. I ...

ring and thoroughly overhauled and ned the water jacket connections and ıtor, finding incidentally that one ıection was reduced in area nearly third. This led to a marked im- ement in the circulation.

y large cylinder head gasket troubled ıot a little. I could find nothing with h to make a gasket that would hold. lly I consulted my repair man and d him if he could not make a gas fit without any gasket. He thought bly he could, but had never tried. , we tried. First the head was faced n a lathe, then the cylinders were ght in and fastened in a drill press, we then ran the head on its place the assistance of a little goose-neck, ng emery and oil almost constantly early a week, when we had as pretty ish as any one could desire. That d my last trouble of any impor- . The head absolutely does not My machine has since carried me reds of miles in all kinds of weather, l kinds of roads, and is still my ul and best friend. It is easily olled, can round a corner on high at 4 miles an hour, and as I con- this article I can see her patiently ıg for me to take me for an airing. expenses were almost exactly and we did not throw away a cent. ıre both men of family and old h to know what money is worth. 're made several long trips, and ut any auto troubles at all. Two ount on a daily expense of $10 a

Effect of Automobiles on the Roadway of Public Roads.

ıw with New York State Highway Examiner Frank D. Lyon.)

question as to the effect of the use ımobiles upon the roads is of special t just at present, because of the which will be made by the State de- nt this spring, through the Legisla- ı systematize and improve the laws e repair and maintenance of the ys. An interview was secured by a ESS AGE correspondent with Special ıy Examiner Frank D. Lyon, in ieveral features of the question were ed.

s been found, Mr. Lyon stated, that ount of damage, both in the case of y wagons and in that of automo- ıd other motor vehicles, is deter- by the height of the body of the above the ground, the speed main- ınd the weight of the vehicle. At ful and ordinary speed the damage the common draught wagon of the is far greater than that by the auto- The difficulty is, however, that the ıiles very frequently exceed the peed. The effect of a speed of, say, per hour or over is to suck up the ken stone used as a dressing and scatter it with the dust to either side of the road. This dressing consists of stone not greater than three-quarters of an inch in thickness. No special kind of stone is prescribed by law. It is desirable, however, in most cases to use the same sort of stone as that already composing the road, and the price of this, together with necessary cartage, is so great that the replacing of the dressing becomes a serious matter. With no special system for repairs in use at present, no road can be given the attention which it should receive. The consequence is that often the wearing surface of the road is damaged, which is a still more serious affair, since the road must be practically rebuilt. The lower the machine is set the greater this suction becomes. When asked what was the maximum and minimum frequency with which State or improved roads, used chiefly or almost exclusively by motor vehicles, would go without repairs and the replacing of this dressing, Mr. Lyon said that no test sufficiently exact had been made. He knew one case, he said, of a road which had gone for two years without any but the slightest repairs, but he would not vouch for the condition of the wearing surface of this road where the dressing had been taken off. The only method followed by the department at present is to make repairs each year where found necessary and from where petitions to that effect have been received. Mr. Lyon agreed that there was a tendency on the part of automobile manufacturers to set the machines lower and lower because of the greater speed thus made possible by the increased stability.

Another important phase of the subject Mr. Lyon believed was the question of the width of the tire. Mr. Lyon would recommend a State law governing the width of all tires without consideration of the sort of vehicle, "a general State law for the regulation of the width of tires by requiring all manufacturers or merchants dealing in wagons in the State to conform with a proper width." The difference in damage caused by the difference in the width of the tire was greater, Mr. Lyon thought, in the case of the steel tired farmer's draught wagon than in the case of motor vehicles. The latter, however, alone exceeded the lawful speed, so that matters were evened up somewhat. Mr. Lyon also thought that the weight of the vehicle, whether motor or not, should be regulated by the size of the axletree. Mr. Lyon had a law enacted some time ago, which went into effect the first of the year, "to amend the county law relating to powers of boards of supervisors with reference to tires on vehicles." This law requires that "all wagons equipped with thimble skein axles of 3 inches or less in diameter, tubular axles of 2⅜ inches in diameter, and built to carry a weight of 1,500 pounds and upward, shall have tires not less than 3 inches in width. All wagons equipped with thimble skein axles of 3¾ inches in diameter, steel axles of 1¾ inches in diameter, or tubular axles of 2⅝ inches in diameter, and built to carry a weight of 1,500 pounds and upward, shall have tires of not less than 3½ inches in width." A number of counties have already adopted this law.

In another way the automobiles do positive good, as Mr. Lyon said. They do not, as a rule, take the exact middle of a road, as do the ordinary draught wagons, and follow an almost perfectly straight course.

A PATROL SYSTEM OF REPAIR.

The system of repair which Mr. Lyon would introduce will be an improvement over that of the French, which will be used as a model. This would provide for the constant maintenance of a force of men in each county, under the control of the county authorities, to each of whom would be assigned a certain portion of road, say 6 or 8 miles, which it would be his sole duty to keep in repair during spring, summer and fall. Supplies, properly sheltered, would be kept constantly at hand. The cost of such a system of repairs, Mr. Lyon thought, would be not more than $75 or $100 per mile yearly. Results show that it is the most practical and efficient method known. The estimate of expense would not include, of course, extraordinary damages, such as those caused by floods and the like.

January Exports.

The exports of automobiles and parts from the United States in January, 1906, amounted in value to $297,694 ($196,144 in 1905), and in the seven months ending with January, 1906, to $1,438,600 ($1,122,638 in 1905 and $1,014,124 in 1904). The distribution of the exports among the different countries is as follows:

	Jan., 1906.	Seven Months Ending Jan., 1906.
United Kingdom.....	$114,991	$421,982
France	16,369	113,696
Germany	4,806	30,824
Italy	20,005	62,094
Other Europe.....	4,448	66,597
British North America.	22,107	250,116
Mexico	30,935	145,179
West Indies and Bermuda	40,461	104,893
South America.....	3,588	41,490
British East Indies....	4,147	24,149
British Australasia....	32,669	117,365
Other Asia and Oceania	2,000	29,746
Africa	1,168	20,180
Other countries.....	....	10,289
Total	$297,694	$1,438,600

New Offense.

According to a decision rendered by the Appeal Court of the Department of Seine (Paris) on February 12, every automobilist in France is liable to a fine and even to imprisonment if his car emits obnoxious odors. For every offense after the first imprisonment may be made the punishment.

Automobiles in Municipal Service in New York City.

Now that the automobile is being widely used as a pleasure vehicle, and as a business conveyance by commercial houses, it is also rapidly proving itself of great value in the various departments of municipal service. Up to a few years ago the commissioners and chiefs of departments of the New York Municipal Government used horse drawn vehicles for making their tours of inspection. As every department has to cover the whole of Greater New York, an area of some 240 square miles, they were unable to properly attend to their work as long as this method of transportation was in use, but with the recent adoption of the automobile this difficulty has been satisfactorily solved.

Fire Chief Croker informed a HORSELESS AGE representative that the automobile is such a great help to his department that he would not want to be without it. For their use it surpasses the horse in every way. The car used by the chief is a 1906 model American touring car, 45-50 horse power, painted a bright glaring red. It is equipped with a large brass fire gong, carried on the dashboard, and also a siren horn. It is often necessary for the chief to visit fires at midnight or early in the morning. The auto not only does away with the harnessing up of the horse but is able to reach the scene much quicker than the horse runabout. This machine consumed on an average from 5 to 7 gallons of gasoline and travels about 50 miles per day. It is driven by the chief's own man, who used to drive his horse and was taught to operate the automobile.

Deputy Fire Chief Binns also uses a motor car instead of a horse and buggy for visiting fires. The deputy's territory is contiguous to his headquarters, but when Chief Croker is out of town on his vacation, or indisposed, Deputy Chief Binns takes his place. He uses an electric stanhope which was made especially for him. The car carries its motor in front under the dashboard, being of cylindrical shape. The batteries are carried under the seat. The back of the car, which slopes downward, can be opened, furnishing a place not only for tools but also for necessary fire fighting apparel, such as boots, rubber coats, hats, etc. The machine travels between 10 and 20 miles per day. It weighs 1,860 pounds, and is driven by the deputy's former horse driver, who was also taught to operate



DEPUTY FIRE CHIEF BINNS' ELECTRIC STANHOPE.



FIRE CHIEF CROKER'S TOURING CAR.

The department anticipates
rheostat at the engine house
is kept, so that the batteries
charged when required.

Automobiles also find a pr
in the street cleaning depar
nine are in use. Commissio
Gaw Woodbury said incid
HORSELESS AGE representative
mobile multiplies the effective
spection by about ten as comp
horse." Both foreign and A
touring cars and runabouts,
buckboards, are used by the
deputies and inspectors for m
inspection.

Another unique use for the
the municipal service is for
tion of sick and homeless
In this department a 6 horse
with a closed body is used
averages about 38 miles per
tween 3 and 4 gallons of
pint of oil. It covers the bor
hattan and Bronx, including
Mott Haven, West Farms
and other nearby places.

In the police departmen
power imported touring c
Commissioner T. A. Bingh
has been in the service sin
in the course of which tim
ruary 1 it had traveled 8,0
aging about 30 miles per da
missioner visits the borou
hattan, Bronx, Richmond,
Brooklyn. Since this car h
department four new tire
used to replace damaged o
gallons of gasoline and a q
cating oil are consumed
the car is called upon to do

commissioner's chauffeur said that there had been no serious trouble with the machine since he has been driving it, which was from April, 1905, and from then up to January 1 the car had lost but one day through indisposition. It is used exclusively by the commissioner, bringing him from his house to his office in the morning and taking him from his office to his home in the evening.

In the department of water supply, gas and electricity only one American touring car is used at the present time for inspection, but in this department, as in some of the others, the officials feel that the automobile for the service it renders is not only useful but essential.

Two steam runabouts are doing duty in the department of docks and ferries. They are kept at the docks at the foot of North River and the Battery, where they receive the attention of an automobile engine man. C. A. Manley, superintendent, makes use of the conveyances, as well as others in the department. The cars are capable of making from 30 to 45 miles per hour, and cover a distance averaging 35 miles per day.

Dr. Darlington, president and commissioner of the health department, has at his disposal a 45-50 horse power gasoline touring car, which is also used on inspection tours covering the five boroughs. Here, as in the other departments, the machine is found to be a necessary equipment, as often the commissioner or Dr. Benson, the assistant sanitary superintendent of the borough of Manhattan, must reach some place in a limited space of time. About 17 gallons of gasoline and 1 pint of lubricating oil are used by the machine in a day when in hard service. Occasionally the car stands idle for two or three days in succession, while again it is used constantly for three or four consecutive days. Another branch of this department that finds use for an automobile is the bacteriological bureau, where Dr. Billings, chief of the department, who has considerable inspection work to do, uses a touring car of Western manufacture in making his rounds. There is also a runabout in the department.

Several of the public hospitals have installed motor ambulances, and find that by the aid of these they are enabled to reach a scene of disaster in a great deal less time than they could while they used the horse drawn wagon. As an ambulance is often called out on an emergency case where every minute counts, the speed of an automobile is of apparent value.

In other municipal departments automobiles are hired to do the necessary work, as occasion calls for it. However, the heads of most of these departments feel as though they should be equipped with their own machines, claiming that the department is put to almost as great an expense by the hiring of the self propelled vehicle.



STREET CLEANING COMMISSIONER WOODBURY'S CAR.



DR. DARLINGTON, COMMISSIONER OF THE HEALTH DEPARTMENT, AND HIS CAR.

Good Roads Convention.

The Cattaraugus County Automobile Club has arranged for a local good roads meeting in March, the date of which will be determined by the convenience of Governor Higgins, State Superintendent of Public Works Franchot, Special Highway Examiner Lyon and others, who have been invited. A committee was in Albany recently conferring with them on this and other important matters, especially surveys. Another important convention will be that of the Southern Tier Good Roads Association, which occurs at Hornellsville, March 20 and 21. Governor Higgins, Congressman Fassett, Commissioner McDonald, of Connecticut, State Examiner Lyon, United States Senator Latimer, of South Carolina, are among those invited. One of the chief objects of the convention will be to arouse interest in the importance of having trunk roads or circuits from county to county, as is the case with many national highways of Europe. Goods roads conventions in New York State during the past several years have been well attended, and the prospects for the success of these meetings are bright.

WINTER EXPERIENCES.

Hints on Winter Use.

By Dr. Joseph Stokes.

From an extended winter experience with an automobile I am convinced that only two conditions can seriously interfere with its usefulness for a physician, viz., deep snow and the deep mud of a winter thaw. Neither of these would affect seriously the practitioner in a city, so for him the automobile is a practical conveyance almost the year round.

To get satisfactory service, however, it is necessary to attend to many little details which are of no importance at other times in the year. First, you must have a stable somewhat warmed. This is not to prevent freezing, for you must use an anti-freeze solution anyhow, but to ensure thorough care and inspection, which are certain to be neglected if your stable chills you to the bone whenever you attempt any adjustment or repairs, and also to facilitate the morning start. I know of few automobile experiences more discouraging than the coaxing of the first explosions when the cylinder oil is so stiff you can hardly turn the crank, and with a poor mixture from a cold carburetor. It is not necessary to have the stable very warm, but the temperature ought not to fall much below 40°. With a small hot water heating plant 1 ton of coal has lasted me all winter.

The same problem of a cold motor confronts us when unavoidably detained several hours—it may be on a cold night. If you have your chauffeur with you it is a simple matter to have the engine started occasionally and so kept warm, but if by yourself you can generally run into a shed or other sheltered place, and by throwing your robes over the hood keep the heat in the engine a long time. Good, fresh batteries and a strong spark are invaluable aids.

I have tried two anti-freeze solutions this year, first the potassium carbonate solution recommended last year in The Horseless Age, later calcium chloride. The first made a curious, soapy froth, probably by dissolving some of the grease around my pump, and gradually choked up my radiator, so I discarded it. I think though, that my experience was exceptional, for another physician here used my solution with entire satisfaction. Calcium chloride has many advantages. It is cheap, efficient, and by testing with a hydrometer you can always tell just how strong it is. I am sure, however, it has somewhat corroded both my radiator and my copper tank, and I shall not use it again. In fact, I do not believe it is wise to use any chemical salt. Inevitably a slow, electrolytic action goes on which eats the metal independently of any chemically corrosive power the solution may have. Another objection to chemical salts is that they are dirty. Small leaks will occasionally occur and by evaporation of the water the salt is left encrusted wherever the leak may be, soon giving the engine an uncared for look. My next experiment will be with wood alcohol and glycerine diluted with water, which I believe will be satisfactory, though possibly requiring more care to keep it to the proper strength.

For cold weather use it is quite important to cover part of the radiator with canvas or any convenient material, otherwise the engine is kept too cool for satisfactory service. It will not develop its full power, and will become cold much more quickly during a stop.

COMFORT IN WINTER DRIVING.

An impression prevails largely that winter driving is work fit only for an Arctic explorer, and entirely out of the question unless one is enveloped in furs and provided with foot warmers. This may be true of long distance riding, but most doctors on their rounds do not travel more than a very few miles between stops, and there is scarcely time to be thoroughly chilled. If the top is raised it is astonishing how thoroughly one is protected from the wind, and it has been a never ending marvel to me to face a stiff breeze with no protection in front and feel nothing of it on account of the effect of the top in "cushioning" the wind. There has been no day this winter when I have wished for a glass or celluloid front. To be thoroughly comfortable, however, you must have warm robes wrapped securely around your legs to exclude the air, and a little device which I placed on my machine has given me endless satisfaction. Every one who has used robes knows how quickly they become disarranged and loosened with the jolting of the machine, no matter how carefully they were tucked in at the start. Gradually they work to one side, and before you realize it that side of the robe is dragging in the dirt or splashed with filthy mud, while on the other side the cold air is getting in its work on your legs. To prevent this I had my carriage maker cut out of thin, light wood two small panels about 5 inches high, which simply slip into place at the sides, and which can be put in or removed instantly. Being painted and finished to match the car, they are not unsightly, but keep the robes in place, protect them from mud and keep them snugly and warmly around my legs.

IMPORTANCE OF STEERING POST AND PEDAL POSITION.

Just here I wish to enter a most earnest and vigorous protest against one feature in the design of most automobiles. I observed the matter carefully at the New York shows this year, and find that even among the best machines very little thought has been bestowed on the relative positions of the steering post and the levers in the footboard to provide for comfortable winter driving. The steering post ought to be entirely outside of the robes, for otherwise they cannot come snugly and warmly up over your lap, but in the great majority of cars the brake and clutch levers in their extended position come so near the steering post that there is no room between them and the post for the robes, so it is necessary to put the robes outside the post. I wish the ethics of The Horseless Age permitted me to mention by name some of the offenders in this respect, for I would like to hold them up to public condemnation; but I must content myself with generalities, hoping that some of the designers may see them and ponder over them. Some of the very best makes are included in this criticism. For the physician who is purchasing an all the year round car the point is vital and no matter what other excellencies the machine may have, if this is unsatisfactory he should discard it, for it would mean a winter of discomfort. The proper arrangement is for the steering post to pass through either the dashboard or the junction of the dashboard and the floor, and not through the floor at all. The levers will then have free play without disturbing the robes, and the robes will not interfere with the proper action of the levers.

I have not been able to see that the rough frozen roads have had any bad effect on my tires, though when a puncture or a blowout does occur it is certainly a much more formidable matter than in summer. I spent one very uncomfortable hour this winter in a howling wind with the thermometer at 20 degrees mending a blowout, and another hour in the mud one raw, chilly evening after sunset wrestling with a puncture. I prefer August, even if my collar does wilt.

TRACTION DEVICES.

Of course chains or some gripping device for the driving wheels must not be forgotten among winter equipment. Twice this winter I have been stalled because I did not have them on, and submitted to the ignominy of being hauled back to solid ground by a horse.

The advantage of a three speed transmission is especially apparent in winter. There are many times when the mud is just a little too deep for satisfactory use of the high gear, when the middle gear will pull you through at a fair speed and without any feeling of strain, and again when the soft sea of mud has all its waves fixed by the frost, and you bump from billow to billow, the ability to run smoothly and slowly on the middle is a great boon. If you have only two gears you are so often tempted to continue too long on the high to avoid the snail-like pace of the low.

Soon after the first of February I laid my car up to be repainted for the coming season, but up to that time it was not out of service a single day. I had faced with success every weather condition which this winter had furnished—rain, snow, wind, cold and mud—and am convinced that if he has a warm stable, a reliable anti-freeze solution, warm robes closely and securely wrapped around him, chain grips, a phaeton top and gauntlet gloves, no physician need hesitate to defy with his auto every winter condition except deep snow and deep mud.

The Lessons of Two Winters.

By Dr. L. A. Walker.

This winter, so far, has been exceptionally mild, and there has been no more difficulty in running every day than there was last summer. Last winter it was a different story. We had snow, and plenty of it, but there were not to exceed a dozen days when I did not run my car to make my calls about town. I did not attempt to run into the country, or on streets in the outlying districts, where the beaten track was the width of a sleigh. A full track auto will not fit into a three-quarter sleigh track, as I have found to my sorrow. The wheels on one side sink into the soft snow until the axles scrape, and you stop. You may back out the same way you went in, but nine times out of ten the "Vis a tergo" will be a dray horse. I have a gasoline car with a single cylinder of about 10 horse power, which will be a "two year old" the first of next July. Since I received it it has been run practically every day, winter and summer.

The car has a detachable tonneau, which I remove when cold and stormy weather comes on, thus converting the car into a runabout. To this I attach an ordinary carriage top. This makes a vast difference in the comfort of winter driving. For rain or sleet, I put on a storm apron which comes up to my chin, fully protecting my hands and not interfering with vision. Glass fronts and aprons with celluloid windows are very material obstructions to vision when covered with rain or sleet, especially at night. The disagreeable feature of the slight amount of rain which will strike the faec is, in my opinion, more than offset by the ability to see distinctly where you are driving.

For slippery pavements and deep snow I use chains on my driving wheels, but discard them when possible, as I think that the bother of removing and replacing is more than offset by the saving to the tires. Since I have adopted the alcohol, glycerine and water mixture I have had no trouble with my cooling fluid becoming too cool in some places and too hot in others. I had a different experience with the calcium chloride solution. This was my first experiment with an anti-freezing mixture. I had had the chloride solution in about a week, when I had occasion to leave the car standing for about two hours where the wind had a good sweep. The result was that the solution became so thick that the pump could not circulate it, and the cylinder became so hot that the charge would be fired with the spark turned off. The pounding and laboring of the motor, on attempting to make it propel the vehicle was almost pitiful.

I dislike to see a good piece of machinery labor at a disadvantage, almost as much as I do a horse or human being. After the machine had "limped into port" I washed out the circulating system thoroughly, and it was surprising to see the amount of corrosion that had taken place in the short time the mixture had been in the tubes. The one thing that I can say in favor of the chloride solution is that the tubes did not burst, as would have been the case had they been filled with plain water. I filled the tank with a mixture containing a gallon each of wood alcohol, glycerine and water. The circulating system holds 3½ gallons, so I filled up the rest with water, thus giving less than 33 per cent. of glycerine or alcohol. With this mixture I have never had the slightest trouble, even in the coldest weather of last winter. As the mixture evaporates I replenish it with equal parts of alcohol and water, having reason to believe that the glycerine does not evaporate. One would naturally think that the alcohol would evaporate much faster than the water, but I do not believe this to be a fact. Even after the mixture has evaporated one-third, there is still sufficient alcohol left to lower the freezing point several degrees beyond that of glycerine and water alone. This mixture does not corrode the pipes so far as I am able to observe.

I use stove gasoline in the summer time, and several times in the late fall, when the car had been standing in the cold night air for some time, I have had difficulty in starting, the carburetor being too cold to allow the low grade gasoline to vaporize. I have resorted to two methods of starting the motor when confronted with this difficulty. One is to turn the starting lever over until the spark is passing between the points of the plug, and holding it there for some seconds. I cannot conceive of the spark in the cylinder generating enough heat to vaporize any gasoline in the carburetor, but it will certainly start that way at times, when repeated crankings are of no avail. If this method fails, the only thing to do is to apply some form of heat to the carburetor. This is best applied by pouring on hot water, as an open flame is a poor thing to have around a gasoline tank. If the hot water does not end the trouble one should look elsewhere for it.

Of course, the higher grade gasoline should be used in cold weather, but sometimes one may get caught in the late fall without having made the change. Some dealers say that only the higher grade gasoline should be used at all times, but I have experimented with both kinds, and I am satisfied that my mileage is practically the same with the cheaper grade as with the so called "76," and with no more trouble during weather suitable to its use.

Another little device which might be of service to someone who has difficulty in starting a cold car is to wrap the carburetor in a layer of felt. This will retain the heat for a long time, and greatly facilitates starting after the car has stood outdoors for some hours, while one is waiting, perhaps, for a stork to alight.

I am able to heat my auto house by steam, as its proximity to my dwelling makes that method feasible. This makes a great difference in starting, as a cold storage for an auto means congealed oil in the cup, and a piston which seems to prefer not to move. Lighting the building by electricity, I have no fear of fires, although I keep a 50 gallon tank of gasoline under the same roof. The insurance company does not object to this, as I am my own underwriter on the garage and contents. I never have a naked light in the house, lighting my lamps after leaving the building, and extinguishing them before entering.

Cost of Maintenance.

The actual cost of maintenance is a difficult thing to figure accurately. One should take into consideration the deterioration of the machine in making his estimates. I paid $850 for my car in July, 1904. Today I could get not more than $300 for it. That means a depreciation of $275 per year. This rate of depreciation must necessarily decrease as time goes on, else in a short time I would have to pay someone to take it off my hands. The car seems to have practically as much power now as when I first ran it, so that there is no excuse for getting a new one for some time to come, except for the satisfaction of having a later model. If one should follow the prevailing practice of purchasing a new car every year, the cost of maintenance would be high on account of the depreciation.

The cost of running the car, so far as fuel and oil are concerned, is so small as hardly to be mentioned. I average a gallon of gasoline a day, the year round. One gallon of gasoline carries me 15 miles, according to my odometer. I buy my gasoline in 50 gallon lots, so that it costs from 10 cents per gallon for stove gasoline in summer to 11 or 13 cents for the higher grade. I load my machine with gasoline, oil and water myself, then if the supply runs out I am positive of the one to blame. I have a man come to wash the vehicle as needed, and once a week or so he cleans the machinery, washing it with gasoline. Minor repairs I do myself. If I went to the public garage every time I wanted a loose nut tightened, and had them wash my car and supply me with gasoline and oil, my cost of maintenance would be much higher than it is.

The size of the repair bill is governed partly by luck and partly by management. I have repeatedly contended that if one would run his automobile one-half as carefully as he would drive a spirited horse, his repair bills would not be as large as they are at present. But repairs one must expect. When we stop to consider that a locomotive, run by an expert on a perfectly smooth surface, and after every run groomed by an expert, is in the repair shop a fair proportion of the time, is it any wonder that we have repairs on an auto, which is driven by an amateur, over rough roads and across car tracks and crosswalks, ofttimes at a most unholy speed, with an inspection and overhauling afterward by the same rank amateur? The wonder is that the machine stands it as well and as

long as it does. I heard one physician of this town say that he had run his car without water and without oil; that he had tried a number of times to run without gasoline, but that the long suffering beast had drawn the line at that, and balked every time.

Tire troubles, the great bugbear, are largely an element of luck, but not altogether. If one will proportion the size of the tire to the size of the load, and then add a half inch for good measure, he will have fewer punctures and blowout than if he stops to consider first cost too closely. If he will throw out the clutch and coast around corners and across car tracks, thus minimizing the chances of skidding; if he will avoid sudden stops and starts, he will do much to prolong the life of his tires.

Up to January 1, 1905, I had very little repair work except on tires. From that date until the 1st of January, 1906, my total expenses for my car were $280, in round figures. This includes four new cases, two inner tubes, chain, general overhauling and varnishing last spring, and gasoline and oil. It does not include the expense of washing and cleaning, which I am unable to estimate accurately Since January, 1906, I had the misfortune to break my crank shaft. While this was being replaced I had the machine thoroughly overhauled, and believe that now it is in fit condition for another year's running, aside from minor repairs.

Engine Starting and Cooling Difficulties in Winter Time.

By E. H. Kessler, M. D.

Eight or nine years ago it was rare to see a motor car running during cold weather, and those few who owned cars wondered how much trouble the driver had to start the engine. Carburetors in those days did not start an engine with a few turns, even in warm weather. The usual way to start my engine when cold was to pour gasoline over the carburetor and intake pipes, and set it afire. That generally warmed things up enough. If I was at home I usually beat the fire out with a broom. For outdoor use I carried a bran sack to smother the flame. The proceeding was a little dangerous to the car, but was effective. To start an engine today, even in the coldest weather, is a small thing. If the best carburetor is not on the machine, a little gasoline can be introduced into the cylinder through priming cocks. If the engine has no priming cocks the spark plug can be removed and a little gasoline injected directly into the cylinders, when a few turns of the crank will start the engine. Several years ago the winter was extremely cold, the temperature going to 15° and 18° below zero, and as I used my car daily I often had trouble to start the engine after standing the office or hospital for one to To overcome this trouble, I etor made with the spray nozimmediately opposite the inlet valve opening, which was in the centre of the cylinder and directly against the head. When priming this carburetor a little gasoline would trickle against the inlet valve seat, and on cranking the engine some gasoline was taken into the cylinder in the liquid state. When the weather was moderate the carburetor needed no priming.

Speaking of priming carburetors, recalls a conversation with a physician friend a few weeks ago. The doctor had invested in a $2,200 car late in the fall, and as the weather began getting colder I noticed that he did not use the automobile. In answer to my inquiry why he used his car so little he showed me his hands, one of which was full of blisters. He kept his car at home in a shed. The car was provided with a good carburetor, but no one had told him to flush the carburetor before trying to start the engine. The result was, he would turn the crank like turning a grindstone and often with about the same result. Almost any engine, even if provided with a poor vaporizer, can be started by closing the air supply, thus creating a greater suction in the inlet pipes. A hot cloth wrapped about the carburetor is often sufficient to easily start the engine. Boiling water poured on the inlet pipes and on the carburetor is also a sure starter. To me it seems almost useless to mention these things, but occasionally I see a car, even in the city, with the old fashioned arrangements, which makes me think of the poor fellows in the country who would like to start their car even in moderately cold weather. So much for carburetors. Today they are not perfect, but most of them give good service, and allow of starting the engine with little trouble even in the coldest weather.

The cooling system, which in warm weather requires no thought, must be looked after in cold weather. My practice is to use salt solution until the temperature goes below 5° above zero. A saturated salt solution will stand 1° above zero. As it is not practicable to always have a saturated salt solution, I draw the line at 5° above, and I feel safe in leaving my car stand outside for several hours at a time without freezing the water. Some winters ago, when the temperature went to 15° and 18° below zero, I used a 5 pound to the gallon solution of chloride of calcium. This solution neutralized with a little lime cannot be frozen at anything less than 29° below zero, and I believe that is about the limit of automobile riding.

Oiling takes a little more care during the winter than during warm weather. The gear case, when slpash lubrication is depended upon, should be supplied with an oil light enough to stay thin in the coldest weather. I use ordinary machine oil. Where parts such as the differential are packed with grease, there is danger of the gears cutting a path through the heavy grease and not becoming lubricated until the parts become warm from friction. In such places I leave the grease, but occasionally pour in oil to be churne the gears. On my own machin oil tank, where it is kept war cylinder heat. An aspirator att oiler and worked from the sea oil into the crank case irrespe temperature changes. This is ment of the De Dion-Bouton find it perfect for cold weather.

I use ordinary stove gasoline the tank wagons and put int in the yard. This gasoline va to 72 degrees. While the 76 test gasoline will vaporize more the common grades, and wil start the engine more readily in er, I have failed to get any othe results than from the common

You ask the cost of runnin use a 1,300 pound runabout, about 25 miles per day. For I use about 1½ gallons of gas couple of ounces of oil. In fac line and oil supplies are so hardly consider them worth fig greatest expense in running a c account. For my car, which is day, the tire expense is about $ I seldom have any expense on repairs. All adjustments are ma Batteries cost me about 75 cents I usually keep my cars until needing repairs, then exchange one. With my little car I get of a hard worked business hor pleasure of the finest road team

Dreads the Damage to

Though the past winter has one, I have not thought it paid auto to the exclusion of ho horses, and the auto for extra when conditions are favorable, ing my horses a rest. The pneumatic tires by freezing fabric and subsequent bursting expensive for my practice Since my article in the Docto I have purchased and been u riage with high wheels and sol has more than fulfilled my expe is comfortable, cleanly to care pensive to maintain, has good little mechanism and a speed o roads of 15 miles an hour. it for one month only, of cou so "hopeful" as to cry "Eure visiting the show I consider m the best physician's car sold use, and have run that two ye pect to use it the coming ye new, high wheeled carriage ther defects, of course, but I am st

A Hopef

A special meeting of the Germ bile Association was held in Ber ruary 10, at the time of the Berl bile Show, to discuss the pendi automobile legislation relating to taxing and responsibility of cases of accident.

MAINTENANCE AND REPAIRS

How I Increased the Power and Speed of a 1903 Type Oldsmobile Runabout.

By Garage.

To begin with, you want to dissemble all parts of the machinery, and begin on the cylinder head. This type of head has a wall of metal separating the inlet and ex-

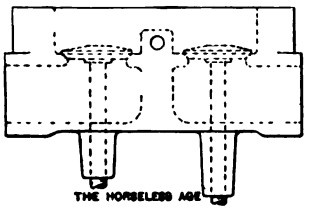


Fig. 1.

haust valve pockets, and also serving for a bolt to go through. Take a cold chisel and carefully cut this wall some three-eighths of an inch lower, just so you don't cut through to the hole for the bolt that passes through, otherwise the pressure would tend to escape around the bolt head. After having this metal cut out, which allows the use of the entire port (not just half, as before) for the charge to enter and leave, the head will look something like Fig. 1. Now bore out the valve holes one-eighth inch larger, making them 1¼ inches instead of 1⅛ inches. Do not disturb the valve seat. Smooth out all port passages with a file and emery cloth, cut the inner broad port more rounding and file smooth. Also remove the pattern number usually found on these heads. Grind all valves with emery and finish with pumice mixed with water, the latter removing all traces of the emery. Put on a very stiff exhaust spring, and inlet springs one-third weaker. Strong

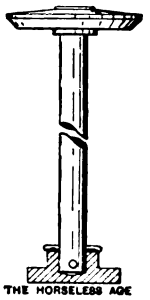


Fig. 2.

springs are necessary in order to crush any carbon particles, etc., that may come between valve and seat. A strong spring is also necessary in order to throttle the motor correctly. Should the springs be weak when the throttle is almost closed the exhaust valves would raise partially during the inlet stroke and destroy the mixture.

To fasten the spring collars on the valve stems so that there is no lost motion is

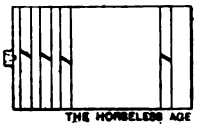


Fig. 3.

next in order. I prefer to use a cotter pin, because by its use the collar can be easily removed; but using a cotter pin means additional means for preventing wear in the holes. To accomplish this I take and put a pin (steel) directly over the inner end of the collar, so that the collar rests against the pin, as shown in Fig. 2. Smooth all passages and remove the sharp edge on the cylinder head flange.

Usually there is a boss on the piston for the centre hole (Fig. 3). Remove this boss by grinding or filing, and finish as smooth as possible. With all sharp edges removed, I find I can run the engine so hot that the water will boil away, and not cause any premature explosions or loss of power, nor will the engine keep on firing after the switch is off. Too many make the mistake of tightening up the rod bearing on the piston pin too tight, causing the piston (if

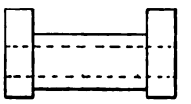


Fig. 4.

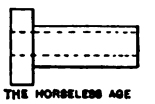


Fig. 5.

loose in the cylinder) to strike the top and bottom walls at each revolution.

The cams play an important part in the output of power, and besides being timed correctly must have sufficient lift. Cams on this type usually lift aboout five-sixteenths of an inch, and are castings. By taking a piece of steel in the lathe and setting it as much eccentric as possible, a much smaller diameter can be used, so there is less stock to be removed. After cutting out in between (Fig. 4) lay out roughly with the old cam, and with a hack saw cut close to the line, then finish with a file, making the cams raise the valves one-eighth to three-sixteenths inch higher, but leaving the time of closing and opening the same. The old cam can also be somewhat improved by cutting down the round part to within three-thirty-seconds of an inch of the hole, and then bending the valve levers to meet this. Keep out all lost motion in the spiral gears by making a new eccentric bushing for the cam shaft bearing (Fig. 5). To hold this in place drill

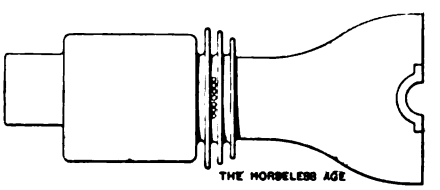


Fig. 6.

and tap for a one-quarter inch set screw in the cast iron bracket supporting the bushing. This solid shaft can be dispensed with by using a piece of steel tubing, driving in a short plug of steel on each end where the cam and gear fit on. This saves some weight.

An auxiliary exhaust was put on by noting exactly the position of the piston head at the end of the outward stroke, which was found to be between the ribs that help to cool the engine. After marking off holes on the side on which the exhaust pipe is located, I took a breast drill with one-

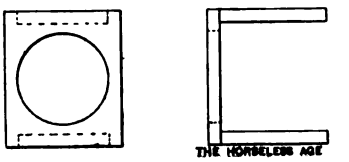


Fig. 7.

eighth inch bit, making a slot, as shown in Fig. 6. The holes were filed smooth and the slot was ⅛x1 inch. A way to carry these products to the muffler was now to be devised. The noise from the auxiliary exhaust is greater than that from the regular exhaust. Our plan was this: the faces of the two adjoining ribs were filed even, until the straight portion extended beyond the slot or port. A pattern was whittled out something like Fig. 7, the projection fitting between the ribs to the cylinder wall, and the face being broad enough to rest on the ribs so that 8-32 machine screws served to hold it in place. A half-inch pipe tap hole was put in and a pipe led to the muffler by drilling and tapping the same size hole in the exhaust pipe. The muffler in this case was carried under the body. The exhaust valve in the head was now relieved of much of its former work, needing less frequent grinding and renewal. This little auxiliary exhaust casting was of brass and made to fit between the ribs as closely as possible. After it was in place, some iron cement, "Smooth On," was applied in the

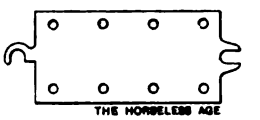


Fig. 8.

corners, making a fillet, as it were. When painted it looks like part of the cylinder casting.

The crank case has a cover plate about 3x6 inches. We took a drill and put in eight three-quarter inch holes in two rows (Fig. 8), to keep the oil from splashing out. I riveted a sheet of wire gauze to the inside of the plate. This allowed cold air to enter, and the temperature of the piston was reduced.

Very few repair men ever adjust the bands on the transmission (planetary) so that no part touches the revolving member

when disengaged, and so that the band contacts well when engaged. I always adjust the reverse band first. The others being off, one can see all around the drums. Then comes the brake band, next the low gear. This transmission is arranged so that you can leave the high gear and enter the reverse without engaging the low gear. How many transmissions stay this way long? The reason of failure can be traced to the wearing of the three-eighth inch rod and band fibre. Wear of these parts causes one to take up on the adjusting screw on one side of the band. The other side, not having any screw, does not take hold as soon as the adjusted side. My method of avoiding this trouble is to secure a small thin washer and place it next to the shoulder of the three-eighth inch rod, taking up with the washer just as much on one side as on the other. Both sides engage at the same time, and the low gear will not partially engage when passing through to reverse to make a sudden stop.

I early found the clutch inadequate for our hills. Semi-weekly adjustment soon wore out the leather so much that it was no longer useful. This clutch has four spring steel plates holding the clutch leather. Usually each leather is about 1x1½ inch, which is not large enough. So I removed all the leather from the plates, secured some one-eighth thick fibre and cut same so that it had 3 inches length by 1 inch width on the steel plate. Then a good piece of sole leather was put to fit on top of this fibre, and the fibre and leather together made about five-sixteenth inch thickness. This was then riveted to the steel plate with copper rivets countersunk in the leather. This gives double the clutch surface, and once it comes to a good bearing, needs no further adjusting for a long time. A slipping clutch, like a slipping belt, means loss of power.

If the foregoing suggestions are carried out carefully you will find that you will get one-third to one-half more power.

To Remodel a Model E Rambler.

By W. M. Jones.

If the parts of your Model "E" Rambler are not actually worn out, you have the foundation on which to build a powerful runabout that will take all sorts of hard knocks. The expense will probably be much less than the shrinkage in value should you sell or exchange your old machine.

Take the old cooling tank right out and put a round cover on the cylinder where the tank rested. Tap this cover for a three-quarter inch brass tube and a one-quarter inch pet cock and bolt it in place into the same hole by which the old tank was bolted on. Then bolt a right angled bracket of ⅛x2 inch iron to the side of the frame near the rear girder for the engine on the 2 to 1 shaft side. On this bracket set a pump and gear it to the 2 to 1 shaft.

Cut off the old bonnet and dash flush with the sills of the body. Set a 24 inch coil radiator (or any other that will do the business) on the front sill of the body and brace it in place. Over this put a tank that will hold 4 to 6 quarts of water. Then connect up with three-quarter inch brass tube and rubber hose from the top of the cylinder downward under the sill and up to the top of the tank, from the opposite side of the tank to the top of the radiator, from the bottom of the radiator to the pump, and from the pump to the entrance to the water jacket on the right side of the cylinder, completing the circuit.

Bend a three-eighth inch wire and fasten it to the fibre block on the make and break and connect it with a handle passing through the board under the seat just back of the steering post. This handle can be made to work on a simple ratchet of sheet brass, bent and with teeth filed in the edge. This spark advance I have found of the greatest value, enabling me to get the full power of my engine's power when I need it. Hills that I formerly limped over I can now take at good speed.

Next put a dash 3 inches back of the old one and put on a bonnet of galvanized iron, fitting it to the frame of the radiator and with a hinged cover on top.

Raise the seat an inch and a half and give the whole a smoke green color, striping with broad black and fine gilt lines. The result is decidedly pleasing to the eye; the changes are mechanically successful and should cost about $100.

SEARCHLIGHT WRINKLE.

On the staff of the light fork fasten a crosspiece extending 2 inches on each side, with a small hole at each end. Then extend two small arms forward from the dashboard 4 to 6 inches. Connect the ends of the crosspiece to the ends of the arms with small stiff spiral springs. A push with the foot on the fork will send the light around a corner, and when the foot is dropped the light is brought at once to the straight ahead position by the springs.

How to Save Repair Bills.

By George J. Edwards.

One of the most important things to notice in buying an automobile is that all the working parts are so arranged that they can be completely protected by a shield underneath, and will keep cool enough when this shield is on, even in the hot months. Some manufacturers make an attempt to put on such a shield, but it is a rare thing to find a good one. Unless it is absolutely tight, it is worse than none. I have been asked repeatedly by others why it is that I am seldom seen tinkering with my machine. They would then tell me their trouble, and generally it was something that a good shield would have prevented. One owner of a machine told me he had no use for a shield. His engine was up in front and had a shaft drive. Some time after that, while out on a trip, I heard of this same party hunting trouble for over an hour, and finally finding the carburetor filled up with dirt. I have never seen the automobile that needed no protection underneath.

I have never found anything that beat a good 10 ounce ducking for a cover. It doesn't rattle. You can loosen one side and drop it to make any adjustments, and it has quite a number of advantages over sheet metal.

The location of the muffler is an important point. The exhaust should be led out the shortest way possible, to get it to the rear of the bed, providing your engine is under the bed. Avoid a muffler hung in the middle or under one side of the bed, as the heat rising from it will keep your enclosed parts all the hotter.

Suppose you have a single chain driven car you want to protect from mud and dust. Take a couple of joints of 7 inch stove pipe, split them at the rivet line, bend the sides outward to the shape of the letter V, flaring two inches of the edges out more abruptly. Rivet both of the lengths together, making a trough about 4 feet long, cutting off, of course, what you don't need to cover the chain and rear sprocket. If the sprocket is housed by the casing of the axle, this trough or boot is very easily fastened. But if the sprocket is exposed, first make a metal cover for it and fasten it well, then fasten the boot to it. To the flared edges of this boot rivet the required amount of ducking to complete the cover. Lay your cloth on what will be the underside of the cover when done. Along the flared edge and on top of the cloth lay a strip of three-quarter inch hoop iron, rivet all together at intervals of 6 inches, fasten your metal boot in line with the chain, bring up the cloth sides and fasten them to parts of the gear frame, or put some screw eyes in the under side of the bed, and fit it up close. It will take some little time to do this job, but you will be well paid for your trouble. If the engine is under the bed, provide some means to let out some of the heat at such points as will not let in any dust, or at least very little. For instance, you may perforate the front board of the seat with a lot of three-eighth inch holes.

Petroleum Congress.

The second International Petroleum Congress, which was held in Liege, Belgium, in June last, decided to hold its next meeting in Bucharest some time this year or 1907. It adopted a number of recommendations, one of which favors the organization of an official conference for the purpose of establishing uniform regulations and supervision of quality of illuminating oil. Other recommendations relate to the unification of statistics of foreign trade in petroleum products under the metric system, the uniform basis of statistics relative to the output, number of borings, number of working days, etc., in the different countries, and a schedule of data to be recorded in boring and exploiting oil wells.

COMMUNICATIONS

Charging Storage Batteries from Gravity Cells.

Editor HORSELESS AGE:

In the February 14 issue of THE HORSELESS AGE there appears an article on "Recharging of Ignition Storage Batteries." In said article mention is made only of current supplied by a dynamo, involving the use of apparatus demanding a knowledge of electricity which is rarely possessed by car operators for its successful operation.

As the voltage of a storage battery for ignition purposes is usually 6 volts, with a capacity of about 60 ampere hours, it will be found very inexpensive and convenient to procure about six gravity cells, such as are used in telegraph work. The solution for these batteries consists of about 3 pounds of bluestone per cell, the solution to cover the zinc at the top of the cell. Connect the wire leading from the copper element in the bottom of the cell to the zinc in the neighboring cell. When the six cells have been thus connected attach the copper terminal of the gravity battery to the positive terminal of the storage battery. Great care should be taken in this, as a mistaken connection would cause the current to flow through the storage battery the wrong way, which would injure it. Leave the gravity battery in circuit with the storage battery until it is fully charged, the most satisfactory way being to allow the gravity battery to charge the storage battery overnight, as the charging current is comparatively small and will not injure the storage battery, if ordinary care is taken.

It is advisable when the storage battery is fully charged to siphon off the bluestone solution from the gravity batteries until they are again required, in which case the same solution may be used, as the elements of the gravity battery decompose when they are not in use.

An outfit like the above would cost possibly $6, and it has the advantage that it can be used anywhere at any time by the average person. FRANK BERRY, JR.

[We understand that primary cells are considerably used abroad for charging ignition storage batteries.—ED.]

Some Comments by a Railroad Man.

Editor HORSELESS AGE:

Being a constant reader of your valuable paper since the first number, I have taken great interest in the same. I have just read the article in the February 14 number, under the heading "The Doctor's Automobile." It expresses my views in many respects. It says: "Some of the most intricate, expensive and troublesome parts can be dispensed with," with which I heartily agree. It has been proved and put into practice on some cars that the water cooling system is not required—that settles that point. Now, the next troublesome point is the rubber tire, which, according to my views, can also be dispensed with, as the article mentioned says, by using metallic tires and more flexible springs. To this, I think I hear someone say: "That would be an impossibility, as at the rate that autos are now run on country roads, they would stave the wheels to pieces in no time." In reply I would say, make wheels that cannot stave to pieces, and for such I would recommend the solid steel wheel (or centre), with the rim and hub riveted on. Such a wheel would not be affected by any stones in the road—not even a stone wall—and it would look far more in keeping with the heavy bodies now used than a spoked wheel, and would be a good deal easier to clean. Such wheels would be provided with plain axle bearings, lined with any kind of a good composition, like the journal boxes used by the railroad companies, and the wheels would stand any amount of wear and hard usage.

Next I will speak of the differential gear—another source of expense and trouble. I am satisfied that a carriage can be run without it, or any other compensating arrangement on the drivers, for I have seen it proved and put into practice myself. When a boy I made the first railless hand propelled vehicle I had ever seen. I will not go into its details at present, but may at some future time, if this doesn't find its way into the waste basket. I will only say the vehicle alluded to had iron tires, with a live driving axle and no differential arrangement, and I could run it through a curve of 4 feet radius without the steering wheel skidding or any other perceptible trouble whatever. I have ridden on shifting engines that would traverse curves of 30 feet radius and less. I imagine I hear some of the smart ones say, "That is a different thing; the tires on locomotives are coned and when running a curve the outside wheel is the largest, as that is treading on the largest side of the cone." This is not always the case. I have seen tires that were perfectly flat and grooved (what railroad men term "double flanged"), and they would curve just the same. Now, there would be no trouble about an automobile curving if the axle was stiff enough and it had iron tires. One wheel might be held with the friction flanges that in extreme cases would slip, but having friction enough to propel its part of the load, excepting when curving where the nature of the surface was such that the tires had a too firm hold on the same.

I am satisfied that a machine constructed on the above principles is practical and far more durable, and will cost one-half for repairs what the majority of machines of the present day do. Some will say that we would have to keep oiling the plain boxes often. That is just what we won't do. There has been altogether too much of the "fool-proof" principle carried out. What is wanted is a practical machine run by practical persons, who are not above using an oil can and know when and how to use it. Then there will be fewer arrests and fines imposed than at the present time; neither will there be so many recruits for the "devil's army." L. L. FLETCHER.

A Canadian Doctor's Winter Experience.

Editor HORSELESS AGE:

Two years ago last October I went to Detroit, 40 miles away, and bought a two cylinder, 8 horse power, water cooled runabout. I had never sat in a car, but was confident I could make it go. After half an hour's instructions I filled up and started for home, which I made in two and one-half hours. I had no trouble at first, but soon the frost made me call in the plumbers, so I dissolved some chloride of lime with glycerine and water, and ran that winter regardless of the thermometer.

Next spring I had to get a new water tank, but what of a dollar or two! Canadian winters are usually pretty steady, so I ran every day in my professional work till February 6, when the snow fell heavily, and I had to wait for the hay motors to pack it a bit. After a few days I was out again, till February 27, when it began to thaw, and I again hired horses for four weeks, when I ceased hiring and ran steadily till February 13, 1905. Again the snow did the business, and I hired horses till March 20, excepting the last six days of February. Since March last I have run continuously till the present time, excepting a few days now and then, when it got too muddy or too rough, and it has to be pretty bad, for I don't spare the machine if it can be run at all.

Now that is the history of its usefulness. There are two other stories, one of the accidents, and the other the expenses.

I may say that as soon as I bought the car I subscribed for THE HORSELESS AGE, and became a student, which lessened my accidents very much and assisted in making repairs. I flatter myself now I am quite an expert, but it is mostly due to the communication and query columns of your paper, and perhaps some to my persistent tinkering at the machine.

Before taking up the expense and accident stories I want to say a few words about my last winter's and this year's experiences with the cooling system. I concluded it would not be healthy to repeat the chloride of lime solution the second winter, and started a search. I soon found in your columns a mention of oils, and after experimenting and boiling a few varieties, such as "polar ice" and the like, I became discouraged. I then wrote your journal and soon came in touch with special oils, and chose one of them. Say, it was

the clear stuff, and I would not have taken $5 a gallon for it. It worked fine till May, when I took it out.

Last fall I put it back in again, but it boiled and failed to work right, perhaps because I had mixed a little kerosene to make up enough. So again I got the blues and started reading up the journals. One man wrote that he had used a saturated solution of rock salt with sodium carbonate, and it worked fine last year. So I mixed it up and put it in my cooling system after cleaning it thoroughly. I wish I could have soused him with what I drew off a few weeks after. It resembled tomato catsup. However it cooled the cylinders while I used it, but I could not hold the stuff. I mixed up a tubful and left it to cool a few days, and when I went to use it, it had exchanged places with the tub. It did pretty much the same with the cooling system. You could not screw two pieces of ground copper tight enough to hold it, and then when it got loose I had to rub off rust from all unpainted metal. To make a long story short, I dumped out the tomato soup and sent for more oil, and have been happy ever since.

Now this is long enough for one number, and as my expense and accident accounts are interesting. I will ask you for more time to do them justice.

P. H. Hughes, M. D.

Validity of the Sintz Two Cycle Engine Patent.

Editor Horseless Age:

From the letter published by E. W. Roberts in your issue of February 28, criticising my article on the three port engine patent situation, I find it desirable, in order to avoid "confusion worse confounded," to recite the section of the law in force at the time of the Sintz patent application:

"Sec. 4,886. Any person who has invented or discovered any new and useful art, machine, manufacture or composition of matter, or any new and useful improvement thereof, not known or used by others in this country, and not patented or described in any printed publication in this or any foreign country, before his invention or discovery thereof, and not in public use or on sale for more than two years prior to his application, unless the same is proved to have been abandoned, may upon payment of the fees required by law, and other due proceedings had, obtain a patent therefor."

Sintz's application was filed October 27, 1892. When required to do so he made an affidavit showing that he had built his engine before May 1, 1892. An inventor does not usually build the device embodying his improvement immediately after his invention or discovery thereof, and it is quite possible Sintz may have evidence to the effect that his invention or discovery antedates the March, 1892, publication in Switzerland of Söhnlein's Swiss patent. As a matter of fact the United States Patent Office should have introduced this Swiss patent in the Sintz case, requiring Sintz to swear behind it. In upholding the patent in court Sintz must furnish evidence to prove his invention or discovery to have been made earlier than May, 1892. That he can do so I have not doubted. It was not necessary under the law for Sintz to have built a complete engine earlier than the Swiss publication to make his title good, but merely to have made his invention or discovery, and from my experience in the ways of inventors I would be very much surprised if Sintz is unable to establish a date of invention which complies with the law.

He need not do more than to antedate the Swiss publication, for, although the Swiss application was filed November 27, 1891, it did not become a printed publication in the meaning of the law until March, 1892.

While the Cock patent drawings show the exhaust port adapted to open in advance of the inlet port, and this feature may have been copied from the earlier Sintz patent, it was more probably copied from the Day two port British patent 6,410 of April 14, 1891, which was published in England, July 9, 1892.

F. W. Barker.

Patent Situation with Respect to Frictional Spring Retarding Devices.

Editor Horseless Age:

I note in your issue of February 28 last an article by F. W. Barker upon the patent situation concerning frictional spring retarding devices, and also a letter by the same gentleman relating to the Hartford Suspension Company's trademark," "Shock Absorber."

Without desiring to try out my clients' case in the public print, I think it only right to call your attention to a number of errors contained in the article mentioned, especially as it apparently bears the stamp of approval of your valuable paper, and would thus undoubtedly mislead some of your readers, to their detriment. This is the more important as the writer, Mr. Barker, states in his letter that he is the attorney for one of the parties whom the Hartford Suspension Company has threatened to sue as infringers, and therefore the article would naturally not place my clients' case in its most favorable aspect.

In the first place, Mr. Barker is in error in stating that the Hartford Company's claim to broad protection on frictional retarding devices depends upon the Truffault patent, No. 695,508, of March 18, 1902. If he had examined the records a little more carefully he would have known that this patent has been canceled and is no longer in existence. It has been succeeded, however, by reissue No. 12,437, of January 16, 1906, the claims of which latter patent have been most carefully drawn, so as to claim nothing but what was th of Truffault, but to claim that i

Again, Mr. Barker states that of the Stubbs patent, No. 664,4 viously intended" to have a "spr ing effect," and therefore would limit the scope of the Hartford monopoly. An examination o wrappers of the Truffault pa show that this reference was ca sidered by the Patent Office, an plicability fully demonstrated. of the Hartford patents as they have been drawn with a full kn every one of the matters cited b ker, and the points which he regard thereto have all been p by the Patent Office favorab clients' position.

With respect to Mr. Barker's ous opinion of the Hartford trademark, "Shock Absorber merely say that I regret that given the law on the subject m consideration. The cases whic were not called to my attenti first time by his letter, and the portant considerations which h dently overlooked, which in goo be presented to the court, but w occupy too much of your valuab this time. Clifford E.

Counsel for the Hartford Company.

"Simultaneously and Succ Opened Ports.

Editor Horseless Age:

The article in the February 2 The Horseless Age, on the thre cycle engine patent situation, very interesting to me. So much that I should like to ask one fu tion, as to the exact interpretat words "simultaneously and su as used to describe the opening haust and inlet ports. Take, fo an engine of a common type, with of both exhaust and inlet ports with the top of the piston when bottom of its stroke. Let the e be three-quarters and the inlet po eighths inch wide. Then as moves downward the exhaust to open while the inlet is still when the bottom of the stroke both ports are fully opened. T gards the beginning of opening, are successive; as regards full op are simultaneous. Would they by the Sintz patent? F. E

In response to the inquiry of as to the exact interpretation of "simultaneously" and "successi to describe the opening of exha let ports in a two cycle engine, the scope of the Sintz patent, I make the matter more clear by a claim for said patent which have had in place of Claim 6:

"In an explosive engine, a pi

ider have a supply port and an exhaust , said ports being arranged to be closed essively by the piston in its compres- stroke, and to be opened successively he piston in its power stroke."

to the example given by Mr. Watts e the bottoms of both ports are trans- ly aligned, and the exhaust port is en- d in the direction of the combustion ber, it will be seen that such a construc- (which is shown in the Swiss patent ohnlein, No. 4,395, vide HORSELESS AGE ebruary 21) would be covered by the e suggested claim. But the wording ntz's actual Claim 6 renders said claim what ambiguous, leaving a grave t in the mind of the writer as to her said claim does actually cover it was probably intended to protect. claim reads thus:

laim 6. In an explosive engine and in ination, a piston, and a cylinder hav- i direct supply and an exhaust port, arranged to be closed by the piston s upward or compression stroke, and opened by the piston at the limit of ower or downward stroke, the said being opened and closed successively e movement of the piston, substantial- described."

e statement that both ports are ar- d to be closed on the compression e and opened on the power stroke re- o ports which might be in true align- for their full extent. The conclud- atement in the claim, "The said ports opened and closed successively by iovement of the piston," might mean oth ports are opened in one action e piston, and closed in the other ac- of the piston, but does not imply that are opened successively and closed isively. To raise such interpretation ive to resort to the words, "substan- as described." This concluding phrase claim, read upon the drawing, means ne port is fully opened prior to the ig of the other port, and conversely ort is fully closed prior to the closing other port. In the example named r. Watts the exhaust port partially in the first instance and opens fully the opening of the inlet port, and sely the exhaust is partially closed he closing of the inlet port. Hence, r correspondent states, the full open- the ports is simultaneous.

he matter is put by Mr. Watts, and w of the several limitations of the Claim 6, I would rather be for the e than for the patent, if suit should ught against such structure by the of the Sintz patent.

F. W. BARKER.

Band Brake Type of Rebound Check.

HORSELESS AGE:

rring to the drawing and suggestions r correspondent, L. Toquet, in your f January 31, in regard to a simple rebound check, it may interest him to know that the device which he suggests certainly is most excellent, and a device almost identical with that which he shows was in use last year on both Fiat and Napier cars in the Gordon Bennett race, and on a Napier car at Florida this year.

The idea is not, as far as I am aware, the subject of a patent; we certainly have no patent on it, but it is a most excellent device.

S. F. EDGE.

Friction Clutch Formula.

Editor HORSELESS AGE:

It would be interesting to know the source of the formula

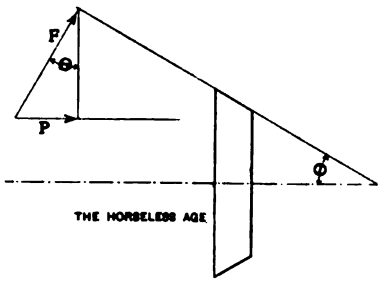
$$F = \frac{P \times \text{Sin } CAB}{\text{Sin } ACB}$$

used in the article on "Friction Clutches" in your Engineering Number. It is believed that this formula should be

$$F = \frac{P}{\text{Sin } \theta}$$

where θ is the angle between the axis and an element of the conical surface.

The diameter of the clutch when found

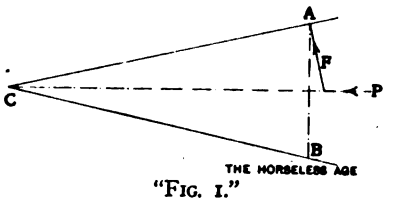


by this formula would be 8¼ inches instead of 17 inches, as found in your article.

W. B. STILZ.

[We referred this letter to Mr. White, the author of the article, whose reply follows.—ED.]

By the diagram, Fig. 1, page 79 (here-



"FIG. 1."

with reproduced), we see that F:P::BC: AB, which may also be stated as $\frac{F}{P} = \frac{BC}{AB}$

and therefore $F = \frac{P \times BC}{AB}$. As the side of a triangle is proportional to the sine of the opposite angle, we have,

$$BC = \frac{\text{Sin } CAB}{\text{Sin } ACB},$$

so that $F = \frac{P \times \text{Sin } CAB}{\text{Sin } ACB.}$

On the Phenomenon of Leaky Inner Tubes.

Editor HORSELESS AGE:

In regard to the tire trouble of O. E. Davies, would say that I had a similar experience last season. The tube in question had been in use about one year, and though I often tested for leaks I was never successful, yet it would leak when in the shoe. I finally cut it up and used the best of it for patches, portions of it appearing full of very small cracks, which evidently leaked when subjected to the greater pressure applied when the tube was in its shoe.

It is well known that an inner tube cannot be blown up very hard when out of the shoe, without causing numerous large swellings to appear which are liable to burst and render the tube useless. This being the case, only a small per cent. of the pressure which is applied to the inner tube when it is encased is permissible when testing for leaks. This proves that the pressure which is applied in testing for leaks is not great enough to cause a leak.

If it were possible to apply the same pressure in testing for leaks as is applied when the tire is in service there would be no trouble in finding the defective part of the tube when it acts like those of Mr. Davies.

W. E. T.

National Automobile Regulations.

Editor HORSELESS AGE:

Is there any good reason why we should not have national laws to govern the use of automobiles? There are certainly very many reasons why we should have. I wonder that the subject is not taken up by automobile clubs and by automobile journals.

The automobile has become a truly interstate institution, and as such there should be a code of laws to govern its use passed by the United States Congress, which should supersede all State and county laws. We could depend upon Congress to pass fairly wise laws, which is not the case with many of the States and county law making bodies. When one travels at a distance with an automobile he never knows what sort of a law he is going to run into. These local laws are the bane of automobiling in many instances. I recently saw a touring car here in California from the East with a whole lot of tags and numbers hanging to it.

L. B. HOGUE.

Cost of Extras—Winter Difficulties.

Editor HORSELESS AGE:

The ordinary purchaser of a car thinks that the catalogue price of the machine, plus the freight, is about all the expense he will have, except for gasoline. But give him time and let him put down every single item that the car has cost, directly and indirectly, he will find that in three months the list of things has grown very fast. While it is true the carmaker furnishes a set of tools, a tire repair kit and a pump, he does not furnish without extra pay a top, a suitable shed, a rear lamp, cans for gasoline and oil, funnels, extra inner tube, extra outer case, jack, spark plugs, gauges, cap, gauntlets, lap robe, new batteries, waste, ammet-- repairs, vulcanizing, etc. Some peopl

not require all of these; a majority require a great many more things.

A doctor cannot at present depend entirely and every day in the year upon a machine. To say the same remark applies to a horse and buggy is true, but the great difference is that a lame or sick horse can in a few minutes be replaced from the livery stable at a moderate cost, but an auto is a different matter. Gasoline machines will not develop the same power in cold as in warm weather. The moving parts are stiff from cold grease; the sucked in air when mixed with the gasoline hinders a strong explosion. A machine that runs well on paved streets or the car tracks slows down very materially on soft mud. The man who runs the auto is very much like a performer on a church organ—he has to work his hands and feet automatically and his brain actively. There has not yet been devised a plan for keeping the feet warm. Heavy robes may be warm, but they prevent the proper moving of pedals; the wind sweeps in from the sides of the front seat. When all conditions are favorable and the car in good working order, the temperature is mild and the weather good, there is no more delightful method of traveling or one that annnihilates distance as an automobile. There are over 100,000 physicians in the United States, but cars for their special wants and needs have not yet been built, and the manufacturers persistently ignore their suggestions; but the time will come.

M. D. Hoge, Jr., M.D.

Replies to "Kicker."

Editor Horseless Age:

My attention has been attracted to an article by "Kicker," in your issue of February 28. I don't know what the particular brand is that he uses, but it must have required a considerable overdose to have enabled him to "trow a fit" in such an artistic manner.

I note especially his remarks in regard to the steam car. Now, I am by no means a steam crank, but am a friend of both the steam and gasoline systems, holding them in about equal regard and owning and driving both classes of cars. But when I see my good friend, the steam car, so shamefully abused, I cannot help taking up the cudgel in its defense.

"Kicker" begins his layout by claiming that the steam car consumes twice as much gasoline as the internal combustion car. This was undoubtedly true of the steamer of early days; in fact, I know it is true of a small runabout which I purchased five or six years ago and still drive occasionally. However, the more up to date steamers, especially those with flash generator, compound engine and condenser, are a different proposition entirely. In driving a car of this class during the past year I have frequently compared with my gasoline friends as to the matter of fuel consumption in traveling over the same course under the same conditions, and have found that we were not very far apart. I am aware that some of the gasoline makers claim remarkable economy for their cars, but catalogue statements and actual road results are quite often widely at variance. Along this line I would suggest that "Kicker" read carefully the account of the recent California endurance run. It would probably prove an eye opener to him and might impart some information that he ought to have.

The heat under the seat is another point mentioned. On my steam touring car, which is of last year's model, and one of the best known and widely used makes, this trouble positively does not exist. I am not in the habit of carrying a thermometer in my hip pocket for the purpose of recording the temperature of the article upon which I am sitting, and am ready to grant my friend that a carefully conducted test with a sufficiently delicate instrument might reveal a slight amount of heat in excess of that to be noted on a gasoline car. I know, however, that the heat has never been sufficient to be apparent to me, nor has it ever been remarked by anyone riding with me. Further than this, some of my friends in conversation have mentioned this point as a disadvantage of the steam car, but an investigation has invariably convinced them that they were "barking up the wrong tree."

As to the time required for getting up steam. I would be glad at any time to take my friend into my carriage house and, with my car cold, show him 750 pounds of steam within four minutes from the time of lighting the match. Certainly this is not bad. To be sure, the engine should be run free for a few moments and warmed up before going out, to get the best results; but this requires a very short time indeed, and is in no sense a burden. I am ready to confess frankly that when the matter is brought down to the last analysis the gasoline car has the advantage in the point of quick starting, but I contend that in up to date steamers the time required for getting up steam has been so reduced that it should be no longer an objection.

"Kicker" next takes up the matter of the gasoline being in dangerous proximity to the flame, and I believe this is a point upon which much superficial thinking has been done. It makes little difference how close to a fire gasoline is placed, provided it is properly confined and protected from it, and this is the condition existing in up to date steam cars. Builders of this class of car, carrying their fuel under pressure, have realized the necessity for properly proportioning and constructing their tanks and have given the matter careful attention. On the other hand, in the case of the gasoline car it has generally been considered that any old can was good enough to hold the gasoline. A flimsy, soldered affair of light weight material has been the rule, and only recently have the gasoline makers been giving serious attention to the necessity for strong tanks. Any designer knows that a tank can be constructed to carry 100 pounds pressure with the same degree of safety that another may carry 5 pounds, it being simply a matter of correct design, and I will venture the opinion that, if the matter were to be investigated, the factor of safety in connection with the confining of gasoline would be found to average higher in steam cars than in gasoline cars.

I would like further to call my friend's attention to the fact that in the steam car the gasoline is completely confined, so that no fire can communicate to it except in case of rupture of tank or pipe. In the very great majority of gasoline cars this is not true. And just one more point along this line. I find by reference to the rate sheet furnished by the company that is insuring my dangerous steamer against fire that the rate is the same on both classes of cars This fact speaks with no uncertain sound in support of my claim that the steamer is at least as safe as other cars, for the reason that insurance companies are not in the habit of making rates by guess.

Now as to the matter of complication. I believe that any unbiased mechanical man, competent to judge mechanisms, will upon comparison of up to date cars of both types decide that there is very little choice between them in this regard. In making this statement I have in mind more especially the particular make of car that I am driving, and know that my statement would be true if it were the one considered. The most complicated car would certainly be the most difficult to keep in order and the most subject to troubles on the road. I have found, through taking care of my own machines, that my steamer does not require a particle more attention than my gasoline car, both large touring outfits, and if the endurance contests of the last four or five years have had anything to say along the line of reliability, they have certainly borne testimony to the fact that the flash steamer can hold its own on the road and under the most trying conditions. We have a considerable number of cars in this vicinity, and I know positively that none of them have been more reliable or more characterized by ability to get where they started for than my steamer.

Burned out boilers are, of course, a possibility with the older type of steamers, but are unknown with the flash type. With the particular make of car that I am especially acquainted with it is practically impossible to burn the generator; indeed, it is quite possible to drive the machine until it stops on the road for lack of steam and yet not injure it in the least.

I realize that both types of cars have their advantages and disadvantages and that neither is perfect. But I claim that when a man styles the steam car "the freakiest freak piece of machinery of modern days," he simply doesn't know what he is talking about, and needs a good, liberal dose of information. If "Kicker" had ridden as many miles and spent as many pleasant hours as I have on the "hot seat" of a flash steamer he would realize that it has a very good reason for its existence, and

ıe time has not yet come for it to get
: earth.

last paragraph of the spasm touches
the matter of the perfect car. The
ent is made that so many of them
be easily made wholly perfect. Now,
icker" knows just how this can be
one of three things is true; either he
reveal the secret to some of the
s for a proper compensation, or he
start a factory of his own and fur-
he cars, or he should be jailed for
ıg to alleviate the sufferings of his
men when he has it in his power to

reply to "Kicker's" article is written
in the interest of fair play. As
earlier, I have nothing against the
ıe car, and realize its good points as
s anyone; but I also know from ex-
:e that the flash steamer is a mighty
ive proposition, and believe that the
ınication in question is entirely too
e. H. W. BEACH.

HORSELESS AGE:

tice in your issue of February 28 an
signed "Kicker." I certainly think
signed a good name to this article.
ıt see why he calls a steam car a freak
e. This type of car has several
proven itself to be reliable in con-
nd they have certainly come to stay.
the time consumed in getting up
this does not amount to anything, as
ouring cars now on the market can
med up in three minutes, and many
/ou will see a man crank a gasoline
ıger than that time in an effort to
when the carburetor or spark coil
working right. As for the "ten thou-
ɔmplications" and the burned boilers
ıtions, there are certainly complica-
nough about a gasoline car to offset
e difficulties. He seems also to think
ıyone who has anything to do with
ıled motors and what he call "fool
ry transmissions" is a fit subject for
tic asylum. I consider air cooled
to be all right, as they are used
in both pleasure and commercial
s. With the "fool planetary trans-
" a person can handle a car in tight
where the sliding gear transmission
s too much time in changing gears.
will probably be a time when stand-
ion in motor cars will be greatly
ıoticeable than it is at the present
ut it will not have to conform with
ıs to meet the demands of the public
ant a serviceable, reliable, simple
:ar. It is quite possible to build such
even with a great number of the
e condemns.

only an amateur in the automobile
s, but I have driven both steam and
: cars. I am now running one of
ter, and it has the "fool planetary
ission" and other "objectionable"
s, but it gives very good service.

AMATEUR.

Editor HORSELESS AGE:

I cannot understand how anyone who is really posted can write such an article as "Kicker's" in your issue of February 28. I have watched the auto. game and played it for the past six years, and I know it to be ridiculous to belittle steam or the air cooled gas motor. They both have well known advantages and good points, and in my own case steam still appeals to me so much that, all things considered, I must say I prefer it for my own use over any gasoline motor driven car that I have ever owned, operated or ridden in. As to air cooling, all motors are air cooled, and it looks more reasonable to me that the radiating surface be attached directly to cylinder than to have it in another part of the car and use water as a circulating medium, depending in all cases on a pumping system more or less complicated and unreliable. The air cooled motor is every day becoming more popular, and I believe will come into universal use. As for gasoline consumption in steamers, I find that I use very little more than my friends, and while I admit that it takes a few minutes to get up steam, I much prefer to wait than to spend the time in repeated cranking on a hot day. In the 100 mile run to Bridgeport from New York and return, as I remember it, the steam stanhopes made about 20 miles to the gallon of gasoline, and there was surely nothing freakish about the performance of these same cars in both the Buffalo and Pittsburg endurance runs. The performance of the steamers at Mt. Washington and Ormond surely is convincing proof that steam is still far from being "a dead one." It is also understood that for speed steam still holds the record on land and water.

I noticed in the Vanderbilt race that nearly all the cars carried their gasoline low, and I suppose they depended on some kind of a pumping system to elevate it. As for the planetary system of transmission, there are lots of merit in this, and good cars still have it, and the makers have the best of reasons for using it. It is no fool idea any more than the ball bearing.

HENRY R. STICKNEY.

Some Comments on a Discarded Type of Car.

Editor HORSELESS AGE:

In regard to the query of A. J. Ekander, I would like to state I have used a 10 horse power double cylinder air cooled engine over a year, with the most satisfactory results. After handling it all of this time it is difficult for me to suggest wherein it might be improved. With its six blade 18 inch fan on the end of the crank shaft blowing a strong blast of air over and through some seventy copper fins which encircle the cylinders, the cooling is perfect, both summer and winter. No pre-ignition ever takes place. Accessibility is as strong a feature as dependability. Inlet and exhaust valves, both mechanically operated, can readily be taken out and ground, and quickly replaced without disturbing the fastening of the engine to its sub-frame. These valves are contained in cages bolted to the rest of the engine.

The engine has been daily and extensively operated four months with but a single grinding of the valves, and then the exhausts were but slightly fitted. In all this time the spark plugs were not removed. Occasional adjustment of the coils was the only attention required. It is not necessary to soak it in oil, and it runs as coolly and quietly as any water cooled engine of its size and type that I have ever seen. Moreover, it is clean.

The remarkably smooth running qualities of this particular make of engine have charmed me for the last fifteen months; its successful cooling system, its cleanness, its quietness, its dependability, all convince me beyond the peradventure of a doubt that the company made a mistake when they stopped the building of this particular type of engine. It is one which the average doctor will have little difficulty to keep going day in and day out. Mine has been on the street without missing a day for five months. Those of us who have operated automobiles for five or six years know what it means to be able to keep out of the repair man's hands a few months at a time. For one I sincerely hope the manufacture of this type of engine will be resumed. There is a great future for it.

DANIEL LONGAKER.

Concerning Accidents—A Theory.

Editor HORSELESS AGE:

As automobiles are multiplied in kind and number accidents increase; that goes without saying. Some of these accidents may be attributed to ignorance on the part of the driver, some to carelessness, and perhaps a very small percentage to the chauffeur's "condition" at the time the accident occurred. Leaving out those thus easily explained, and also those which result from mechanical defects, there are others the cause of which is not so apparent. For instance, when a machine of high power, and being driven by a competent, experienced chauffeur, suddenly leaves the roadway and, without apparent cause or warning, plunges off the side of a bridge or embankment or crashes into a telegraph pole or other obstruction, we are very much in doubt as to the reason for its so doing.

The writer has a theory as to the causes of such accidents, which if sound should have an important bearing on the future of automobiling—at least should contain a warning to all who ride.

Anyone who has operated a car long enough to become "experienced" knows that few, if any, ever acquire "experience" enough so that their nervous system becomes indifferent to the tension which is, from the first, a condition. That this strain eventually affects the "tone" of the sympathetic nerve system (over which the will has no control) is not to be doubted. The

person affected may not be, probably seldom is, aware of the nerve lesion.

The oculist recognizes a condition of the optic nerve which he terms "slow accommodation"—that is, the nerve has become defective in tone, so that the impression made upon the retina of the eye is slow to dissolve, and the next impression equally slow to form; that is, of course, slow by comparison with normal conditions. In other words, a person thus affected will not lose from his eye the last picture and receive a new one nearly so rapidly as when the tone of the optic nerve is in normal condition.

Now the application of this theory is that a person driving a car, whose eyes have become so affected, may turn aside to clear some object in the road, and before the object at the roadside or the embankment is impressed upon his vision he is too near the danger to successfully avoid it, the result being such an accident as has many times occurred, which it has been impossible to explain.

If this theory should be found to be correct, the only safety would be in the enactment of laws restricting manufacturers from making machines geared beyond a certain safe speed limit.

It has been demonstrated that the placing of laws upon the statute books regulating speed upon the highways, whether it be of automobile or horse drawn vehicles, is useless, if the power to exceed the limit be present. Hence there is but one remedy, which is as above suggested.

H. W. Francis.

Explosion Engine Queries.

Editor Horseless Age:

In a gasoline motor, which will allow of the highest piston speed, a short or a long stroke? Does the length of the stroke determine the compression that may be used? The longer the stroke the slower the speed, and it seems to me that a slow speed motor would not run as steady as a high speed one.

Which would be the harder on a motor, to always run with a full charge, or to run on a throttled charge, and do the same amount of work by running at a higher speed? In the first case there would be a greater strain on all the parts, and in the second there would be more friction loss. Running with full throttle would give greater fuel economy, but would the motor last as long?

I am asking these questions because I am designing a transmission that will allow the motor to always run on full throttle, regulating the speed of the motor by the load. To run the car slow one changes to a higher gear, and thereby slows the motor down in a greater proportion than the change in the gearing.

Vernon Taylor.

[We do not believe that the length of stroke has any appreciable effect on the maximum piston speed, nor has it any effect on the compression that may be used. A short stroke high speed engine runs, of course, steadier than a slow speed long stroke engine, unless the latter has a very much larger flywheel. No definite answer is possible to the question whether it would be harder on a motor to run always on full charge or to run it on a throttle charge at higher speed.

The method of speed change proposed by you we consider impracticable. If you were running at normal speed and desired to slow down, by increasing the gear gradually the speed of the car would first increase, which would be very undesirable. Furthermore, with full throttle an engine will not run steady at any speed much below its normal and is very easily stalled.—Ed.]

Compression Calculations.

Editor Horseless Age:

Will you kindly inform me through the columns of your paper what is the formula to use for finding the necessary volume for the compression space in a gasoline engine cylinder? For example, what would be the compression volume in a cylinder of 3½ inches bore and 4 inches stroke, the compression to be 75 pounds per above atmosphere?

Is the practice of opening an air inlet in the intake pipe fo purposes a good one? That i opening in the pipe between th carburetor and uncovering thi the governor when the engine thus weaking the mixture.

Robert E

[Formulæ for calculating have been discussed at length umns only recently. To secur sion of 75 pounds per square atmosphere the compression s about one-third the volume displacement. It is not good govern an engine by diluting The charge should be reduced connecting the governor to valve.—Ed.]

Cause of Unequal Piston Four Cylinder Eng

Editor Horseless Age:

In the article, "Six Cylinder your February 21 issue, it i the speed of the pistons in th revolution is slightly greater lower half revolution for points. Will you please expl is so?

[This was explained in reply regarding the balancing of engines in our last issue. In language, the reason that the faster for any given point half of the crank revolution corresponding point in the l the revolution is that in the the revolution the crank pin a moves more nearly in the dir connecting rod than in the low revolution. The motion of the considered constant.—Ed.]

Addresses Wante

The Horseless Age would dresses of O. E. Davies and whose communications appea columns recently.





Incidents of an Automobile Tour in Texas.

OUR FOREIGN EXCHANGES.

The 1906 Herkomer Competition.

The Imperial (formerly German) Automobile Club has issued the definite regulations of the 1906 Herkomer competition, which contest is unique for the reason that it is limited to amateur drivers. The contest will be run from June 5 to 13, inclusive, starting at Frankfort-on-Main and leading by way of Munich to Vienna, Austria, and thence back to Munich by another route. The competition is nominally an international one, for touring cars, but, on account of the restriction as to the class of drivers, it is not likely that many other than German cars will compete. The contest is open to all classes of touring vehicles of 16 horse power and over which are private property of members of the internationally recognized clubs, of the clubs belonging to the German Automobile Association and the clubs having relations with the Austrian Automobile Club. The vehicles must have four comfortable seats, motor bonnets, mud guards over all wheels, three lamps, two brakes, muffler, reverse gear and a back stop safety device.

The competing vehicles must be driven by amateur drivers (Herrenfahrer)—that is to say, they must be members of the clubs mentioned above and must not receive any compensation for their driving. The amateur character of the drivers is subject to the decision of the commitee in charge. Vehicles may be entered with the secretaries of the Imperial, the Austrian and the Bavarian Automobile clubs, by sending in a completely filled-in entry blank accompanied by the entry fee of 300 marks per vehicle. The entry fee will be forfeited in full in case of non-appearance at the start. Entries at the regular fee close on April 15, and at the double fee on May 15. The competition will only take place if at least sixty wagons are entered.

The route of the contest is about 1,000 miles in length; the vehicles entered must be presented to the committee in charge at Frankfort-on-Main on June 5, where they will be provided with front and rear number plates and the necessary documents insuring their free passage across the boundaries. The program of the contest after that is as follows: June 6, Frankfort to Munich; June 7, Munich to Linz; June 8, Linz to Vienna; June 9, day of rest and exhibition in Vienna; June 10, Vienna to Klagenfurt, by way of the Semmering Hill; June 11, Klagenfurt to Innsbruck; June 12, Innsbruck to Munich; June 13, awarding of prizes and exhibition of the vehicles that completed the tour.

The vehicles will be started each day in a definite prearranged order according to their power, the most powerful vehicles being started first. Every car will be accompanied by an observer, who will be responsible to the committee in charge for the observation of the local automobile regulations and the rules of the contest. All occupants of the vehicle must submit to the instructions of the observer, under penalty of disqualification of the vehicle. The observers are honorary officials.

Each vehicle must carry at least three persons, inclusive of the observer, throughout the contest, and during the ascension of the Semmering Hill and the trip through the Forstenrieder Park four persons. In case the fourth person should not be available at the points mentioned, 70 kilograms of ballast must be taken on at the last station before the scenes of these hill and steep trials. The amateur driver of the car may temporarily allow his chauffeur or any other occupant of the automobile to control the car, but remains responsible to the committee in charge for the actions of such other driver. All repairs necessary during the tour must be accomplished by the owner and his chauffeur, or in case no chauffeur is carried, some particular other occupant of the car designated in advance. At the arrival in the end station of each daily stage the time of arrival and of the following start will be recorded in a touring book supplied to each observer.

Upon arrival at the end station of a stage the observer must hand over the car to the garage manager, who will keep the car in an enclosure and return it to the observer only 45 minutes before the next start. Nothing must be done to the car during the interim, under penalty of disqualification. The 45 minutes before the start may be used for cleaning and oiling, replenishing of supplies and adjustment of the brakes. The observer must verify the proper operation of the brakes.

During the ascent of the Semmering Hill and the trip through the Forstenrieder Park the cars will be timed. No stops are permitted at the beginning and the end of the stretch designated for the timing operation, a decrease in the load prescribed for the rest of the tour is not permitted, and no change is allowed in the sprockets of the car.

The performance of the cars will be calculated as follows: Every minute of involuntary stops is penalized with one mark, except stops for the change or repair of tire covers, which will be penalized with one mark for each five minutes or fraction thereof. If repairs or misplacements are made during the 45 minutes before the start, or during the time of any voluntary stop, the time thus occupied will be penalized in the same manner. Time consumed in emptying fuel into the tanks and oil carried on the car, or in replacing inner tubes, will not be penalized. The performance in the Semmering ascent and the Forstenrieder Park speed course will be judged as follows: For each car entered a normal speed will be calculated in advance; if this speed is exceeded the car will be credited 1 mark for each minute, and 1-60 mark for each second or fraction of a second of time gained, and penalized equally for time lost. The winner in the Herkomer competition is the competitor who at the end of the contest has the smallest number of marks against him. In case of a dead heat the result will be determined by the performance on the Forstenrieder Park speed course, in the second place by the performance in the hill climb, and in the third by lot. The committee in charge reserves the right to take the measurements of the cylinder volume of those vehicles which are entitled to prizes at the end of the competition.

On June 9 there will be a public exhibition of the competing vehicles in Vienna, on which occasion there will be a competition of the carriage portion and equipment of the car according to the following conditions: For the exterior form a maximum allowance of 80 marks will be made; finish, 20; upholstering, 50; lamps, 10; protection against rain, dust and wind, 40; luggage carrying arrangements, 40; tools, 30, and other equipment, 30. The particular car which receives the highest number of marks in this competition will receive the "Appearance Prize," provided the car completes the entire tour. In case several vehicles should receive the same maximum number of marks, the Appearance Prize will be awarded to the one which made the best times in the Semmering and Forstenrieder Park speed trials. On the day of arrival in Vienna each competitor will be allowed a certain time during which to clean his car under observation.

There will be a considerable number of prizes in addition to the double Herkomer prize, which is the object of the competition. For the Appearance Competition, four cash prizes, aggregating 7,000 marks, are offered; for the hill trials, four cash prizes, aggregating 8,000 marks; for the Forstenrieder Park speed trials, three cash prizes, aggregating 8,000 marks, and for the general competition, in addition to the Herkomer trophy and the prize offered by the city of Munich, nine cash prizes, aggregating 16,000 marks. All competitors completing the tour will be awarded diplomas.

Protests must be entered within 24 hours after the event leading to the protest, in writing, and must be accompanied by a sum of 300 marks, which will be returned if the protest is allowed.

The Society of Motor Manufacturers and Traders has under consideration an arrangement between the society and the Automobile Club of Great Britain and Ireland, which is calculated not only to remove any possibility of friction between the club and the trade, but also to advance the general interests of the motor movement.

NEW VEHICLES AND PARTS.

The 1906 Six Cylinder Napier Car.

The 1906 model Napier car will be exhibited for the first time in this country at the coming Boston Automobile Show. This car is the product of the Napier Motor Company of America, whose factory is located at Jamaica Plain, Mass. The type of car that will be exhibited is their 60 horse power, six cylinder touring car, with side entrance tonneau body, with a seating capacity of seven persons. The body is upholstered in red leather.

The engine is located in front and covered with a bonnet in the usual manner. It is of the vertical type, with six cylinders. These cylinders, which are of 5 inches bore by 4 inches stroke, are cast in pairs with the inlet and exhaust valves on the same side. The valves are of large diameter, interchangeable, mechanically operated and kept close up to the cylinder proper. Special care has been taken in the design to facilitate the flow of the gases to the inlet and exhaust passages, and effectually jacket the valve chambers. For each pair of cylinders two inlet valves lie between the two exhaust valves, and there is only one induction pipe connection, but two exhaust pipes connect to each pair of cylinders. The water jackets extend two-thirds the way down the cylinders.

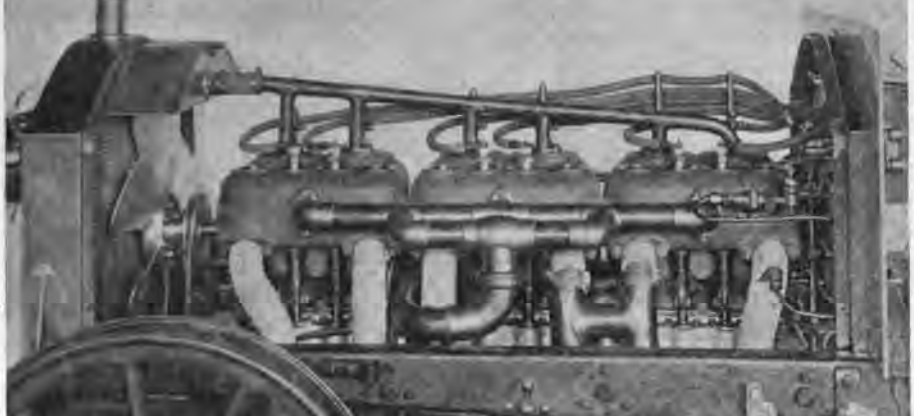


NAPIER SIX CYLINDER TOURING CAR WITH CAPE TOP.

The crank shaft has four long bearings, each of which is fed with oil from a branch pipe that lies along the side of the cylinders. The shaft is made of special steel, and is not only ground true, like other parts of the engine, but has counterbalance weights to render the running more even and steady. The throws of this shaft are set at 120 degrees. At the front end of the
cated a sprocket wheel for
water pump and centrifugal gov
at its opposite end is an integr
which is bolted the flywheel. T
ing rods, which are circular in
bored out from end to end so
form tubes having a thin wall,
big end bearings, which are
white metal, with their caps, a
size.

The cam shaft has twelve ca
made in one solid piece. Thes
accurately spaced by an automa
tool built for this purpose. By
of constructing the cams there is
of their becoming loose, nor is
hand fitting to cause variation in
of the valves. Beneath the ca
trough is formed in the upper ca
chamber. This trough is kept fu
the overflow from the lubricati
The cam shaft, like the crank sh
ported by four bearings. On th
of the cam shaft there is a s
gears, which drives the high te
mutator by a vertical spindle to
This vertical spindle has a very
ing gear for advancing and re
ignition. On this spindle is a s
has a spiral groove that produc
motion between the upper and
tions of the shaft, when the sli
is raised and lowered by a com
erating fork that engages wit
cam shaft is also used to drive
cating pump through a worm.

The ignition is by the Napier
chronized igniter, driven by a s
gears enclosed in an aluminum
casing. Provision is also made
neto ignition. A single vibrator
on the footboard, with the plu
into the inspection plugs above
tion valves, is used. The commu
is the Napier patent type, and is
the dashboard under the driver
tion. The engine is water cooled
being circulated through a 12 ga
comb radiator by a centrifugal
previously stated, this pump
same speed as the motor.



VALVE SIDE OF SIX CYLINDER NAPIER MOTOR.



OFF-SIDE OF NAPIER SIX CYLINDER MOTOR.

A system of lubrication saves the driver considerable worry and anxiety, as there is an oil well of 1 gallon capacity cast in the bottom of the crank chamber. From this well the oil is taken through a filter to the pump, from which it is forced to all working parts of the motor. At the bottom of the tank a tap is provided to drain off all oil that remains above the tank. The well can be replenished from a large pipe filler on the right hand side of the engine, which filling pipe contains a gauze strainer.

The transmission is of the sliding gear type, and has three forward speeds which are governed by a single lever working over a plain quadrant, while a separate small lever is employed for controlling the reverse speed. A neat interlocking device prevents the reverse lever from being moved except when the main lever is in its neutral notch. For the first speed the lever is drawn rearward, and for the second and third speeds it is pushed forward. The sliding gears are enclosed in a neatly designed box, and the propelling shaft is also covered with a dust-proof casing.

The clutch, which runs in oil, is large and of the metal-to-metal type. It is self contained, and is kept in a gripping position by a large spring, which may be adjusted instantaneously. The clutch pedal, placed vertically on the left hand side of the steering column, is easily depressed, as it has a leverage of 19 to 1 to the clutch. The live rear axle, with its enclosed propeller shaft and the hub brake mechanism attachments, is well arranged. Inside the axle tubes, which are 3 inches in diameter, and bolted on to a differential casting, the live shafts run in ball bearings, but the wheels themselves have a bearing upon the outside of the axle tubes, also of the ball type. For operating the hub brakes, compensating rods, which are connected to the brake pedal on the right hand side of the steering column, pass rearwardly from behind the gear box and connect with levers on shafts which run parallel with the live shaft casing. To the ends of these are fixed special shaped cams that engage with the two ends of the brake band, forcing them apart against the action of a strong spring. The two halves of the brake band are pivoted to a fixed pin and renewable shoes form the friction surfaces. By this construction a very powerful braking effect is obtained, it is claimed, but a very gentle and gradually increasing action is assured.

The car is geared for 21½, 34½ and 52¼ miles per hour at 1,600 revolutions per minute.

The lubrication of the change speed gear is by splash, with separate grease lubricators for the countershaft and driving shaft bearings. The differential gear consists of four differential pinions, which mesh with two large wheels, these being enclosed and held together by a bronze cast case.

The steering gear is of the irreversible type, consisting of a triple threaded screw and nut, the nut having a rack cut on the outside of it which meshes into a quadrant which is solid with the spindle to which the ball ended steering lever is fixed.

The throttle, timing control and main switch are fitted centrally above the steering wheel, the throttle lever and timing lever working over the quadrant on the wheel.

The frame is of pressed steel, consisting of two side and three cross members. Each end of the side members is so arranged that it forms a projecting hanger for the springs; the long semi-elliptic rear springs are placed above the live axle and have shackles at each end. The front springs are 42 inches long, the rear springs 48 inches long, and both are 2 inches wide. Radius rods are employed for tying the axle cases to each side member, but the spring brackets to which they are coupled up at their rear ends ride freely about the axle tubes. Grease cups are fitted to these spring brackets, to which considerable importance is attached.

The car has a wheel base of 129 inches and a tread of 56 inches. The wheels are 34 inches in diameter and fitted with Dunlop tires. The weight of the car, when fully equipped, is about 3,360 pounds. The car is equipped with a set of tools, five lamps, one generator, horn, tire pump and jack.



NAPIER DASHBOARD AND STEERING COLUMN.

The Shawmut Gasoline Touring Car.

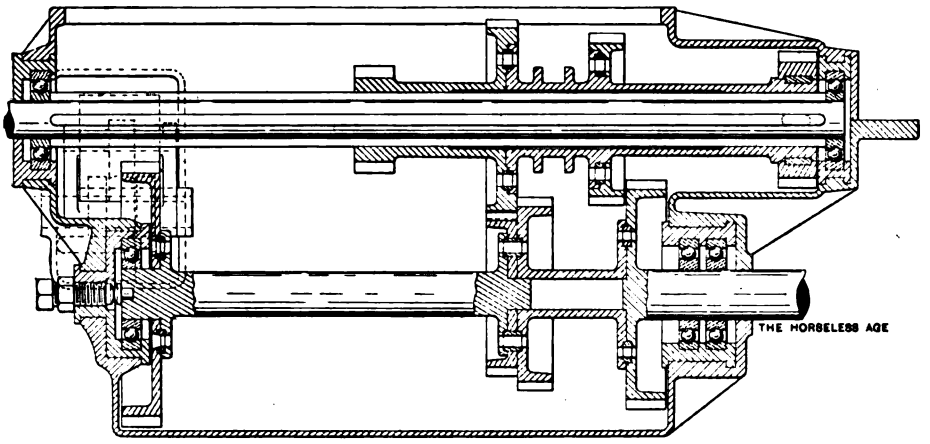
The Shawmut Motor Company, of Stoneham, Mass., will exhibit at the Boston Show their Model 6 touring car, which is equipped with a four cylinder upright engine of 4¾ inches bore by 5½ inches stroke, rated at 35-40 horse power at 1,000 r. p. m. The cylinders are cast separately and have separate heads. The inlet and exhaust valves are on opposite sides of the cylinders, are mechanically operated and interchangeable. The water jackets completely surround the valve seats. Both pistons and connecting rods are extra long, to reduce the pressure on the cylinder walls per unit of contact surface, thus insuring minimum of wear on the cylinder walls. The cylinders, valves, pistons and rings are ground and polished. The connecting rod is an I section steel forging and has plain bearings. The piston is fitted with four rings. The crank shaft is a hammer forging of nickel steel and is



SHAWMUT MOTOR CYLINDER.



SHAWMUT FAN FLYWHEEL.



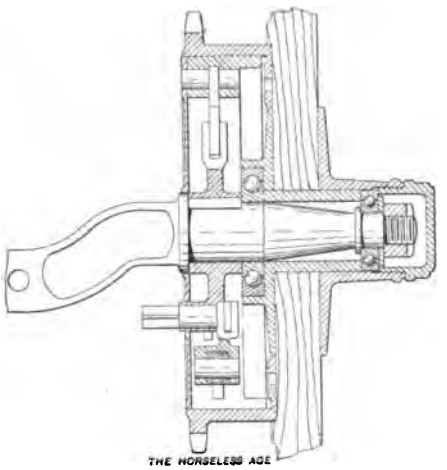
SECTIONAL ELEVATION OF SHAWMUT CHANGE SPEED GEAR.

supported on five Malicet & Blin ball bearings. The crank pin bushings are of Parsons white bronze cut from the solid slab. The cam shaft is a nickel steel shaft and is supported on four Malicet & Blin ball bearings. The cams and rollers are hardened and ground. The crank-case is of aluminum and encloses the cam shaft gears and cams.

The carburetor used is a float feed type, water jacketed, and provided with a piston throttle valve. It is fed with gasoline from a 24 gallon tank under the front seat. Ignition is ordinarily by make and break or low tension spark, furnished by a Sims-Bosch low tension magneto, but if the customer prefers the jump spark an Eisemann high tension magneto will be furnished, and in addition to the magneto a Lacoste storage battery and single vibrator coil can be fitted as an additional ignition system. The standard ignition outfit is the Sims-Bosch low tension magneto. The throttle and spark levers are mounted on a stationary sector on top of the steering wheel, so that their position is not varied by the steering motion. The throttle may also be controlled by an accelerator pedal at the base of the steering post.

The engine is of the water cooled type, and a honeycomb radiator is mounted in front of the bonnet space. Each section of this radiator, consisting of three tubes, is separately removable for cleaning. The combined water capacity of the radiator and pipes is 3 gallons. The water is circulated by a centrifugal pump of foreign type, which is driven by spur gears from the cam shaft. Air is drawn through the radiator by means of the 22 inch engine flywheel, with specially designed fan shaped spokes. A fan behind the radiator is not considered necessary, but will be supplied if customers desire. The engine is lubricated on the splash system, oil being fed to each crank chamber compartment by means of a positively geared pump, forcing the oil through a sight feed on the dash and through a rotating valve.

The clutch is of the leather faced cone type and is provided with ball thrust bearings on the disengaging fork. A universal joint is interposed between the clutch and the gear case. The transmission or change speed gear is of the sliding pinion type, affording four forward speeds and one reverse. The gears are cut from hammer forged nickel steel blanks, and the shafts



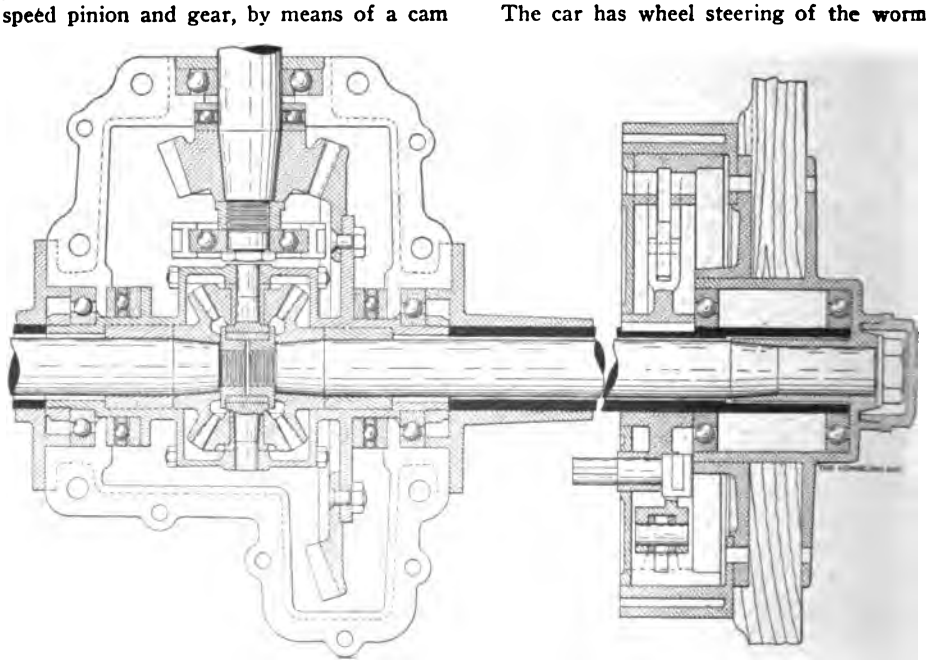
SHAWMUT STATIONARY REAR AXLE END.

run on Malicet & Blin ball bearings. The gears are operated by a single lever moving on a simple quadrant. The reverse drive is obtained by moving a single reversing pinion laterally into meshed with the low speed pinion and gear, by means of a cam mechanism. The change speed gear is enclosed in an aluminum case and operates in oil bath. From the sectional elevation of the change of speed gear herewith it will be noticed that the sliding set is mounted on a fluted shaft, instead of a square one, and that the gear wheels are bolted to each other or to flanges on the sliding sleeve with hardened bushings. All the bolts used in this, as well as in any other part of the car, are made of special stock, and all the nuts are castellated. The gear case is of aluminum, and provided with large inspection cover on top.

The front axle is a hammer forging of nickel steel, as are the steering knuckles, which are provided with a Mercedes type pivot. The rear axle is either of the chain or shaft driven type. In the chain driven cars the axle is a nickel steel hammer forging, while in the shaft driven cars the wheel hubs are carried on the axle tubes, which take the entire load, no weight coming on the axle itself. The live axles are of the floating type, the driving shafts fitting into the differential at one end and into a square socket in the wheel hub at the other end. The axles are fitted throughout with Malicet & Blin or Hess-Bright ball bearings. The wheels are of artillery type, made up with nickel steel hubs and best second growth hickory spokes, twelve to each wheel, the front wheel spokes being 1¾ inch and the rear wheel spokes 1½ inch. The wheels are 34 inches in diameter, and fitted with 4 and 5 inch tires in front and rear, respectively.

The frame is built up of cold rolled pressed steel members, of channel section, with a wide flange at the bottom, the side and cross members being hot riveted together. It is supported on four semi-elliptic springs, the front ones being 40 inches and the rear ones 48 inches long, and all 2 inches wide. The car has a wheel base of 112 inches and a tread of 56 inches.

The car has wheel steering of the worm



SHAWMUT BEVEL GEAR DRIVEN REAR AXLE CONSTRUCTION.



ASSEMBLY OF SHAWMUT FRAME, ENGINE AND GEAR BOX.

ector back lock type, and it is stated n the design of the steering gear the have been laid out to provide a safety of five with respect to the maximum to which they can be subjected in ce. In the chain driven car a foot



AUBURN-MOORE SPECIAL TOURING CAR.

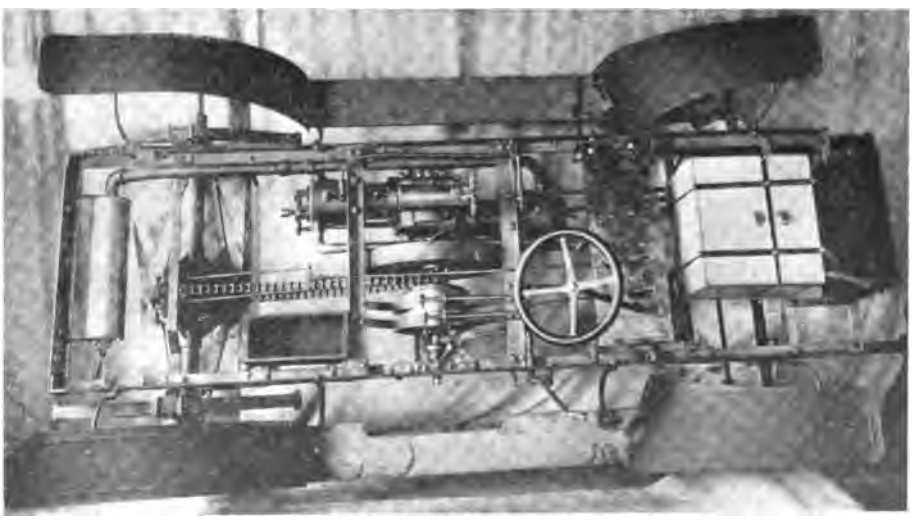
acts on the differential countershaft, wo internal expanding brakes, oper- y a hand lever, act on drums secured rear wheel hubs. These latter brakes terconnected with the friction clutch. shaft driven car there are both in- and external brakes on drums se- to the rear hubs. One of these sets ated by a pedal, and the other by a

Shawmut car is fitted with an alu- and wood body from designs fur- by Chauncey Thomas & Co., of Bos- has double side entrances, a divided seat, and accommodations for five . The upholstering is in curled hair id buffed leather. The body is ironed ape top and two extra tire shoes. All work. such as the hub caps, levers, g post, spider, etc., is made from rosive steel, which is said to be more olished than brass. The mud guards aluminum. The cars are painted a d dark blue color, bodies and run- ar the same. The equipment includes nps, a French horn, a set of tools ne extra parts. The weight of the nplete is 2,400 pounds.

The Auburn-Moore Special.

Among the new cars exhibited at the Cleveland Automobile Show was the 1906 Auburn-Moore Special, manufactured for H. S. Moore, of 160-162 Crawford street, Cleveland, Ohio. The car is fitted with a side door and divided front seat body, which has a large storage capacity under the rear seat, and provides accommodation for five persons. The motor is a double cylinder, opposed, horizontal of 5 inches bore and stroke respectively, and is located longitudinally under the seat. It is rated at 20-24 horse power. The carburetor is a float feed device, and ignition is by jump spark produced by means of dry batteries and a multiple coil with switch. The transmission is by a two speed planetary gear, with no internally toothed wheels. The transmission gear is encased and holds one quart of oil. A single chain transmits the power to the rear axle. The frame is of angle iron and is supported on semi-elliptic springs in front and full elliptic in the rear. The rear axle is a standard live axle mounted on roller bearings, while the front axle is tubular and fitted with ball bearings. The car has a wheel base of 94 inches. The steering device is of the Brown-Lipe internal worm type.

The gasoline and water tanks are constructed of heavy galvanized iron, the gasoline tank having a capacity of 12 gallons and the water tank of 8 gallons. The cooling water is circulated by a bronze double pinion gear pump, which insures positive circulation in each jacket. The engine bearings, cylinders and crank pin bearings are lubricated by force feed from a large reservoir. A coiled radiator containing 76 feet of flanged pipe is placed in front of the hood, the water tank and gasoline tank being located back of it under the hood. The car is claimed to have a speed range of 3 to 40 miles per hour.



PLAN VIEW OF AUBURN-MOORE CHASSIS.

The "American" Motor Truck.

We show herewith some line drawings of the American motor truck, manufactured by the American Motor Truck Company, of Lockport, N. Y. The design is said to be the result of many years of experience, and the designer's aim has been to secure the greatest possible simplicity and reliability of operation, recognizing the fact that most commercial vehicles are driven by men very ignorant of mechanics.

The motor used in this truck is a four cylinder vertical one, with cylinders cast separately, with cylinder dimensions of 5 inch bore and 6 inch stroke. This motor is designed as a low speed, low compression motor, and has a conservative rating of 30-36 horse power. The crank case is parted diagonally and in such a manner that when the cover is removed every bearing on the crank shaft and cam shaft is completely and perfectly accessible for inspection, repair or adjustment. Moreover, through the peculiar construction of the crank case, and on account of the fact that the crank shaft is not in line with the centre line of the cylinders, it is possible to readily remove any or all of the four pistons through the crank case without removing the crank shaft or the cam shaft, or requiring any other manipulation than removing the connecting rod cap. This feature is distinctive and of the greatest value.

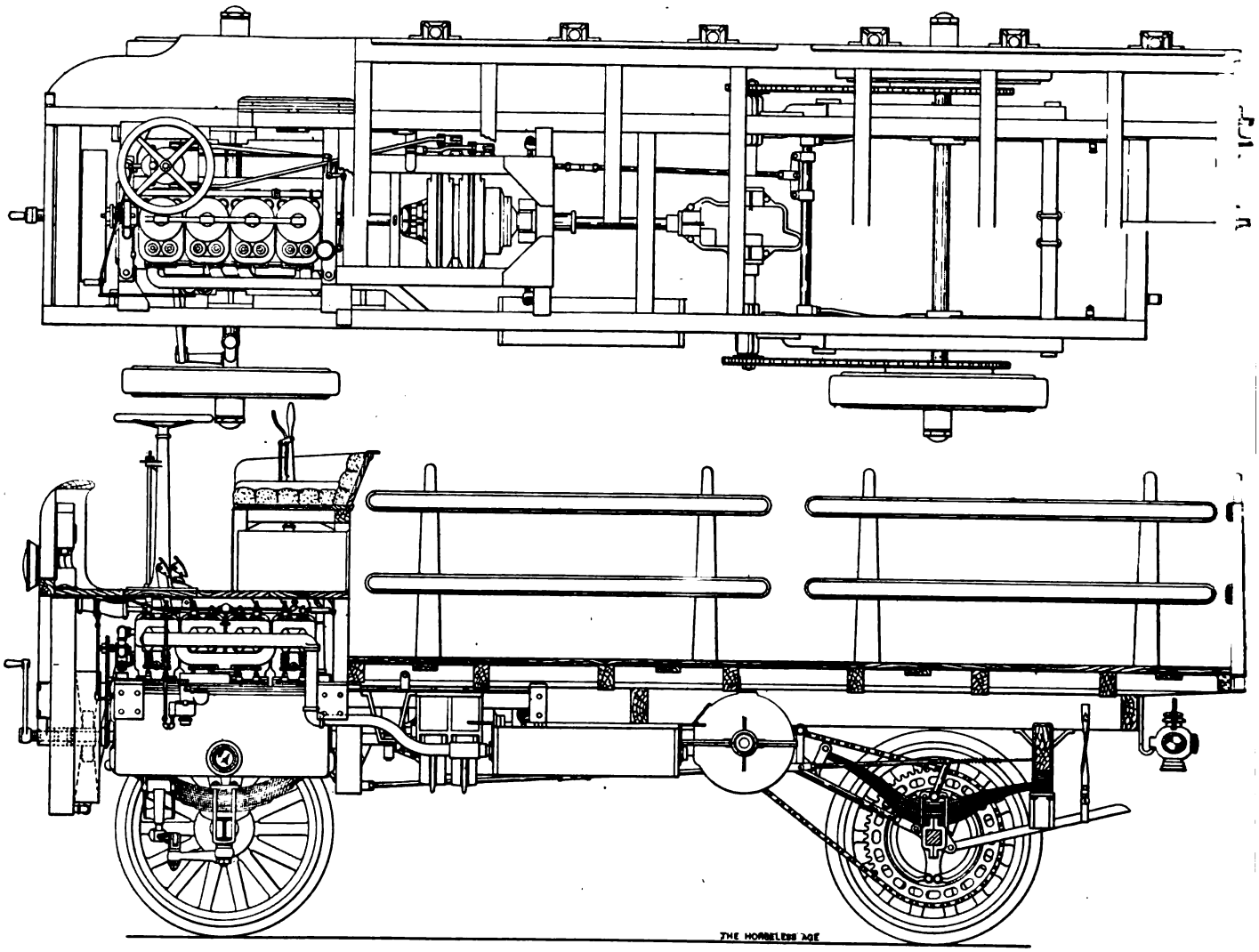
The valves are mechanically operated, interchangeable, and both intake and exhaust valves are located on the same side of the motor and operated from one cam shaft. The valve rods are rigidly supported in long bronze bushed bearings, having roller guides inside the crank case, so as to prevent any distortion of the valve spindle, due to the action of the cams. The valves are readily get-at-able for removal or regrinding.

The crank shaft is a solid steel forging, having five supporting bearings. The cams are secured to the cam shaft with dowels, so that in case of removal for any cause they can be accurately replaced. All bearings are exceptionally generous, and ample provision has been made to insure copious oiling through the use of the splash system. The crank case is ribbed so as to produce a maximum of strength, and at the same time retain the proper amount of oil in the base underneath each crank to insure perfect lubrication.

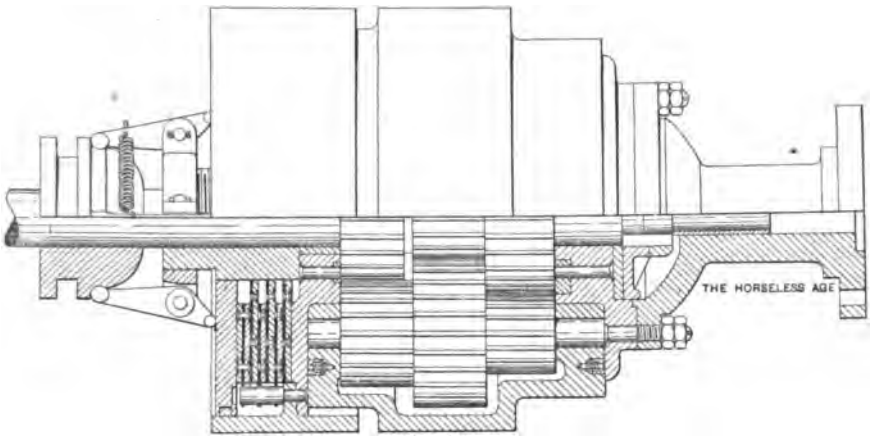
The cam shaft gears and all bearings of the cam shaft and crank shaft are located inside the crank case, thus insuring freedom from grit and dirt.

A float feed carburetor of the automatic type is used, which draws its supply from a gasoline tank of 18 gallons capacity. Ignition is by jump spark, with current supplied by storage batteries, and transformed by four induction coils on the dash. The engine speed is controlled both by the spark and the throttle, by means of finger levers on the vertical steering post. The cooling water is circulated by a chain driven gear pump, and air is drawn through the large radiator at the front by a 22 inch fan keyed to the crank shaft.

Believing that the sliding gear transmission in the hands of untrained men is liable to serious derangement, due to unskilled handling, the American Motor Truck Company designed an improved form of planetary gear which is of exceptional size and strength. They believe that this transmission is practically unbreakable. In connection with a multiple disc clutch of their own design, and with a bevel gear drive to the differential countershaft and a double chain drive to the rear wheels, they believe that they have



PLAN AND ELEVATION OF AMERICAN MOTOR TRUCK.



CHANGE SPEED GEAR OF "AMERICAN" MOTOR TRUCK.

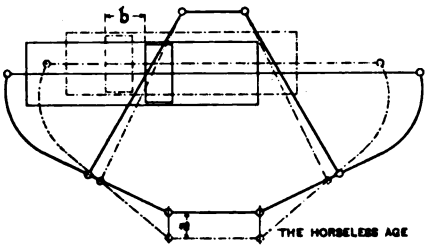
a simple, rigid, strong and highly efficient transmission system.

The change speed gear gives two forward speeds and one reverse, the two forward speeds being controlled by a lever, and the reverse by a pedal. The steering is accomplished by a hand wheel on top of a vertical column, through an irreversible gear mechanism.

There are internal expanding hub brakes on the rear wheels, which are double acting and compensated to give an equal braking effect on each wheel. In addition to these brakes the truck is provided with 2½ inch steel drag bars.

The truck has a carrying capacity of three tons. The front axle is an I section steel drop forging of 2½ inches by 4 inches section, the rear axle is a solid square steel axle, and both axles are fitted with Timken roller bearings. Thre-quarter • elliptic springs are used in front and platform springs in the rear. All wheels are of the artillery type, 36 inches in diameter and fitted with 4 inch (in front) and 5 inch (in rear) Firestone sidewire solid rubber tires. The wheel base of the truck is 118 inches and the tread from centre to centre of tires 54½ inches.

Bodies other than the standard platform with stakes can be furnished to suit the requirements of the purchaser, including steel hopper bodies, with a bottom or side discharge for the handling of coal, grain, liquids or other material ordinarily transported in bulk.

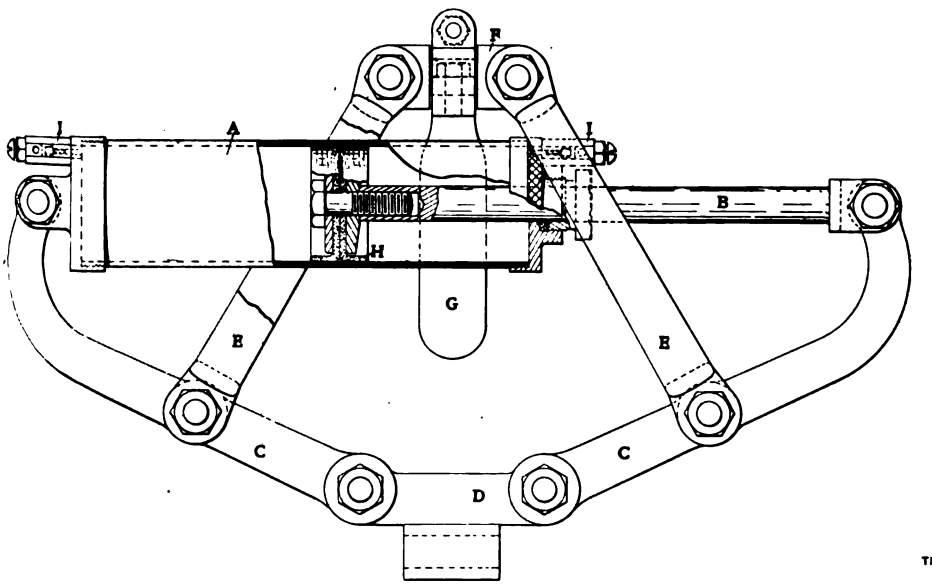


MOTION DIAGRAM OF SIMPLEX SHOCK ABSORBER.

The Simplex Air Shock Absorber.

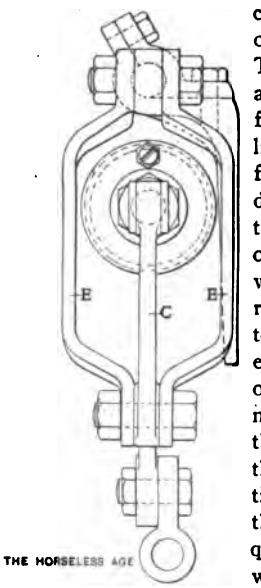
A pneumatic shock absorber of somewhat unusual design has been placed upon the market by L. E. Stachl & Co., 262 West Forty-third street, New York city. It combines an air compressor arrangement with a link and lever mechanism, as shown by the illustration. The cylinder A and piston rod B of the device are pivoted respectively to the free ends of lever arms C C having their fulcrum on a fitting D secured to the axle. Intermediate of the length of the lever arm C are pivotally secured links E E, which at the other end are secured to a metal stud F journaled in a bracket G secured to the frame. The piston H is of the double leather cup type. The cylinder is closed at both ends and provided with check valves II in each head, these check valves being adjustable. When the distance between fittings D and F is increased or decreased owing to the play of the springs, a somewhat increased motion is transmitted to the piston in the cylinder, and the air is thereby compressed in one of the cylinders, and escapes through the check valve I at that end. The pressure of compression within the cylinder for any given position of the piston depends upon the velocity with which the piston has been brought to that point, hence, upon the violence of the spring action, and the retarding effect is therefore greater in proportion to the shock sustained by the springs. The action is exactly equal for both the compression and rebound of the spring. The ordinary play of the springs is not appreciably affected by the shock absorber, as there is very little pressure in the cylinders so long as the piston is near its central position.

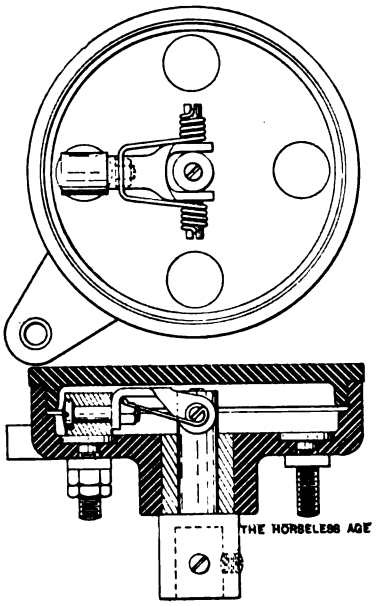
In the diagram herewith, showing the relative position of the parts for the normal position of the spring in full lines and for the compressed position of the springs in dash dotted lines, *a* represents a given compression of the spring, and *b* the corresponding motion of the piston within the cylinder, from which it will be seen that the lever and link mechanism increases or "gears up" the motion. A particular advantage of this device seems to be that it occupies comparatively little room in a vertical direction.



SIMPLEX SHOCK ABSORBER IN SIDE AND END ELEVATION.

The National Oil Heating Company will exhibit at the Boston Show a device for oiling steam engine cylinders freely without wasting the oil. This boiler is operated by a branch from the boiler feed line, water being forced in drop by drop by the pump through a slightly opened valve, the water going into the reservoir at the bottom, and forcing an equal amount of oil out at the top. By means of a valve at the opposite end of the reservoir, admitting boiler pressure, the engine may be quickly drenched with oil at any time by hand.





DODGE TIMER.

The Dodge Lubricator Company's "Positive" Timer.

This timer is designed to combine the wearing qualities of a roller bearing with the perfect electrical connection of a wiping contact. Instead of having the roller pass over plug contacts located in the rim of the timer case, as is usual, it is carried on the end of an arm extending like the spoke of a wheel from the central shaft, and rolls around an annular path on the bottom of the case, the plugs extending through and forming binding posts on the under side. The length of the roller on its axis is one-half inch, and its outer end rolls on a circle a little over three inches greater in circumferential length than the circle the inner edge travels on. Consequently there is a continual slipping along the contact surface of the roller, which amounts in one turn of the timer arm to nearly two and one-half revolutions of the roller.

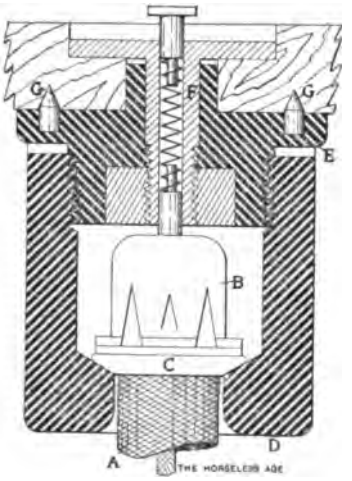
The plug contacts are circular, molded into the insulating material of the case, and during three-fourths of the time of contact present a wipe contact line one-half inch in length, instead of a point contact, as where a ball is used. This gives an ample conducting surface for the current from the coil to the contact plugs, with the result that a larger and hotter spark is produced. The roller is held against the plug contacts by a double coiled spring, the loop between the coils pressing against the face of the roller pin nut and the coils getting their spring by having the free ends engage slots in the yoke pin. This pin being squared in the centre, and held by set screw in the top of centre shaft, forms a means of adjustment for the tension of the springs, should such adjustment ever become necessary.

The case and cover are made of pressed vulvanized fibre, indorsed by the Fire Underwriters' Association to insulate 500 volts for every one-eighth inch thickness; it is claimed to be impervious to oil and water, and of such hardness and density as to wear equally well with the machinery steel of which the plug contacts are made. A manganese bronze bushing is molded in place, absolutely central, forming a bearing in which the centre shaft turns, and is oiled through a self closing oil hole. The lug for the control rod is fitted with a brass bushing.

The device is unusually compact, the case being 3½ inches in diameter and less than one inch in thickness from top to binding posts, and arranged to take a half inch shaft. It is made up with one, two or four contacts and also with distributers.

New Pittsfield Spark Coil.

The Pittsfield Spark Coil Company, of Pittsfield, Mass., have brought out for 1906 a design of coil which embodies original features. The vibrator is of a type known as the semi-hammer blow. The armature is independent of the main spring at the



PITTSFIELD HIGH TENSION COIL TERMINAL.

projection or contact end, hence at the time of break it is allowed to swing a little beyond or higher than the contact carrier or spring end, and when contact is again made the armature descends with considerable force and breaks the connection between the platinum point, whereby the possibility of "freezing" is said to be obviated. The tension spring tilts on a small rod and is so proportioned in relation to the number of threads per inch on the tension adjusting screw that it can only be adjusted to consume up to the maximum current, at which the coil will do its best work. A long range of adjustment for the vibrator is provided.

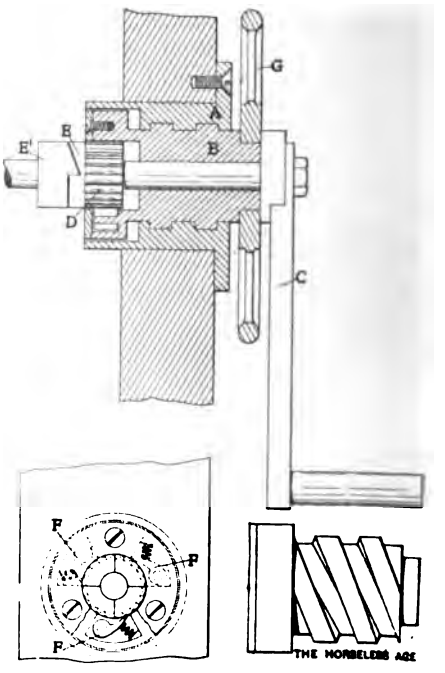
The adjusting screw locking arrangement is provided with means for taking up wear. A quick and sharp break is said to be obtained with this vibrator, owing to the very short distance between the block and the armature, making for a short spring. The platinum contact point is mounted on the spring and projects through the armature, whereby a cushioning action is claimed to be provided for the contact points, which obviates their rapid wear. Owing to the fact that the vibrator cannot be adjusted to consume more than a certain definite maximum of current and that the construction of the vibrator obviates the possibility of sticking and of unduly long contact, the current consumption of the coil is claimed to be very low.

The high tension connectors of the coil are also of interesting design, and a sectional view of one of these connectors is shown herewith. The end of the cable A is cleaned of insulation and is soldered to the brass thimble B, which rests on a hard rubber washer C in the hard rubber gland D that screws over a hard rubber plug E secured by a metal screw F and nut to the wood base of the coil. The connection between the thimble B and the secondary terminal of the coil is made by a coiled spring within the hollow screw F. The hard rubber plug B is prevented from turning when the gland D is screwed up by means of small dowels G G.

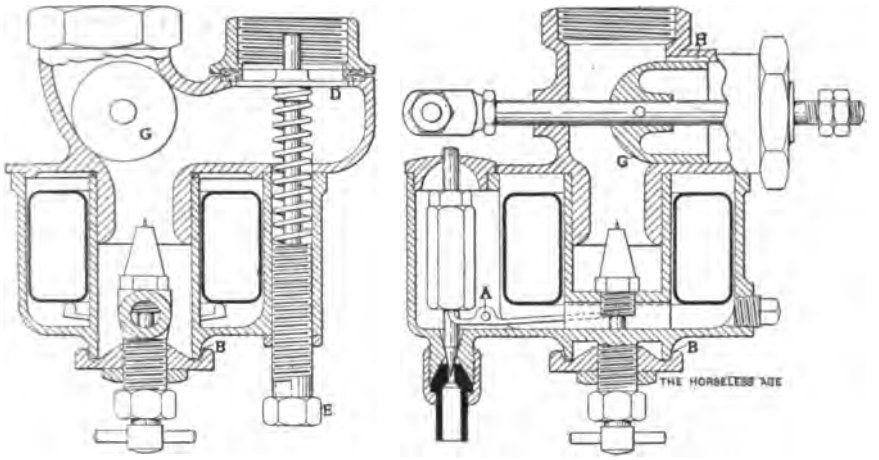
The Pittsfield Spark Coil Company have also made some changes in the design of their Jewel spark plug for 1906. The mica core is ground to a perfect taper and the shell in which it fits is bored to the same taper, so that the core is held in place by simply inserting it in the shell and striking a light blow on the base of the electrode. To remove the core for cleaning, a light blow is struck on the upper end of the electrode and it immediately drops out. The inside of the core is made of sheet mica wound around a solid steel electrode, and is claimed to provide perfect insulation. Connection is made to the cable by a simple brass terminal.

The Miller Safety Starting Crank.

A starting crank designed for starting a gasoline motor without danger of back kicks has been invented by Vernon B. Miller, of



MILLER SAFETY STARTING CRANK.



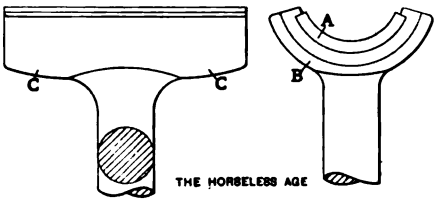
NEW KINGSTON CARBURETOR.

743 North Sixteenth Street, Philadelphia, nd is illustrated in assembly and detail erewith. A bushing A, having a thread f exceedingly high pitch cut on its interior urface, contains a threaded sleeve B which erves as bearing for the shaft of the start- ng crank C. Rigidly secured to the shaft f the crank C are a ratchet wheel D and a atchet cam E, the latter adapted to engage vith the ratchet E′ on the motor shaft. In n extension of the sleeve B are a set of pring press pawls F which are adapted to ngage with the ratchet wheel D.

The device is mounted at such a distance rom the end of the crank shaft that the atchet cams E and E′ cannot engage un- ess the sleeve B is screwed to the limit of ts motion into the bushing A by means of he hand wheel G. In starting the motor, he device being in the position shown in he assembly view, the action is the same as hat of an ordinary starting crank. When the motor runs up to speed, owing to the pressure between the cam surfaces of ratchet cams E and E′, the starting spindle is forced back into the sleeve B, and the ratchet cams E and E′ are thereby disengaged. However, if the motor should kick back, the pawls F would engage into the notches in the ratchet wheel D, and the sleeve B would be rotated and draw the ratchet cams E and E′ out of mesh. The pitch of the thread on the sleeve B is so steep that a very slight rotation of the sleeve in the bushing will carry it back far enough to pull the starting spindle out of engagement with the crank shaft. The pawl and ratchet mechanism is completely enclosed by a lateral extension on the bushing A and an end plate bolted to the extension of the sleeve B.

The New Kingston Carburetor.

The new carburetor of Byrne, Kingston & Co., illustrated herewith, has an annular ring float of either cork or copper, which, when the level is low, depresses the end of a long, pivoted lever, and raises a weighted needle valve. The nozzle is centrally located, and the walls around it are somewhat cone shaped to increase the speed of the air, which enters at the bottom. This opening is adjustable and supplies sufficient air for low speeds. For high speeds the auxiliary air which does not pass over the needle opens the auxiliary valve of light bronze, which rests upon a leather seat and maintains the proper mixture. The auxiliary valve is adjusted by a screw. The throttle is of the balanced piston type, with a small passage which allows the pressure on opposite sides of it to be equalized. The carburetor is made with either a vertical or horizontal outlet. The cut of this carburetor was shown in our issue of February 21 and the device was there erroneously described as that of the North Chicago Machine Company.



ANDERSON'S CONNECTING ROD END.

The Anderson Gasoline Motor.

This is a new motor which was shown to the public for the first time at the recent Chicago Show by George W. Stahl. It has three cylinders set 120°, and all three connecting rods work on the same crank pin. The cylinders are stationary. The connecting rods are of the usual form, except at the crank end. The shape of these ends is shown in the sketch. The end fits against the crank pin and at the bearing surface A is a combination bronze and babbitt bearing. The three rods are held to the pin by a screw ring on each side against the crank webs. These two rings are beveled to fit over the tapered ends C C of the rod ends. The rings can be adjusted toward the centre of the crank pin to take up any slight wear. The cylinders are copper jacketed. The flywheels are two circular discs on the inside of the crank case. These also act as plate cams to operate the exhaust valves. The inlet valves are automatic.

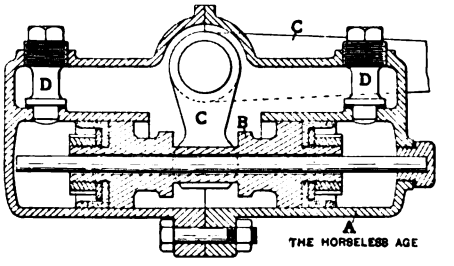
These engines are built in two sizes with three and six cylinders. The six cylinder engine is 3½x4 inches, rated at 50 horse power, but is claimed to actually develop over 60 horse power on the brake at 2,000 r. p. m.; it weighs only 320 pounds. Light weight, compactness, speed and lack of vibration are claimed.

The "Powerful" Searchlights.

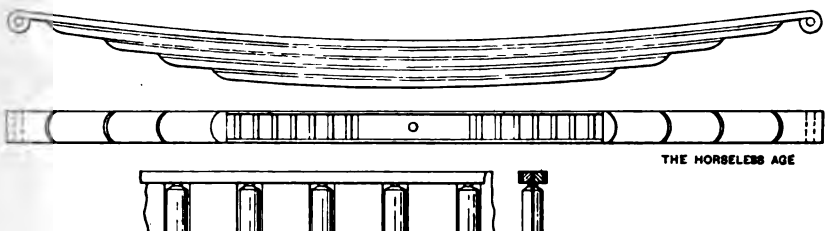
Among the lamps, lanterns and searchlights to be exhibited at the Boston Show by Peter Gray & Sons, of Boston, is the "Powerful" searchlight for automobiles. This light is equipped with Bausch & Lomb lens reflectors, and also with a combination of parabolic and mirror lens reflectors. This light is claimed to give a much more powerful light than can be obtained with simple mirror lenses or other reflectors of even far larger diameter. It has a swivel support so the light may be turned in any direction and the burner can be adjusted in focus to project the light ahead in parallel rays, or to spread it out to cover the roadway. The method of ventilation is said to obviate the possibility of the heat breaking the mirror lens. All the joints and parts are riveted or screwed together, and the front glass and reflector can be readily removed. Five sizes of searchlights will be shown, finished in gun metal, all copper and brass.

The Renault Shock Absorber.

We show herewith a sectional view of the Renault hydraulic shock absorber, a sample of which was exhibited at the recent Armory Show in New York city. It consists of a closed metal vessel A in two halves bolted together. At the bottom of this vessel there are formed two opposed cylinders, in which is adapted to move back and forth a double piston B actuated by means of a bell crank C C, the shaft of which passes through a stuffing box in the wall of the housing A. The horizontally extending arm of the bell crank C is connected by a link with two universal joints to the spring support on the axle, while the housing A of the device is rigidly secured to the side frame of the car. Each of the two cylinders communicates through an adjustable check valve D with the other portion of the vessel A, and as the double



RENAULT SHOCK ABSORBER.



MERCER ROLLER BEARING SPRING.

piston B is moved to either side of its central position it forces the liquid from that cylinder through the check valve D, whereby an adjustable constant resistance is opposed to the play of the spring. Oil is the fluid used in the device.

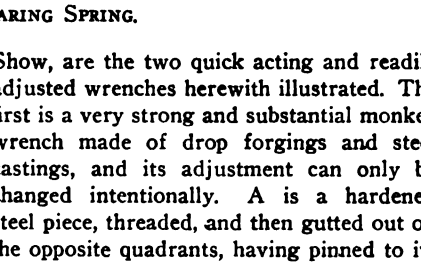
The New Leach Steam Generator.

The National Oil Heating Company, of Melrose, Mass., are manufacturing what is known as the "New Leach Generator," which is of the well known semi-flash type, simple in construction and very compact in form. One of the features of this generator is the automatic regulator for operating the by-pass connected with the water pump, which automatically opens and closes the by-pass, so that the boiler receives just the amount of water required. It is possible to set this regulator so as to deliver steam at any required temperature to the engine, thus making it feasible to use a slide valve engine with the generator and obviating the usual objection to semi-flash boilers, viz., the extremely high temperature of steam. Some other advantages claimed for this generator are that it cannot be burned out, it is perfectly safe, very accessible and easily taken apart when necessary, generates steam in a very short time, and has the largest possible amount of heating surface for its size.

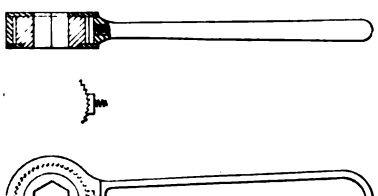
The "National" kerosene oil burner, which is used in connection with the generator, was specially designed for it, has no exposed parts, all the fittings being housed in and kept hot, so that when the car is kept standing indefinitely with the pilot light running there is no tendency to condensation in the vaporizers, and less care is required in turning on and off the oil supply to both main and pilot burners. To remove the burner it is only necessary to disconnect the unions to the fuel supply and pull it out like the drawer of a desk. No asbestos cement is required for stopping up joints as in common types of fire tube boilers and burners. The size of the 10 horse power type is 14½ by 17 inches.

Quick Acting Wrenches.

Among many novel and interesting little tools which the Bay State Tool Company, of 23 West First street, South Boston, Mass., will exhibit at the coming Boston Show, are the two quick acting and readily adjusted wrenches herewith illustrated. The first is a very strong and substantial monkey wrench made of drop forgings and steel castings, and its adjustment can only be changed intentionally. A is a hardened steel piece, threaded, and then gutted out on the opposite quadrants, having pinned to its lower end a little thumbpiece by which it can be turned around. Part B is tapped similarly to and receives part A. Therefore when A is turned so that the teeth are not in mesh B can be slipped up or down according to the size nut to be taken. But



NEW MONKEY WRENCH.



RATCHET TIRE LUG WRENCH.

when the thumbpiece C is restored to its original resting position by the spring, the teeth are again in mesh and there is no danger of the adjustment being changed or backing off, as in the ordinary wrench. The wrench is made in different sizes and finishes, varying from 8 inches to 15 inches in length.

The other sketch illustrates a new ratchet tire lug wrench, which is quite a time saver. It can be had with a double head for removing the front and rear wheel tires should the lugs be of different sizes. It is very simple in construction, having a small ratchet wheel operating against a pawl, which is kept in contact with the wheel by a small stiff spring set into a hole drilled into the body of the wrench. The ratchet wheel is held by a washer, which is riveted down on the outside. By simply turning the wrench on its other face it may be used in the opposite direction.

The Mercer Roller Be... Spring.

Frederick J. Mercer, of ... Mass., has a patented roller ... which he expects to accomp... object as is usually attained ... sorbers. It comprises a se... one-eighth to three-sixteent... ameter, placed about one-h... and held by small trunnions i... ends of the rollers, which ... length of the spring. The ... hardened, and the cages a... proof by felt pieces fastene... strips upon which the sprin... main body of this device is cl... out of sheet brass, to preven... openings for the rollers to s... roller bearings are placed be... inæ of the four springs, ... wheel passes over an obstru... ferent leaves of the springs ... straighten out, without the ... is usually offered by the rou... the leaves in contact. The e... the cage has the same thickn... ameter of the rolls, while th... tion of the cage is of less t... the diameter of the rolls. By... tle graphite into the bearin... while, all grinding friction ... The inventor claims that th... alike under light and heavy ... all jolts and vibrations and re... tires.

Novelties in Gog...

The Globe Optical Compa... have introduced a novelty i... auto goggles. There are fo... each pair, and instead of the ... frame fastening, an almost i... at the squared corners of th... lows the removing and rep... glasses without loosening or u... frames. They are made eith... or pongee silk, silk lined, ... velvet bound, with an adju... headband.

Another novelty is a comple...



GLOBE OPTICAL COMPANY'S N...

detachable ear and mouth pi... pigskin with chenille lining.

"Kryptok" invisible bifocals ... ing fitted to any kind of g... which does away with the nece... ing eyeglasses under the goga...

Fuller Gasoline Electric Truck.

ew truck with a combination power n is being constructed by the Fuller r Vehicle Company, of Detroit. notive power is furnished by a four er water cooled gasoline motor, di- connected to an electric generator, which current is transmitted to two ic motors on the two axles respect- The capacity of the truck is from tons, and the power is said to be ent to propel it with full load over ary roads at a speed of about 5 per hour. The motors drive their tive axles by means of spur driv- ears and differentials. The speed ol of the car is effected by an elec- ontroller varying the motor connec- The carrying platform of the is 20 feet in length by 6 feet in , but 4 feet of the length is taken r the engine, generator, fuel tank adiator. The frame is entirely of nal steel, and is claimed to be very g. The forward end is supported fifth wheel construction mounted ball bearing. The front truck can fore be turned to an angle of 90°, ing of making very short turns, it possible to disconnect the rear in such a case. We expect to a complete technical description of ruck in an early issue.

-Line Oil and Grease Guns.

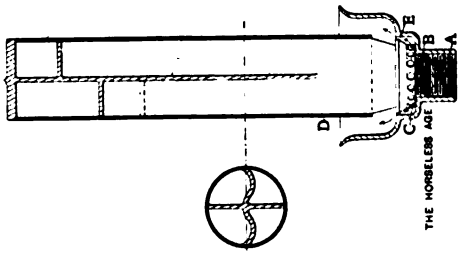
Randall-Faichney Company, of Bos- rill exhibit at the Boston Show their ine oil and grease guns, which are led to be used for oiling automobiles ergency cases or where the lubrica- is not taken care of mechanically. guns are so constructed, it is d, that they will handle equally well ghtest oils and the heaviest greases. plungers are made of heavy metal, d to fit as snugly as the piston in an , therefore preventing leakage. They ry simple in their construction, and is almost nothing to get out of order. ips are made both straight and bent, able the user to reach inaccessible . They can be carried loaded, and f such a character that one hand ulation is possible.

ew Differential Transmission Gear.

nk H. Lewis, of Flint, Mich., has ed a differential transmission gear t is to be tested on one of the large s of the Buick Motor Company. contrivance is small but strongly and consists of cup shaped discs, en which are three pulley-like s. On the outer side is the driving and the speed of the machine may gulated at will by means of a lever. pparatus consists of a combination e friction drive with an epicyclic of gearing.

The Autochime.

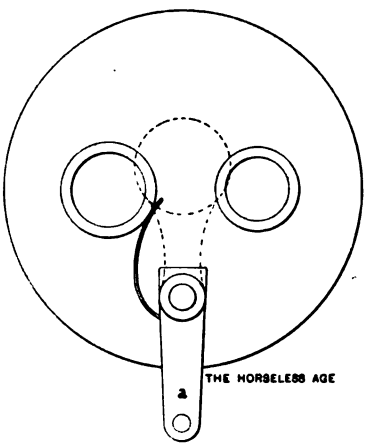
The Gray-Hawley Manufacturing Company, of Detroit, Mich., have placed on the market a new chime horn, which gives four separate and distinct musical tones, the same as would be produced by four individual pipes. It is made of one tube of finely polished brass, into which is placed a casting divided into four compartments, each compartment being of a different length. The lower part is fitted into a brass bell shaped piece, so that when the gases



AUTOCHIME.

from the exhaust of the engine are blown through A they pass through B and out through numerous small holes C, thence by the very small opening E and under the tube and out, so as to give a rich, clear and musical chime, which carries a long distance. The horn is small and compact in size, measuring only 15 inches in length, is claimed to be very durable, and can be blown from a pressure of a few ounces to 300 pounds per square inch. It can be adapted to either a steam or gasoline machine.

To go with the horn, the company also manufactures a special valve arrangement to be fastened to the engine, as shown in illustration. There are two openings from this valve, one going to the horn and the other to the muffler. When it is required to blow the signal, the driver, by means of a



CHIME VALVE.

lever, pulls the arm A to the right, which shuts the opening leading to the muffler, and the waste gases follow out of the other exit and go on their course. If a very loud effect is not desired, each opening may be closed half way, which will divide the gases and give half the pressure.

The Adjustable Foot Power Horn Blower.

This is a device manufactured by the Lawton Manufacturing Company, of Fitchburg, Mass., and comprises an ordinary horn attached to a blower or foot pump, which is placed under the driver's footboard. To a projecting arm of the blower is fastened a long plunger rod which protrudes above the board and furnishes a foot button for the operation of the pump. The horn will be exhibited at the Boston Show.

Club Notes.

DULUTH (MINN.) A. C.

The Duluth Automobile Club is planning to inaugurate a vigorous good roads campaign the coming spring.

A. C. OF MARYLAND.

The Automobile Club of Maryland was incorporated February 26, the incorporators being M. Gillet Gill, Richard Leupold, C. Warner Stock, Harry M. Rowe and Jacob I. Detrick.

SPRINGFIELD (O.) A. C.

The club has re-elected the following board of directors: J. K. Williams, P. A. Staley, C. W. Russell, H. C. Downey and A. F. Sparks. They will meet at an early date and elect officers for the ensuing year.

SYRACUSE A. C.

At the annual dinner of the Syracuse Automobile Club a few days ago Charles T. Terry, of New York, suggested that automobile clubs establish committees or bureaus of complaints, the idea being to create a sentiment in favor of living up to the laws. He believes that if his plan is adopted it will not be necessary for the various legislatures to pass new laws for automobilists, but that the present laws would suffice.

Commercial Vehicle Notes.

It is reported that the George N. Pierce Company will soon start the manufacture of 5 ton trucks.

H. F. McIlwain is planning to establish an automobile passenger line between Cascadia and Albany, Ore.

Walter Moffatt and Edwin Wittleshofer, of Denver, Col., are planning to start an automobile delivery service in that city, beginning with four vehicles.

Col. Thos. H. Girling, of Robbinsdale, Minn., is the head of a company which proposes to operate an automobile passenger line from Minneapolis to Anoka and intermediate towns.

The Stickney & Poor Spice Company, of Boston, are testing several makes of automobile trucks for use in their delivery service in Boston and vicinity, and between Boston and Providence, if found practicable.

Detroit is the first city in the United States to receive automobile mail service. Authority has come from Washington for establishing such service between the main post office and Station F in that city. Forty minutes is the period of time save way on each of seven trips daily.

LEGISLATIVE and LEGAL

Automobile Bills in New York Legislature.

ALBANY, N. Y.—Assemblyman Cox has introduced an act "to amend Chapter 538 of the laws of 1904, entitled, 'An act in relation to the registration and identification of motor vehicles and the use of the public highways by such vehicles,' providing for the release from custody and furnishing of bail by persons charged with violation of the motor vehicle law." The only changes from Chapter 538 and the bills of Senator Saxe and Assemblyman Stanley, which if passed will constitute the entire motor vehicle law, are in the provisions for "a bond or undertaking executed by a fidelity or surety company organized under the laws of this State and having a deposit of at least $200,000 with the Superintendent of Insurance of this State, said bond or undertaking to be in an amount not exceeding the maximum fine for the offense with which the owner is charged and to be conditioned for the owner's apppearance in answer for such violation at such time and place as shall then be indicated." The requiring of this bond for release from custody may be set aside provided the offender gives his personal undertaking to appear in answer for the violation.

Senator L'Hommedieu has made an important amendment to his bill providing for the imposition of a State tax on automobiles. Every owner upon registering his machine must hereafter state the weight; and every owner who shall not have filed the required statement specifying the weight before June 1 of this year must file with the Secretary of State "a supplemental statement of the name of such owner, the registered number of his motor vehicle, and the weight thereof. The weight of a motor vehicle includes the weight of the tires, lamps, top and other equipment ordinarily used therewith." The tax, instead of being $1 per horse power, will consist of 50 cents for each vehicle, "and an additional 50 cents for each 500 pounds or major fraction thereof in the weight of such vehicle exceeding 500 pounds."

Assemblyman Lee has introduced a measure to amend the same chapter "in relation to stopping when meeting horses." It provides for the reduction of speed of a motor vehicle by its operator to a rate not greater than six miles per hour when within twenty rods of a horse, horses or other draught animals, and if the animal or animals is restive or frightened, the coming to a full stop, unless the person in charge of the animal shall give his consent to the operator's not stopping. Stopping when meeting, and not at the request or signal by putting up the hand from the person in charge of the horse, whether the animal be restive or not, is required.

Senator Malby has introduced a bill appropriating $50,000 for purposes of highway improvement, under the provisions of Chapter 115 of the laws of 1898 and their amendments. The money is to be expended under the direction of State Engineer Van Alstyne.

Advocate Speed of 20 Miles an Hour.

BOSTON, Mass.—The Committee on Roads and Bridges of the Massachusetts Legislature on February 28 gave a hearing on the bills relating to the changes in the automobile speed regulations. The bill to increase the speed limit to 20 miles an hour came in for the most defense and criticism.

J. P. Coughlin, president of the Worcester Automobile Club, said that policemen never get the fast drivers, but usually arrest the innocent man out with his family for a drive. He believed even 30 miles an hour would be a safe speed on a good road, and he did not regard himself as in any sense reckless. He favored imprisonment for reckless drivers, who were usually either professional chauffeurs or persons under the influence of liquor, and not owners.

Former Senator H. E. Fletcher said that the present 15 miles an hour law was not practicable, as the constant temptation is to go faster than that. The violator finds that he must go 40 miles an hour not to be caught, when he would be content with a slower speed if it was not for the danger of arrest. He further believed that speed regulations should be governed by the State Highway Commission, so that they might be more uniform. Eight miles an hour is now the rate in one place, while it may be 15 miles in another.

Louis R. Spear favored imprisonment for a man going over 30 miles an hour.

Daniel F. Gay, a lawyer, of Worcester, thought that automobilists ought to use their best judgment in determining a safe speed for any particular locality. It all depended on the surroundings, he thought.

Selectman Briggs, of Bourne; A. W. Kilham, selectman, of Reading; Selectman Preston, of Danvers, and Judge J. Albert Brackett opposed any law that would take away from towns the right to make the speed laws within their limits.

Want Non-Resident Scorchers Dealt With.

TRENTON, N. J.—After the recent hearing on the Frelinghuysen bill, the Highway Protective Association recommended the following amendment to the New Jersey automobile law:

"Each owner having a residence outside of the State shall file with the Secretary of State a duly executed instrument constituting the Secretary of State and his successors in office the true and lawful attorney upon whom all original process in any action or legal proceeding against such owner may be served, and therein shall agree that any original process against such owner shall be of the same force and effect as if served on such owner within this State; the service of such process shall be made by leaving a copy of the same in the office of the Secretary of State with a service fee of $2, to be taxed on the plaintiff's costs of suit."

Alleged Infringement of Patents.

HARTFORD, Conn.—The Electric Vehicle Company have recently filed suit against the Hartford Rubber Works Company for infringement, by their manufacturing and sale of the so-called Turner tire. The Electric Vehicle Company claim that the solid tires which have become well known under the name of Turner were really the result of ideas developed and used by the Automobile Company, who had the samples made by the Rubber Works. The Vehicle Company also state that they had the Fiske patents pending which were issued in February, 1904, and the case seemed to them such a clear one for recognition by the Rubber Works Company that negotiations to that end continued for some time, which accounts for the commencement of the suit only at a recent date.

On the other hand, the Hartford Rubber Works Company deny that there is any connection between the invention of the Turner tire and those of the Fiske patents sued on. As a matter of fact, the actual constructions illustrated in the Fiske patents relate solely to pneumatic tires, while the Turner tire has never been made in any form other than endless solid rubber.

Further, the Hartford Rubber Works Company allege that the inventions of the Fiske patents never contemplated the covering of a construction like the Turner patent, and that after the Turner construction appeared on the market in 1900 efforts were made to change the claims of the Fiske patents so as to cover constructions which were never in the mind of the inventor; this being evidenced by the fact that while the applications for the Fiske patents were filed in 1899, they were not issued until 1904, while the Turner tire was on the market in 1900, and the patent on it issued in 1901.

The Electric Vehicle Company also control the auto rights for the Stirling Elliot tire patent, which they claim is infringed by the new Hartford Dunlop tire. It is understood that they are about to begin suit to enforce these rights. The Rubber Works Company claim that this charge of infringement is more absurd than the other.

UTICA, N. Y.—The bankruptcy proceedings against the Black Diamond Automobile Company of this city have been dismissed.

CLEVELAND, Ohio.—The Royal Motor Car Company makes a counter claim of $64,000 loss, by reason of the failure of the Garford

:ompany to deliver certain parts as agreed. 'his claim is in answer to a suit of the iarford Company to recover $10,000 al-:ged to be due on account.

FLINT, Mich.—A petition has been filed by ie creditors of the Auto Brass and Alu-iinum Company, of this city, to have the ompany declared bankrupt.

TACOMA, Wash.—The International rotherhood of Teamsters has filed a pro-:st with the city council against granting franchise to operate a line of automobiles n the city streets.

COLUMBUS, Ohio.—Detectives and police-ien have been equipped with stop watches, nd automobilists will be timed. It is al-:ged that the 8 mile speed limit is being onstantly violated.

PHILADELPHIA.—In the case of the suit f Stephen De Feher, in which the owners f the Selden rights got a decree and in-unction, testimony is practically completed efore the Master in connection with the ecovery of damages and profits.

SPRINGFIELD, Mass.—The Springfield Au-omobile Club was represented by City So-icitor Beattie at the legislative hearing on he bill to have automobile fines applied to ood roads work, who urged the passage f the bill.

KNOXVILLE, Tenn.—J. C. Fain, a lawyer f this city, has asked the city council to idopt an ordinance requiring all automobiles sing the city streets to be equipped with a vater tank and sprinkling apparatus to lay he clouds of dust raised by the machines.

BOSTON.—The Napier Motor Company as been granted a temporary injunction estraining the Machinists' Union from pa-roling the streets near the factory at Jamaica Plain or interfering in any man-ner with employees until the hearing, March 3. The company is endeavoring to main-ain the principle of the open shop.

HARTFORD, Conn.—Robert F. Painter and Harold D. Thomas were fined last week for aving no number plates or markers on heir machines. They were testing new ars which were likely to be sold in a few lays, but the Connecticut law provides without qualification that numbers must be displayed on all cars using the roads in hat State.

NEW YORK CITY.—In the main litigation under the Selden patent, the rebuttal testi-mony is being taken by the complainants at the offices of Redding, Kiddle & Greeley, 38 Park row, New York city, and is being pushed without intermission, it being the declared object of the complainants' attor-neys to bring the case to a decision at the earliest possible date.

BOSTON.—The Automobile Owners' Asso-ciation was organized here March 1 for the purpose of defending its members in any court in the State for alleged violations of the automobile laws. The only expense for such defense will be the annual dues. Fred-eric Tudor was chosen president, John F. Graham treasurer and Francis Hurtubis, Jr., counsel. There is already a large mem-bership.

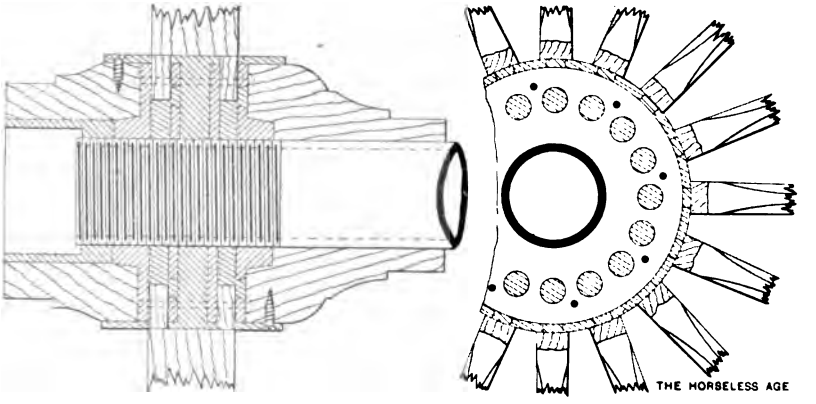
Philadelphia Automobile Show.

The fifth annual automobile show under the auspices of the Philadelphia Automobile Trade Association was held at the National Export Exposition Building, February 24 to March 3. The attendance through the week was large, and considerable business was reported.

Among the new exhibitors were the Key-stone Lubricating Company, of Philadel-phia, who showed a complete line of lubri-cating greases. William Robinson & Sons Company, of Baltimore, Md., exhibited a complete line of oils, five grades, numbering from one to five, each of a character suit-able to the requirements of the various cars.

Charles Freihofer, of Philadelphia, Pa., exhibited a wheel of steel, which, it is claimed, while inexpensive to construct, is practically indestructible and of relatively great strength. The wheel was invented by Wilhelm Tilsner, of Philadelphia, and con-sists of a felly, a hub made in a number of parts and spokes connecting the hub with the felly. The spokes, felly and the various parts of the hub are brazed together. In the inner part of the hub is a spindle, threaded and in two parts, which work in each other, and in the case of a plain bearing act di-rectly as the bearing surface of the hub, or can be used with roller or ball bearings. The spokes may be described as two paral-lel metal bars united by a web, but really being in one piece. The felly may be made and shaped according to the kind of tire to be used. The wheel is designed to apply to all classes of vehicles, the hub being covered with two wooden rings to give it a finished appearance, but which are dispensed with upon application to motor vehicles.

The list of the exhibitors at the show is as follows: Hamilton Automobile Com-pany, exhibiting Corbin and Stoddard-Day-ton cars; the Locomobile Company of America; White Sewing Machine Company; Titman, Leeds & Co., exhibiting Studebaker cars; Ford Motor Company; Dalsimer Au-tomobile Company, exhibiting the Haynes car; Martin & Hart, exhibiting Thomas and Waltham-Orient cars; Paul P. Rippien, Prest-o-Lite gas tanks and accesso-ries; Motor Shop, Inc., exhibiting Royal tourist cars; Reo Motor Car Company; Pennsylvania Electric Vehicle Company, exhibiting Columbia electric, Columbia gasoline and Buick cars; Keystone Mo-tor Car Company, exhibiting Packard and Autocar; Foss-Hughes Motor Car Com-pany, exhibiting Pierce cars, Cadillac cars and Baker electric cars; T. B. Jeffery & Co., exhibiting Rambler cars; the Rainier Company; Kelsey Motor Car Company, ex-hibiting Maxwell cars; St. Louis Motor Car Company; Napier Motor Car Com-pany of America; Gawthrop & Wistar, ex-hibiting Elmore cars; Winton Motor Car Company; Knox Auto Company; Diamond Motor Car Company, exhibiting Jackson and Cleveland cars; H. M. Ambler, exhib-iting Welch cars; F. P. Young, exhibiting Glide cars; Hartford Suspension Company; Reading Standard Cycle Manufacturing Company; J. L. Gibney & Brother; Iro-quois Iron Works, exhibiting Iroquois trucks; MacDonald & Campbell, exhibiting automobile clothing; Rose Manufacturing Company, exhibiting Neverout lamps; Mer-cedes Import Company; W. W. Taxis, ex-hibiting automobile parts; Smith & Mabley, exhibiting Panhard, Simplex, Renault and Mercedes cars; Brazier Auto Works, exhib-iting Marmon cars; James T. Halsey, ex-hibiting Halsey motor truck; J. H. Mitchell, exhibiting Mitchell delivery wagons; N. A. Petry, exhibiting Weed chain tire grips; Puritan Soap Company; Consolidated Rub-ber Tire Company; Mors Automobile Com-pany; Haskins & Howell; Reid, Haverstick & Co.; Voorhees Rubber Manufacturing Company, exhibiting cushion tires; J. W. Jones, exhibiting Jones speedometer; Wm. C. Robinson & Son Company, exhibiting lubricants; Pennsylvania Automobile Sup-ply Company; Pennsylvania Rubber Com-pany, exhibiting tires; Charles W. Miller, exhibiting automobile sundries; J. H. Jol-ley & Co., exhibiting automobile parts; Keystone Lubricating Company; Pennsyl-vania Petroleum Company; George W. Nock Company, Inc., exhibiting parts and sundries; E. Teel & Co., exhibiting auto-mobile tops and tire covers; H. A. Conners, exhibiting Samson leather tires; Michelin Tire Agency, exhibiting Michelin tires; Hutchinson electric horn, American shock absorber, Keystone fire extinguishers; Hyatt Flexible Roller Bearing Company; Keasbey & Mattison Company, exhibiting asbestos auto houses.



TILSNER VEHICLE WHEEL.

MINOR MENTION

The Governor of Utah has recently purchased a Rambler surrey, Type 3.

The Wayne car will be given a six day non-stop test on the streets of New York this spring.

The factory of the Gearless Transmission Company has been removed from Glens Falls, N. Y., to Rochester.

An automobile show will be held at Cincinnati next summer under the auspices of the Fall Festival Association.

Jos. Grossman has succeeded E. J. Kuegeman as manager of the National Sales Corporation of 256 Broadway, New York city.

The Eagle Automobile Company, of Rahway, N. J., have purchased property for their new plant. Construction will begin at once.

The Ariel Motor Car Company, of Boston, has leased a factory at Bridgeport, Conn., and will begin the manufacture of cars at once.

Coffman & Cherry, of Lincoln, Ill., are planning to organize a company for the manufacture of a new automobile recently designed by them.

Orey Jansen, of Davenport, Ia., has organized the Iowa Vulcanizing and Tire Company, to be operated in connection with the Davenport Automobile Company.

Baltimore chauffeurs have organized with the following officers: A. F. Wagner, president; Clyde Lane, vice president; J. Cromer, secretary, and C. Burrows, treasurer.

Thomas B. Jeffery & Co., Kenosha, Wis., have been awarded $50,508 land damages on account of the building of the Chicago and Milwaukee Railroad through its property.

The Mercedes Import Company, of New York, are about to establish a branch in Boston, with Mr. Stillman, formerly of the Pope Manufacturing Company, as resident manager.

The Timken Roller Bearing Axle Company, Canton, Ohio, have recently placed contracts for machinery and buildings which will double the present capacity of their plant.

The Mora Motor Car Company, which recently moved from Rochester, N. Y., to Newark, N. Y., are installing their machinery, and expect to make their first shipment by April 15.

The Columbus (Ohio) Automobile Dealers' Association, at a meeting Saturday night, definitely decided not to hold an automobile show this year, owing to the fact that the season is so far advanced.

Brock & Smith, Atlantic Building, Washington, D. C., are making a compilation of all patents relating to two cycle engines, to be arranged in twelve portfolio volumes. The first portfolio, entitled "Crank Case Compression—Two Cycle Engines," and containing thirty-four patents, has been completed.

Theodore Jonas, president of the Jonas Automobile Company, of Milwaukee, is dead.

The Salisbury Wheel and Manufacturing Company, of Jamestown, N. Y., has voted to increase its capital stock from $50,000 to $100,000. A large addition to the plant will be built the coming spring.

The Columbus Automobile Company, Columbus, Ohio, have offered to move their plant to Zanesville if the business men of that town will subscribe $125,000. Fifty thousand dollars has been pledged already.

The Elektron Mfg. Company, Springfield, Mass., have secured the American rights for the Sultan car, a four cylinder French machine made in sizes from 12 to 60 horse power. It will soon be placed on the American market.

Sidney S. Gorham, of Chicago, the new secretary of the American Automobile Association, took charge of the headquarters in the Spalding Building, 31 West Forty-second street, New York, March 1, succeeding A. G. Batchelder.

The White Sewing Machine Company have bought the building 205-209 West End avenue, New York city. The structure is six stories high, and will be used as a repair shop and for storing cars. The present showrooms will be retained.

Kansas City professional chauffeurs have organized for the purpose of compelling dealers to allow them the customary 5 per cent. commission on all automobile accessories purchased by them. Some of the dealers regard this move as a holdup game.

A. S. Levino, formerly advertising manager of the Maxwell-Briscoe Motor Company, of Tarrytown, N. Y., has been made supervisor of the central district, including western New York, Pennsylvania and West Virginia, and will have charge of all agents in that territory.

The recently incorporated York Motor Car Company, York, Pa., is the successor of the York Automobile Company. The officers are S. E. Baily, of York, president; J. C. Schutte, of Lancaster, vice president; George W. Ryan, secretary and treasurer, and James A. Kline, general manager. The capital stock is $100,000, of which $50,000 is paid in.

Thos. B. Jeffery & Co., of Kenosha, Wis., report that they have recently made what they believe was the largest individual shipment of automobiles on record. A train of seventeen cars containing fifty-two surreys, Type 1; thirteen surreys, Type 3, and one surrey, Type 2, left Kenosha for San Francisco on February 25, consigned to the San Francisco office.

Charles B. Wilson, who has been general superintendent of the Detroit and Lansing factories of the Olds Motor Works for several years, has resigned to accept the management of the New Ferro Machine and Foundry Company, formerly the Hoffman Hinge and Foundry Company, at Cleveland, Ohio. They have been producing automobile and marine engine castings for several years past, and are now going into the manufacture of marine engine and automobile parts on a larger scale. They have recently put up and equipped a building to be fitted entirely as a machine shop, 250 feet long by 100 feet wide, which is thoroughly equipped with automatic machinery for the rapid production of motor parts.

W. F. Smith, of Philadelphia, recently submitted his Rambler car to a non-stop 1,000 mile test under the worst possible conditions. The course lay through the hilly section around Ogontz, and the roads were in a bad condition from rain. The test, we are informed, proved entirely successful, and the car was then run to Harrisburg and back without stopping the motor.

Agency and Garage Notes.

Walter B. Johnson has taken the agency for the Buick automobile at Essex Junction, Vt.

The Holyoke Automobile Garage, Holyoke, Mass., has taken the agency for the Reo cars.

M. M. Hartz has opened a new garage at Twenty-third and Spring Garden streets, Philadelphia.

Graham & Goodman, Inc., have opened a new garage at 51 West Ninety-third street, New York city.

The Auto Rapid Transit Company, of La Crosse, Wis., has leased a building which will be remodeled for a garage.

The Standard Motor Company, of Utica, N. Y., will handle the Stoddard-Dayton cars, and is planning to largely increase the size of its garage.

The Reliance cars are hereafter to be found in Boston at the establishment of the Baker-Cormerais Motor Company, on Massachusetts avenue.

Carl N. Richardson, of Athol, Mass., has purchased a half interest in the garage at Greenfield. The floor space of the building is being doubled.

Dr. R. H. Rohrer and George C. Eppleman, of Altoona, Pa., will erect a garage and repair shop for the Altoona Motor Company the coming spring.

The Sid. Black Automobile Company, of Cincinnati, Ohio, have leased a building at 705 Chestnut street, Chattanooga, Tenn., where they will handle the Thomas, Franklin, Buick and Olds cars.

The Maxwell-Briscoe-McLeod Company, of Detroit, have opened the following agencies in Ohio for the Maxwell car: Amos Silcott, Mt. Vernon; House & Herman, Bridgeport; J. M. Ginter, Wooster, Ohio; C. T. Gaither, Youngstown, and the White Auto Company, of Columbus.

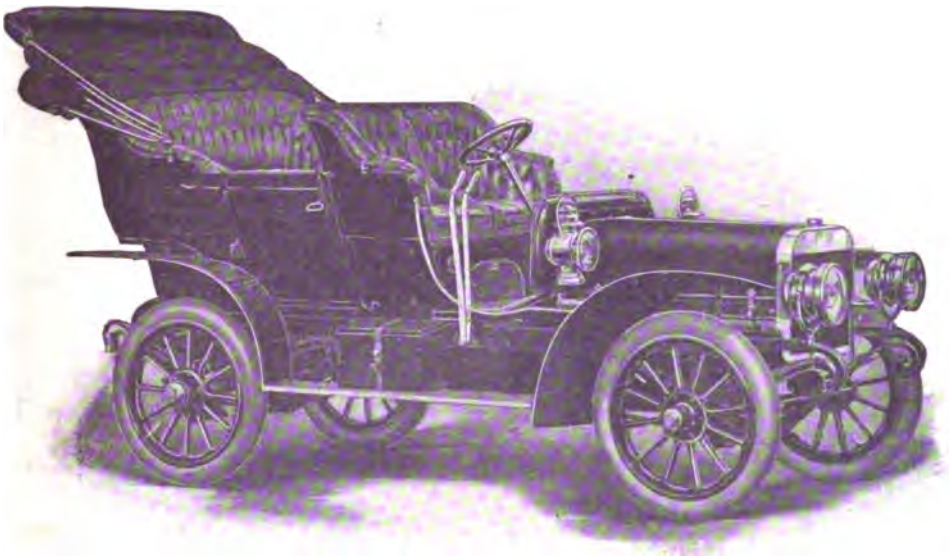
The newly incorporated Electric Automobile Company, of Savannah, Ga., have located their offices and garage in a new building having 12,000 square feet floor space. They have purchased the electric vehicle business of the Electric Supply Company, of that city, and will handle the Pope-Waverley electrics.

...THE...

Horseless Age

VOLUME 17 MARCH 14, 1906 NUMBER 11

WINTON MODEL-K



A ROAD RECORD—A WEATHER RECORD

Mr. G. W. Coffin, president of the Coffin Packing & Provision Co., Denver, Colo., drove his Winton Model K, carrying five passengers, from Denver to Colorado Springs, on February 22, in 2 hours 39 minutes, breaking all previous records.

Mr. Ernest A. Jackson, of St. Paul, Minn., writes: "I have been driving my Winton Model K since December 26, in temperature ranging from 50 above zero to 20 below zero, and it has given perfect satisfaction under all conditison. I do not hesitate to recommend the Winton Model K to any prospective buyer of a 1906 automobile."

Neither bad roads, nor hills, nor cold weather, nor heavy loads can defeat the success of the Winton Model K. It is made right. Just compare this $2,500 car with any car on the market selling at $3,500 or more.

Full information can be obtained at Winton branches in New York, Chicago, Boston, Philadelphia and London, at Winton sales agencies in all important places, or by writing for "The Motor Car Dissected" to

The WINTON MOTOR CARRIAGE CO.

Member A. L. A. M. CLEVELAND, OHIO, U. S. A.

WATCH FOR ANNOUNCEMENT OF PITTSBURG BRANCH, SHORTLY TO BE OPENED

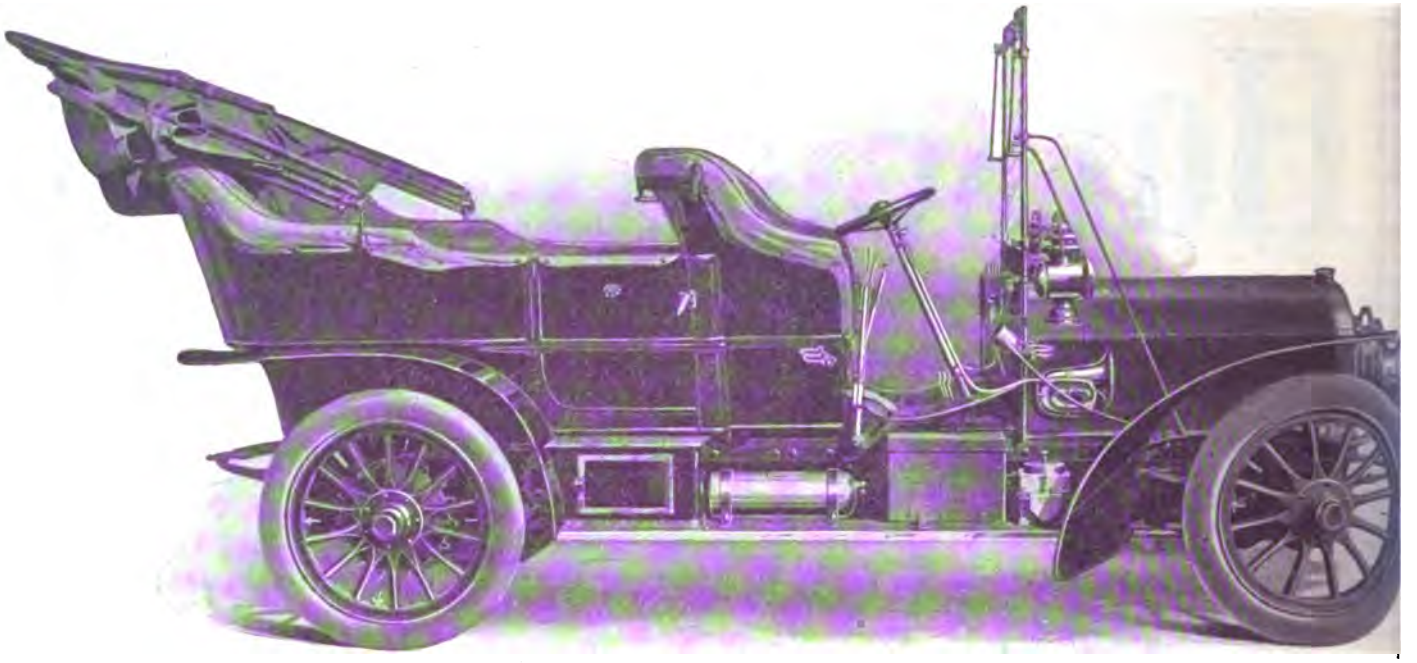
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Complete Catalogue mailed on request.

The new Matheson factory is one of the largest and most modern automobile plants in the world

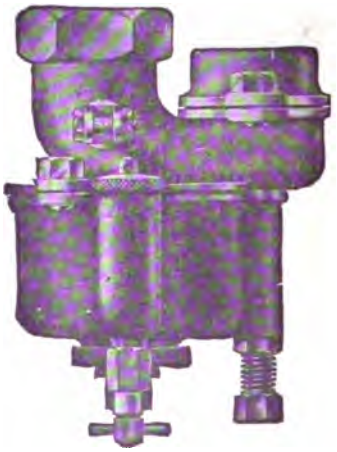
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Taxing Automobiles.

By X. P. Huddy.

e power to tax is the power to de- said Chief Justice Marshall, of the States Supreme Court, in the early of that tribunal's existence. This ition by that most learned and dis- hed jurist has been quoted with ap- time after time, and again and again highest court of the land and by the tribunals of last resort, in support : State's power to tax particular s.

f Justice Marshall's declaration is r. It is the law which applies to all , including automobiles, from which ate chooses to demand contribution : support of the Government.

power of taxation, however, is sub- certain limitations, and the declara- Chief Justice Marshall is taken and tood to mean that the power to tax power to destroy only where the to tax a particular object exists, the State possesses no power to tax ject at all, or where the State may he authority to tax it, but imposes rden in an improper or unconstitu- manner, the authority to tax under cumstances does not exist, and the expressed by Chief Justice Marshall ot apply.

State's taxing power exercised in ing motor vehicles to payment of : can constitute a powerful weapon, a matter which could be used detri- y to automobiling if controlled by ntagonistic to the motor car. This commands the serious attention of omobilists.

often where the State possessed no ty to otherwise regulate a matter in cular way it has accomplished the urpose through the means of taxa- For example, the business of dealing ng stamps has been repeatedly held lawful and beyond the prohibitory of the law-making authorities, but islatures of some of the States have y accomplished the annihilation and sion of such enterprises through the ul implement of taxation, putting actical operation its authority to de- y taxing the subject to death.

ourse, there are certain limits, as fore, to the State's taxing power re prescribed by both the State con- ns and the Constitution of the States; but giving due consideration e constitutional restrictions, we can- id the seriousness of the fact that te rightfully possesses great power matter of taxing motor vehicles, may be oppressively used if the s allowed to be manipulated by anti- bile influences.

bona fide imposition of fair and just it is believed, is not seriously op- y motorists, especially if the revenue bstantial part of it is to be devoted betterment of the public streets and ys, as is provided by the recent act introduced in the Senate of the State of New York, one of the first of its kind in this country. Its provisions, scope and effect are of great interest, especially in considering the fact that similar acts may be introduced in the legislatures of other States.

Let us consider the merits of this contemplated legislation.

The proposed law provides:

"An annual State tax of one dollar per horse power is hereby imposed upon every motor vehicle [,] except motor cycles [,] owned by a resident of this State except a motor vehicle owned by the manufacturer thereof, or by one whose principal business is that of a dealer in motor vehicles, but this exception shall not apply to a motor vehicle in the usual personal use of such manufacturer or dealer; nor shall the tax be imposed on motor vehicles constructed, owned and used for the transportation of goods, wares or merchandise. The tax shall accrue and be based upon the ownership of such vehicle on June first of each year."

The matter above quoted is taken literally, including the punctuation, from the bill which was ordered to be printed after the law had been twice read. The bill is now in the hands of the Committee on Taxation and Retrenchment. What will be the fate of this law it may not be possible to predict at this time, but a searching examination of the provisions of the proposed enactment is in order.

Aside from the ambiguity of the provision of the act above set forth caused by a total failure to punctuate where the writer has supplied the omissions as indicated by the brackets, there exists a less formal defect which affords a loophole through which the whole operation of the law could be avoided and rendered worthless.

The tax is imposed, it will be particularly noticed, "upon every motor vehicle [,] except motor cycles [,] *owned by a resident*" of the State of New York. Two things must concur to authorize the assessment and collection of the tax in every case; namely, there must be ownership of the automobile (excepting where there is a conditional sale) and the owner must be a resident. Residence and ownership must go together in order to subject a party to the tax under the proposed law as it is framed.

That the provision of this act taxing resident owners may be dodged and rendered inoperative is a matter easily seen. All that one would have to do in order to avoid the tax would be to have the title of the automobile transferred to a non-resident party, either a corporation or an individual. This situation is not covered by the proposed enactment. It would be an easy matter, however, to make it impossible to avoid the tax in the manner suggested.

The basis of assessing this tax is according to the horse power of the automobile and it is not graduated according to the value of the vehicle. This will make the tax somewhat unequal, since all vehicles of the same horse power are not uniformly of the same value. This manner of computing a tax on automobiles could not exist in many jurisdictions. In a great many States of the Union there are constitutional provisions requiring property taxation to be by valuation. These constitutional provisions are mandatory and legislative subterfuge cannot evade them. Any substitution in lieu of valuation will render the tax void.

Where these constitutional provisions exist the Legislature is without authority to adopt arbitrary rules for the estimation of values, such as that of taxing automobiles according to horse power, nor can any arbitrary values be attached to property. The grading of the tax must be on an ad valorem basis.

Aside from the matters already considered, there are other features of the proposed New York law which will be apt to cause trouble. The provision enacting that an unpaid tax shall become a lien upon the automobile will render it necessary for the purchaser of an automobile from another individual owner to see that there are no tax liens against the vehicle which may defeat his title. This may eventually require the searching of records similar to the course pursued in land matters in order to know whether a good title can be had. The extent of the complications and difficulties which the tax lien may cause is beyond prophecy. That there will be trouble is apparent.

Another and probably the most objectionable feature of the whole act is the provision which enacts:

"If such tax is not paid within sixty days after the same accrues as required by this act, the owner of such a motor vehicle, notwithstanding his registration under this act, shall forfeit all rights thereby, and shall be subject to the same penalties and liabilities, civil and criminal, for operating such vehicle upon the public highways, as if such vehicle were not registered."

This provision prohibits the motorist from driving on the public highways if he does not pay the tax. In other words, that which is supposed to be a property tax in the first instance is converted into a privilege tax. The automobilist is virtually required to pay $1 per horse power for the privilege of operating his vehicle on the public avenues of travel. He is placed in the same condition as an unregistered owner.

Without further comment, it would seem that objections sufficient in number have been found to require a new bill to be framed if automobiles are to be taxed.

Energetic opposition to the now pending German automobile tax bill is being made by the industry. A hearing was granted to a delegation of the Automobile Manufacturers' Association on February 7.

Production and Properties of Acetylene Gas.

By T. H. Reardon.

Acetylene is a pure hydrocarbon gas, represented by the chemical formula C_2H_2. Acetylene contains a very high percentage of carbon, its composition by weight being 92.3 per cent. carbon and 7.7 per cent. hydrogen. The gas is colorless and the commercial article has a strong odor suggestive of garlic. This odor is mainly due to the presence of small quantities of impurities. When the gas is perfectly pure there is only a very slight and by no means disagreeable ethereal smell.

Acetylene is quite soluble in water. At 60° Fahr. 12 cubic feet of water will absorb about 13 cubic feet of acetylene. The specific gravity is .910, air being taken as unity. In burning 1 cubic foot of acetylene 1,685 heat units are developed. The light produced by burning acetylene is of a very superior character. It is a clear, white light, very similar to sunlight, and all substances show their true colors when illuminated by it. The candle power is about 240 for a consumption of 5 cubic feet per hour under favorable conditions, but it should be noted that it is impossible to get satisfactory results from a flame giving more than 50 candle power. Acetylene is usually burned in one-half foot burners, each flame yielding about 20 candle power. Several such burners may be grouped together to yield any desired amount of light.

The impurities in acetylene that are most objectionable are phosphorus and sulphur, present in the form of hydrogen phosphide and hydrogen sulphide, and are derived from the impurities in the lime and coke from which the calcium carbide is manufactured. Acetylene burns with almost perfect combustion and no odor is perceptible from the burner.

PHYSICAL PROPERTIES.

In the production of acetylene a large amount of heat is generated. This heat may be localized so as to be harmful to the acetylene produced, or it may be diffused and unobjectionable, depending on the manner in which the water and carbide are brought together. If water is allowed to drip slowly on a mass of carbide local overheating will occur and other hydrocarbons of an oily nature and of an easily liquefiable character will be formed, due to secondary reactions and partial decomposition of the acetylene by heat. This peculiar reaction in chemical language is termed polymerization. It implies a change in the physical character of a compound whereby a new compound is formed having exactly the same composition as the compound it was formed from, but being entirely different in appearance and properties. Thus in the laboratory, by the agency of heat alone, acetylene, C_2H_2, can be converted into benzene, C_6H_6, which shows that a kind of condensation occurs, three molecules of acetylene combining together to form one molecule of benzene, the relative proportion of carbon and hydrogen being the same in both compounds. While acetylene is a difficultly liquefiable gas, benzene is a liquid at ordinary temperatures. The reader should note that the term benzene (or benzine) is applied to two products that are very different in their properties (boiling and freezing points). The article referred to above is obtained in the distillation of coal tar, the other and the more commonly known article is obtained in the distillation of crude petroleum and is closely allied to gasoline. In addition to the evil effects of overheating the gas during its production, the heated carbide will give off lime dust, which, being very finely divided, will rise with the evolved gas, and, being carried forward, will tend to clog the burners and even larger passages. This evil can be overcome in a measure by causing the gas to pass through filters of cotton wool.

Where the carbide feed method is used the carbide is in a finely granulated condition and it is automatically dropped into a relatively large quantity of water. All the gas is evolved at once, all the heat is absorbed and the gas is washed and cooled at the same time.

COMPRESSED AND LIQUID ACETYLENE.

Acetylene is an endothermic compound, that is to say, heat is absorbed in its production and given off when it is decomposed. If acetylene is compressed to 150 pounds per square inch and highly heated it may decompose with explosive violence. The use of liquid acetylene is dangerous and is not advisable under any circumstances. It requires a pressure of about 1,000 pounds per square inch to keep acetylene in the liquid condition. If acetylene is unmixed with air and is highly heated at ordinary pressure it will not explode, but will simply decompose into other hydrocarbons, such as benzene, methane, etc.

Acetylene, in common with all other combustible gases, is explosive when mixed with air in certain proportions. One volume of acetylene mixed with 12.5 volumes of air will produce perfect combustion and most violent explosion. The igniting temperature of acetylene is comparatively low. While coal gas ignites at about 1,100° Fahr., acetylene ignites at about 900° Fahr. It may therefore be ignited by a cigar or a cigarette. It will be seen from the foregoing statement that acetylene must be handled with great care, but it has such a characteristic odor that one part of acetylene in 10,000 parts of air can be readily detected, and leaks can be repaired before there is the slightest danger of an explosion.

DANGERS OF ACETYLENE.

It is very dangerous, however, to look for leaks with an open flame light of any kind. Here the writer would like to make a particularly valuable suggestion to those who are liable to be making investigations in the immediate vicinity of gas or gasoline leaks, namely, that t
electric lamp, used with pro
is absolutely safe for this
The lamp should have a wi
tect its glass bulb, for if
fail the incandescent filam
long enough to cause an
lamp should have a well ma
moving tightly enough so
main where it is placed; t
be lit before approachi
of danger and it should
guished until well away
point. A spark is liable
either in making or breakir
while the spark has its
sphere of usefulness, the le
the gasoline tank are not
its province. One of th
searchlights could be sligh
as to fulfill ideal condition
of work.

With properly installed
properly constructed and p
there is absolutely no dan
duction of acetylene in the
suitable parts of residence
apparatus is handled by a
been properly instructed,
good judgment and com
used. This may be inferre
that insurance fire underw
objection to the installatio
generators that have been
proved by their experts.

The foregoing remarks,
to stationary installations.
reality pertinent to the sub
lighting in its restricted us
to auto vehicles; but in ma
autoist is so much pleased
excellence of the acetyle
will be led to wish for so
good in his home, and, re
standpoint, the digression r
Calcium carbide costs ab
pound in small lots. The
figure to buy a 100 pound
not represent a very large
so doing he will corner so
that ordinarily goes to the

As 1 pound of carbide
least 4.5 cubic feet of ga
be a little less than 1 cent
the cost, therefore, for eac
half foot burner will be o
hour for 20 candle power
gas at $1.50 per 1,000 cubic
quarters of a cent per hour
burning 5 cubic feet per
usually gives 20 candle po
sumption of 5 cubic feet p
used with Welsbach burner
70 candle power, with a co
cubic feet per hour, costin
per hour.

ACETYLENE BUR

Ordinary gas tips cannc
acetylene, because the acety
an ordinary gas tip does n
air for perfect combustio
quently smokes; moreover,

s so hot that the acetylene is polymer- or decomposed, by the heat before it irned, and in consequence the candle r is lowered and the burner becomes :d with soot and carbon that are m out during the polymerization of cetylene. Acetylene burners are made e form of a Y. The small jets, one each branch of the Y, impinge upon other and form a flat flame at right ; to a line joining both jets. A num- f small holes are arranged concen- y about the base of each jet to facili- he admission of air which is drawn l mingles with the gas, thus giving a n effect to the flame and insuring less combustion.

SMOKE AND SMELL.

ylene flames when turned down lose unsen effect, and even though they t smoke, still the combustion is very ect and carbon will be deposited and rners will clog. There are burners d with a small needle valve regulat- :h jet, and they can be regulated to t small quantity of acetylene in a ly satisfactory manner.

ito vehicles in many cases it is cus- when the light is no longer needed off the water supply and allow the burn until the lights go out. This to avoid the odor of acetylene that result from the escaping gas if the were blown out. Of course, the n of acetylene will continue until ture in the carbide has been taken the flames will become smaller and until they go out. This does away : odor of gas, but we have as an- il the small flame with imperfect ion, the deposition of carbon and ging up of burners, this last effect e most annoying of all.

IN WELSBACH LAMPS.

se of acetylene in lamps of the h type has been attempted and such re on the market. The highest with acetylene used in connection lsbach mantles is 90 candle power e foot, which is about twice the m an open flame using the same of gas. Furthermore, it has been at the intense heat of the acety- e is very trying on the mantles, etylene is to be used in Welsbach ry trace of phosphuretted hydro- be removed from the gas, other- sphates of the earths of which les are composed will be formed ited on the mantles, and, as these ls are easily fusible, the mantles stroyed.

ry the amount of water required tely evolve the acetylene from a carbide is .56 pound, or a little half pint, but in practice fre- gallon of water is used to a carbide.

EXPLOSIVE ACETYLIDES.

cetylene gas is led into an am- solution of copper, silver and r metals, a precipitate of the par- ticular metal is thrown down as an acetylide of the metal. The compound so formed is very closely allied to the fulminates and possesses the same explosive properties as the fulminates do. It is for this reason that safety regulations prohibit the use of copper in the construction of acetylene apparatus. This particular evil is more to be apprehended in a stationary installation, where deposits are liable to form, than in portable apparatus, where only small quantities of carbide are used, and the carbide receptacles are frequently emptied and refilled. Such deposits when wet are far less dangerous than when dry.

CALCIUM CARBIDE.

The treatment of the subject of acetylene gas without a consideration of the source from which it is derived would be necessarily incomplete, so a brief description of calcium carbide, its production and properties will be given. The manufacture of calcium carbide is intimately connected with the utilization of the electrical energy generated by water power at Niagara Falls, N. Y. As the electrical method of production is the only method that is commercially possible, and as the energy required to produce a pound of carbide is relatively large, about 2.5 electrical horse power hours per pound produced, it follows that this article cannot be produced in a commercial way unless electrical energy is available in an enormous amount and at an extremely low cost.

Calcium carbide consists of calcium and carbon, in the proportion by weight calcium 40 and carbon 26. In the process of its manufacture coke and quick lime, both finely pulverized and intimately mixed, are placed in the electrical furnace, which is arranged on the arc principle, and the heat necessary to fuse the mixture is reached and maintained for several hours.

The accurate estimation of the temperature that exists in the interior of the electric furnace is a very difficult matter, but the best authorities agree that it is about 4,500° Fahr. The proportions of lime and coke placed in the furnace are as follows: Lime, 56; coke. 36; the products formed are calcium carbide, 64; carbon monoxide, 28, the latter passing off as a gas and escaping.

A very interesting matter that occurs in this reaction is the powerful affinity that calcium has for certain elements. Calcium is a yellowish metal that constitutes the metallic base of lime; it is valuable only because it is scarce, and it is scarce because it is extremely difficult to isolate and separate from oxygen, with which it is combined in lime; it is separated from oxygen in the electrical furnace, but does not remain free at the instant that it is liberated from oxygen; it combines with carbon, forming carbide. Calcium is obtained in the metallic condition by electrolyzing its fused chloride, and as a laboratory curiosity it commands $80 per ounce.

CHEMICAL REACTION OF ACETYLENE PRODUCTION.

Calcium carbide, the source of acetylene gas, is a dark colored, extremely hard substance; it is very stable, heat and many chemical reagents having no effect on it; it reacts instantly with water, double decomposition occurring, the carbon of the carbide and the hydrogen of the water uniting to form acetylene, C_2H_2, while the calcium of the carbide and the oxygen of the water unite to form calcium hydrate, Ca(OH) or slaked lime. The following formula expresses the reaction that takes place:

Cal. carb. + water = cal. hydrate + acetylene

64 + 36 = 74 + 26

$CaC_2 + 2H_2O = Ca(OH)_2 + C_2H_2$

The equation expresses the reaction for chemically pure carbide; as commercial carbide is not chemically pure, this yield of gas will not be obtained in practice. Usually about 5 cubic feet per pound is the average in good practice. The 5 cubic feet will give 250 candle power hours of illumination, while the electrical energy that was expended in producing the pound of carbide would give 533 candle power hours with incandescent lamps of 3.5 watts per candel efficiency.

From the foregoing it follows that the efficiency at the point at which the illumination is produced is about 46.9 per cent.; in other words, if 46.9 per cent. of the energy required to produce the carbide could be delivered at the point of consumption, aectylene would possess no advantage over electricity in point of cost as an illuminating agent.

New Rubber Country.

Consul General Guenther, of Frankfort, quotes the report of the well known African explorer, Harry Johnston, to the effect that the Republic of Liberia, in West Africa, possesses an almost unlimited supply of rubber trees. This news, he writes, is all the more remarkable, as heretofore Liberia exported hardly any caoutchouc. Johnston stated in a lecture before a company which has received a concession for the production of rubber in Liberia that an extraordinary amount of that article is to be found there, that it only awaits collection, and that he did not hesitate to say that within six years 2,500,000 of cultivated rubber trees, furnishing an excellent quality of rubber, will be yielding sap. Another report states that at least 20,000 English square miles are covered with dense rubber tree forests. It is also stated that various creepers are found there containing rubber which heretofore been unknown. Should these reports be based on facts, the rubber industry will be greatly benefited.

Count de la Valette, of Paris, recently in this country, observes that America seems to be less hampered by the absence of good roads for touring and adequately testing machines than he had believed possible. The Count seems to be laboring under an illusion. It is the poor road, not the good one, that severely tests the automobile.

WINTER EXPERIENCES.

Experience with the Automobile During the Past Winter.

By L. M. Allen.

The past winter has been so mild I have succeeded in using my automobile the entire winter. In fact, I have used the automobile more or less during the past three winters. Therefore have necessarily learned something about the winter use of the automobile.

The cold does not interfere with the running of the motor. In fact, the motor seems to run as well if not better in cold weather than in warm. It is necessary to use a very thin lubricating oil and a reliable non-freezing mixture, and on very cold days the motor must be run long enough to warm the cooling mixture before taking the car out, or the very cold air may stiffen the mixture in a few moments so it will not circulate. This happened to me a few weeks ago, and after going about a mile or two my motor began to pound and slow down. It immediately occurred to me where the the trouble was, and on investigation the radiator was cold. The trouble was remedied in a few minutes by building a small fire under the radiator with a few leaves and some small dry weeds and sticks.

EXHILARATION OF WINTER DRIVING.

When the roads are good and the air is crisp there is something very exhilarating about automobiling. To be sure, one must be prepared for it by being well clothed, and the ears and eyes must be well protected. Then the more crisp the air the greater the satisfaction of bidding defiance to it. When the roads are rough and muddy, however, it is a different story. During the past winter the roads have sometimes been very muddy, and it has been necessary to use tire grips to get through, and then headway could be made only on the low gear. One day recently, when I had to go about four miles out into the country to make a call, I had to go the entire distance on the slow speed. It was a narrow road, seldom used except by heavy teams, and after getting started in the wheel ruts it would be easier to keep going than to try to turn back, so I kept going. I did it, and did it quicker than the horse that came after me; but if anything had given out I dread to think of the consequences. How would an air cooled motor have held out going those eight miles at slow speed? Something would certainly have been red hot.

When the country roads are heavy with mud there is very little pleasure automobiling over them; but, then, a doctor does not ride under those conditions for pleasure, hence the real question is one of utility. For winter use the under side of the car should be thoroughly protected from the splash of mud and water, otherwise mud will work into and injure the working parts of the machinery, and it is especially injurious to the chain. If the manufacturers would protect the chain by a guard it would last much longer, because of all the parts the chain and rear sprocket are most exposed and sure to get the mud and dust.

ANTI-FREEZING MIXTURE.

The freezing mixture that gives me most satisfaction is a 30 per cent. of commercial glycerine and water with about 10 or 15 per cent. of wood alcohol added. It is not necessary to keep your tank full of the mixture in cold weather. I usually, after filling the tank at the beginning of cold weather, continue to use it without replenishing until it gives some sign of the water being low, then add about a gallon of the mixture, which usually lasts much longer than it does in the summer, and the small quantity keeps the motor just as cool. In fact, in cold weather it is better to use a small quantity than to fill the water tank, for the reason that if you have to use the slow speed very much the water is apt to boil in the tank and you lose more or less of your non-freezing mixture, which is rather expensive, whereas if the tank is only part full it gives the water a chance to boil without boiling over.

WINTER ROADS.

The hardest roads to travel over (both on automobile and man) are muddy roads frozen, on which it is impossible to go faster than on low gear without shaking your car to pieces, at least on our poor Connecticut roads. Of course, there are places where it is smooth enough to go on the high speed, but one must be on the alert for bad places and slow down for them, or something is going to happen to a light car. But when the roads are frozen and smooth, then the conditions are ideal for automobiling. Light, dry snow, to the depth of 6 or 8 inches, does not seem to interfere much with the running of the car; but wet, heavy snow will, especially on the hills. After the snow has become packed and the sleighing is good, the automobile will run very well indeed. It is wiser, however, to have the tire grips with you, even if there is no occasion to use them, and there seldom is, as the rubber clings to the dry snow better than one would expect.

NO NEED OF A TOP.

Most doctors prefer a top on their cars in the winter, but I do not like them. Give me a warm coat and protection for my ears and eyes, and I have never seen it so cold or windy that I did not enjoy it. About two weeks ago, one very cold, windy night, about 10 o'clock, and about 4 miles from home, my chain broke. It was a beautiful, clear night, and I had some good cigars in my pocket, so I did not feel very bad about the broken chain, as I had been expecting it to break for some time past, and I don't like to be disappointed.

About a mile farther on was the nearest telephone, so, after pushing my car to the side of the road, I started for the telephone, puffing on one of my good cigars—which, by the way, were Christmas cigars from another fellow's box, who had insisted on filling my case. After reac phone I was fortunate enou repair man still at his garage a minute it was understood start immediately with his c home. In a short time he ca his motor pounding and runn He just managed to reach motor stopped, with the wate radiator. The people whos had used had not yet reti obligingly heated a kettle of with which we thawed out after which the car started right.

In a few minutes more we onto my car, and the way th car yanked my runabout ov mud, which was as rough mud could be, jarred me so scape became a blur, and I I was taking a vibratory tre

When I purchased my aut my horse out in the country a farmer. The next winter to send for the horse until a January, and sent it back earl Last winter I used my au February, and this winter ha winter without driving once cided to sell my horse and depend on my automobile. become too bad for it I ca team for a few days until chance to improve.

A BUSINESS IDEA

There are four doctors in who have depended on the this winter. The other thr two cars, but I have depende it has not failed me, except o when the chain broke. Wh manufacturer design a docto and then organize a docto could get orders for a thousa the second one was compl know what they want, and t unanimous in their opinion doctor's car should be. Let turer sell direct to the doctor agent's commission. If he of $100 on each car that $100,000 on one order.

There were hundreds of last automobile show looking would meet their requirement able price, and there was n that would fill the bill. The points had the same weak po ago; that is, from the point o tors who have had experien mobiles. We are living in h of some time seeing a stro light car placed on the marke doctors who know of my ex the automobile ask my advice best car for their purpose, a pelled to name a car the pri away out of their reach, or to wait until something suit on the market.

Problem of Winter Driving Satisfactorily Solved.

By Dr. Alfred C. Smith.

ter driving causes but little tire wear than summer use. The snow and lly soft roads seem to keep the tire- obstacles in a harmless condition, so ose their destructiveness. As to the of the other parts, I have had no more during the winter months than in mmer, but had one break directly due cold weather. There had been a and water had run across the road rozen, so that the next morning s broke through, leaving deep ruts, hich one of the front wheels of my opped. The wheel was held as in a and the spindle snapped off at the tting the car down. I got a little om a boy, placed it under the broken e, tied it there and drove home, the ing wheel steering all right.

of the things in winter use which is letrimental to the appearance of the that the mud which collects on the warm days becomes frozen later, ing the lustre of the varnish and using the paint to craze or become vith a multitude of fine cracks ex- in all directions, sooner or later, the paint to scale and peel, which ened by the vibration of the motor itted to the body of the car. When g in cold weather no warm water be used; it should be just at the ature to be worked in without suf- from cold, as the hot bath, following d and frozen splash, soon destroys in the varnish, which when gone a dusty, dull finish, and the paint, lost its protective coat, soon follows. ough "chamoising" after a good rins- remove the fine particles of grit g from the wash, is all important in ather cleaning. This should be fol- by a thorough polishing with a reli- dy polish, which in itself will act as ctive coat to the finish of the car, as add to the appearance of the same; hould be applied in small quantities ie and well rubbed off, as an excess nds to accumulate grit and also to the varnish, by softening the same. first winter I used calcium chloride eze solution, but it proved unsatis- ; then I tried glycerine solution, but ealed in cold weather. Finally I a solution of potassium carbonate of tartar) 20 pounds, glycerine 15 and water sufficient to make five This mixture did not congeal down , but was difficult to keep in the ystem, as at all unions, couplings nts there was a slight oozing, in aces amounting to a waste in quan- did no harm to the pipes or hose, evaporation was not rapid, as often l would boil in the jacket before the siphon) circulation started. I con- he use of this solution last winter, winter I returned to calcium chlor- , in spite of my former experience, found it satisfactory, which leads me to believe that the chemical used the first time was not the right kind. With a solution of four and one half pounds to the gallon of filtered water, the solution has remained perfectly fluid at 6 degrees below zero, and in no way does it cause any injury to the circulation system. It is not so difficult to contain in the pipes and radiator, and being of a lighter specific gravity than the glycerine solution, it circulates more readily. The chemical used was obtained from a house making a specialty of preparing the calcium chloride for this purpose, retailing it at 5 cents per pound in 100 pound cans f. o. b. the nearest shipping point, New York, Pittsburg or Chicago.

I find nothing injurious to the tires in the use of the chain traction grips, though they are used constantly over a long period. Some ten days since we had a rainfall on frozen streets, and in half an hour the streets were a glare of wet ice, impossible for man or beast to travel over, yet I applied the chains and went out for my daily rounds in peace and dryness, though it continued to rain and freeze. I traveled 38 miles in three hours, attending fourteen calls, when it was so dangerous to travel afoot that at times I had difficulty in getting back to the car after having left it. When meeting pedestrians in the middle of the street (that being the only place they could walk) they would stop and allow the car to make the necessary detour to pass them, as it was more certain in its movements than they.

The Item of Expense.

By Robert P. Elmer, M. D.

My experience with automobiles for professional use has now extended over two and a half years. I have had two machines, and have used one or the other almost every day, even in snow of moderate depth, keeping no horses. In the fall of 1903 I purchased one of the curved dash, single cylinder, water cooled runabouts that were then so popular. I relied on it exclusively, and it carried me until last December. I have it still in good running condition, stored away to use in case of an accident to my new one. As figures speak plainer than words, I will give a minutely itemized account of my expenses with that machine for nearly two years.

In the accompanying tables such things as ordinary tools, lap robes, etc., were not counted. Neither did I consider the house ($73) and an underground gasoline tank ($24). Unfortunately I had no odometer, so I can only guess at the distance traveled. Mine is a suburban country practice extending over a radius of about 5 miles. I suppose I am on the go about as much as the average physician, and so the total cost per month and year ought to be fairly instructive, even if it is not reduced to terms per mile. That the amount of use for the two years is about the same is shown by the closeness of the monthly gasoline average figures, viz., $4.74 and $4.72. In February, 1905, I used no gasoline, as the snow was too deep to run, and I had to hire a horse and sleigh. I did venture out once and broke something, as is indicated by the repair bill. The increase in oil expense in 1905 is due to my oil tight transmission case having worn so much as to permit leakage. The decrease in the labor bill for 1905 is deceptive. In reality there was much more work to be done, but experience had increased my mechanical skill so that I could do more myself. The tire expense is reckoned on 28x2½ clinchers. The larger sum in 1905 is partly due to their increased cost.



Front View of Dr. Elmer's Car.

The anti-freezing mixture that I used in 1903-4 and 1904-5 was calcium chloride. This substance was cheap and perfectly effective, but it corroded my water tank so that in November, 1905, I changed to wood alcohol and glycerine. This was non-corrosive and equally effective, but much more expensive. I figured the cost of the dry



Arriving at the Hospita'

cells separately in order to compare it with that of installing and maintaining a storage battery. I think the figures show that a storage batery would have a slight advantage in a town where it could be easily charged.

The extras include a small vulcanizer, a new top and rope to prevent the tires slipping, which, of course, is now superseded by the metal tire grips. A physician should consider that everything which involves a loss of time costs in that way as much or more in trouble and money than the actual repairs. A number of times while in the greatest haste I have had to abandon my machine, and proceed by foot, rail, bicycle or horse.

With all these facts of experience in mind I determined to make a thorough search for the ideal machine. It must have cheap, solid tires, plain bearings; no water, no gears, no differential, no chain, no live axle, no gaskets, no clutch, light weights, comfortable riding qualities, a fair speed, durability, elasticity and high power. This seemed to me a hopeless task, and yet almost at once I found the very thing I was looking for with every one of the above requirements. I bought it early in December. It has high carriage wheels, with 1⅛ inch solid rubber carriage tires. These wheels have shown no sign of weakness, and travel beautifully through mud and snow.

On my first ride, owing to my ignorance and the fact that I was slightly "rattled," I broke a small part which cost $3 to duplicate, and $6 for the labor. Since then I have broken absolutely nothing, however, except two small battery connecting wires. The gasoline cost is slightly greater than with the old machine, owing, I suppose, to the greater horse power and the two cylinder construction of this engine. The oil bill has been 35 cents per month. Repairs have been nothing except as stated above. The car runs easily at 20 to 25 miles per hour, and goes up nearly every hill on the high speed. On the low speed I can go through ploughed fields or up any hill around my home, and there are some very bad ones. When I start out in the morning I know that I can do a full day's work in comfort and peace of mind, which in itself is worth many dollars.

Regarding extra precautions for winter, I can only say that so far as I know there are none. The obvious lesson to be drawn from this article is that the whole question of the value of an automobile to a doctor rests on his choice of a machine.

The firm having the contract for street cleaning in Berlin, Germany, will soon place tentatively in service a number of motor propelled dust wagons, street sweepers and sprinklers.

New Austrian Tariff Duties.

A new tariff schedule for automobiles entering Austria went into force on Mar... The tariff is based on the weight of chassis, including motor, and is as follows: Up to 400 kgs. (880 pounds)... crowns per 100 kgs. From 400 to 1,800 ... 120 crowns per 100 kgs. Between 1,800 ... 2,300 kgs., 100 crowns per 100 kgs. Ab... 2,300 kgs., 60 crowns per 100 kgs. Acc... ing to the old schedule the duty on a cha... of 1,200 kgs. was 132 crowns, and fo... complete car of the same weight, ... crowns. On the new basis the amount ... duty to pay on such a chassis or car ... 1,440 crowns, making a difference of 1... crowns for the chassis and 1,188 crowns ... the vehicle complete.

The duty on automobile motors imported separately has also been materially increased, as may be seen from the follow... rates: Up to 50 kgs., 160 crowns per ... kgs.; from 50 to 200 kgs., 120 crowns ... 100 kgs.; from 200 to 400 kgs., 100 cro... per 100 kgs. Above 400 kgs., 60 cro... per 100 kgs. According to the old ta... automobile motors were considered as ... classified machinery, and were liable to ... duty of 18 crowns per 100 kgs. It may ... stated that 1 crown is equal to about ... cents. The enormous increase in the du... on automobiles bids fair to close Austria ... automobiles and parts of foreign produc...

1904. Month.	Gasoline.	Oil.	Tires.	Freezing Mixture.	Extras.	Replacements and Improvements (Material Only).	Dry Cells.	Labor.	Totals by Month*
January	....	....	....	$1.70	$1.69	$2.15	....	$8.38	$13.92
February	$4.14	$0.50	$15.50	.70	.45	....	$0.90	19.55	41.74
March	5.94	....	....	.70	4.00	9.25	1.20	13.83	34.92
April	6.66	.98	16.40	....	....	44.30	....	13.95	82.29
May	4.86	2.40	1.05	....	....	....	.60	18.50	27.41
June	4.50	....	13.30	....	....	1.15	.60	4.68	24.23
July	6.58	....	10.40	....	....	13.45	1.60	26.81	58.84
August	5.19	.90	6.40	....	6.50	3.93	....	8.43	31.35
September	4.42	.90	1.85	....	....	3.30	2.08	5.82	18.37
October	5.27	.60	....	....	....	1.80	2.08	9.23	18.98
November	5.27	....	18.32	.60	....	5.96	....	13.15	43.30
December	4.08	.75	17.47	1.80	1.20	5.80	2.00	16.13	49.23
Totals by items	$56.91	$7.03	$100.69	$5.50	$13.84	$91.09	$11.06	$158.46	$444.58
Monthly average	4.74	.59	8.39	1.10 for 5 mos.	1.15	7.59	.92	13.21	36.50

* Excluding freezing mixture.

1905. Month.	Gasoline.	Oil.	Tires.	Freezing Mixture.	Extras.	Replacements and Improvements.	Cells.	Labor.	Totals by Month
January	$2.98	$0.75	$17.42	$0.84	$1.50	$8.80	....	$7.88	$40.27
February	....	....	....	.96	....	14.45	....	6.00	21.41
March	4.84	1.50	....	.60	....	21.43	$1.84	21.13	51.34
April	5.44	.80	17.42	....	1.42	....	2.24	8.35	35.67
May	5.74	.75	19.60	....	....	.60	....	5.01	31.70
June	6.98	....	....	....	....	2.05	....	4.13	13.16
July	6.76	1.75	.69	....	35.00	5.50	1.40	2.00	53.10
August	7.64	.75	....	....	....	12.20	2.10	3.25	25.94
September	4.73	1.50	48.77	....	....	12.45	....	9.39	76.84
October	6.76	.75	26.81	....	....	16.79	1.80	.50	53.41
November	....	2.25	.25	8.36	....	10.40	....	40.50	61.76
December	Not used during this month.								
Totals by items	$51.87	$10.80	$130.96	$10.76	$37.92	$104.67	$9.38	$108.14	$464.50
Monthly average	4.72	.98	11.91	2.69	3.45	9.51	.85	9.38	41.25

THE HORSELESS AGE

...EVERY WEDNESDAY...

Devoted to Motor Interests

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HORSELESS AGE

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Table of Contents.

Beginning with the present number a table of contents will be published in each issue on the page containing the Index to Advertisers. Our reason for placing the table in the advertising and not in the reading pages is that a regular classified index is issued at the completion of each half yearly volume, and if the tables of contents were in the reading pages and therefore bound in volumes of reading matter only, they would be simply a duplication of the general index for the volume, and of no use to the owner. By placing the table in the advertising pages this duplication is avoided. We hope that this new feature will prove a convenience to our readers.

To Limit the Show Evil.

The National Association of Automobile Manufacturers, at its recent meeting, adopted a resolution to the effect that hereafter only two shows would be sanctioned annually, one each at New York and Chicago, and that the resolution relative to the exclusion from sanctioned shows of firms exhibiting at unsanctioned shows be continued in force. The resolution reflects the dissatisfaction of the industry with the heavy expense and serious loss of time with which they are now burdened by the constantly increasing number of shows, and it also gives rise to a number of interesting speculations. Only one show in New York will be sanctioned next year. This year two shows in the city, both laying claim to the characterization "national," were accorded the sanction of the N. A. A. M., and the way the resolution is worded looks very much as though the ruling faction in the association was bent upon further aggressive measures in the show line. We are assured, however, that the executive committee had no intention of placing exhibitors at next year's A. C. A. show under the ban and barring them from the Chicago national show; that the two simultaneous shows in New York were collectively referred to as one national show.

The number of local shows has been growing from year to year, while the need of such shows has at the same time become less, owing to the concentration of automobile establishments in the different cities in definite localities. The N. A. A. M. some years ago passed the above mentioned resolution with regard to exhibitors at unsanctioned shows, but owing to the activity of show promoters it became almost immediately a dead letter. Later, with the growth of the industry, the association sanctioned a considerable number of local shows. It is certainly quite desirable that the dealers in the different large cities should arrange some annual public event drawing general attention to their new models, but this ought to be possible to accomplish even more effectively and at less expense than by means of the present shows. If the manufacturers decide not to bear the expenses of these shows, the agents, we are sure, will soon give them up, except possibly in a few large and favorably situated cities. The plan recently suggested in our columns by a correspondent, of having an annual opening day each year on which the public can inspect the new models at the different agencies, seems to be an excellent one, and is to our knowledge regarded favorably by a number of leading manufacturers. We do not believe that the resolution regarding exhibitors at unsanctioned shows will have much weight, as exhibition opportunities are rather plentiful, but if the manufacturers are actually decided not to support any further local shows, the doom of these shows is at hand and will be hailed with pleasure by the majority of the trade. Dealers will do well to reckon with such

an eventuality as tolerably certain, and the Dealers' Association might therefore begin to look into the possibilities of an annual "opening day," or some similar projects.

Co-operative Garages.

The unpleasant experiences which many automobilists have had with public garages have led to different suggestions for remedying the evils. The latest scheme proposed is that a large number of users in a certain community should all purchase the same type of car and then install a co-operative garage. The trouble between motorists and garages has been due to careless management of the garages, overcharges and incompetency of employees. Perhaps the last mentioned factor has been the most frequent cause of friction, as it is impossible for garage employees to be familiar with all the different makes of cars that may be brought to them for care and repair, and, as a consequence, it frequently takes an unreasonably long time to find the causes of certain defects, and the bill for the repair mounts up accordingly.

This trouble it is hoped to avoid by the co-operative garage scheme. When all the cars housed are alike it would be possible to employ only men from the factory where they are made, hence repairs would be greatly facilitated. Moreover, a large stock of duplicate parts could be constantly carried on hand, so that it would never be necessary to wait for such parts to be sent from the factory.

The advantages claimed for the scheme appear very attractive, but we believe it practically impossible of realization, except, perhaps, in the case of one or two very popular makes. To make it practicable, at least twenty-five purchasers would be required who would each own the same make of machine, and with the large number of makes now competing in the market and the great difference in the ideals of individual purchasers, it would be no easy task to get that number in a single city to go in for the same make. Of course, a co-operative garage might also be operated for machines of different makes, but in that case the above named advantages would be lost. Such a garage is now operated by a number of wealthy New Yorkers, we believe, and others on the same principle have been proposed in different cities in the country. The scheme will undoubtedly be further developed, but whether it will eventually prove superior to that of the privately operated public garage is open to doubt. Time and increasing competition will eradicate the present evils in the garage business, and the factor of competition particularly bids fair to have a more salutary effect on the privately owned than on the co-operative garage. The co-operative system has never been very successful in this country, though it is applied successfully and extensively abroad in the creamery, beet sugar and other lines.

Federal Control of Motoring.

The question has been raised in the minds of many whether or not the United States Government should, to any extent, control the operation of automobiles and seek to take the matter out of the hands of the States. This question naturally arises from a consideration of the adverse attitude which some of the State legislators have taken in reference to the automobile.

It is not so much a question whether the United States should control the operation of motor vehicles as whether the Federal Government really possesses the power to act in the matter. It must not be forgotten that in this country there are two distinct sovereignties—two governments—that of the State and that of the United States. Each government is distinct and independent of the other in many matters. There are certain things the United States Government cannot do, which affect the State, and there are matters the State has no control over, which affect the United States.

The regulation of the use of internal highways is a matter which belongs exclusively to the State government. It is a matter of purely internal concern and comes under the State's power to pass regulations protecting the public from danger in the operation of vehicles on the highways. Over these State internal police matters the United States has no control at all; and in so far as motoring is confined exclusively within the jurisdiction of the State, Congress cannot act.

Where, however, automobiling is interstate, that is, where the motorist passes from one State into another, the Federal Government is given jurisdiction over such travel by the United States Constitution. The United States has jurisdiction to control interstate commerce, and interstate commerce includes interstate travel by means of the motor car. Action by the United States in respect to interstate motoring, however, would not prevent the States from regulating auto within their own domains. granted the States by the Co could not be taken from act of Congress.

Progress in the Appl Anti-Friction Bea

The recent announcement ment of ball bearings upon of a prominent car of foreig is of interest, as their adoptio in the engine completes t progress of the anti-friction leaves the modern motor car gle plain journal of any imp ing any revolving portion of t

This use of balls between rod tip and the crank pin ha upon with great reserve owing to the extreme severity ing stresses, which, under tions, act at this point, and a of the fact that the bearing one, and unless the design likely to be rather clumsy. doubtless only a matter of tioning to design a ball be service which shall successf all ordinary use.

The history of the emplo bearings in motor car constru interesting. An adherence ditions insured their emplo wheels of many of the earli and the ball bearing rear a soon developed. For a long ings of the engine and chan were plain, and it is only very the gear shafts of sliding pi tions have been generally ball bearings. In the meant drive to the rear axle was d ball bearings have become ve used in its construction. Th thing but plain bearings in engines was for a long time questionable advisability, and garded in many quarters, but crank shafts are now by no m mon in the latest foreign cars parently proving their practica shafts employing anti-friction ings are not unknown on rec cars, rollers being used in o instance.

Ball bearing crank pins w be the next in order, and de this direction will be watched est, considering the severity of

nditions involved. The motion of the ting rod upon the piston pin is so that very little saving would prob- :sult from the adoption there of an ıction bearing, and a plain bearing obably be retained there. Ball bear- n shafts are by no means exceptional \merican cars at the present time.

how great an increase of mechan- iciency results from the employment s at the main and crank pin bearings ıicle engines cannot at present be but judging from data obtainable comparative tests of plain and ball gs under somewhat similar condi- of service, the saving of energy is to be found very material. If the gs are so proportioned as to be se- rom the danger of crushing or cut- ey are likely to be largely employed future. Lubrication difficulties would, he whole, be considerably reduced by mployment, an advantage of consid- importance.

of Observers in Endurance Contests.

he recent Berlin conference of dele- from a number of recognized na- automobile clubs, it was provisional- ided to hold the coming "European ." endurance contest under the rule ial observers and a maximum speed ased upon actual running time. The d draft of regulations, prepared by C. of France, did not provide for observers, and based the maximum upon the time interval between the start and the arrival. Much oppo- is now raised in France to the d rule, and all sorts of groundless ons to it are put forward. Paul , in an article "Beware of Observ- tates that the observers would not ıe time of stops by means of split watches, and that the records would re be inaccurate and invite pro- He mentions several other equally l and far fetched objections to prove servers are undesirable and that the eed limit rule is impracticable.

difference between the two pro- regarding the speed limit is simply uppose a certain stage of the con- 180 kilometres long, and has to be l at an average of 30 kilometres per r in six hours. Under the original car which covered the whole dis- without stop in six hours and an- which covered it in, say, four and one half hours' actual running time, with one and one-half hours' stops, would receive the same credit, while under the new rule the latter car would be penalized for the one and one-half hours' stops. The former system is evidently a very crude and unjust one. Its inevitable result would be that every contestant would drive at top speed right from the start, in order to gain time for possible involuntary stops. The contest would develop into a race, and its practical value would be lost. This is not mere theory, but has been demonstrated to be a fact in contests held in this country. France would do well, in organizing its first big contest of this kind, to take a lesson from the several very successful endurance competitions which have been held in this country and in England. The attempts at such contests made heretofore in France have for the most part been miserable failures. We need only mention the last year's contest for the Pyrenees Cup, the printed rules for which provided a maximum speed limit of (we believe) 30 kilometres per hour, but the contestants at the start were told not to pay any attention to this rule. Result: A race pure and simple and protests innumerable.

In a touring contest, actual touring conditions should be duplicated as nearly as possible. In actual touring, if a mishap causes a delay, the tourist does not race the rest of the way to make up for it (at least the sensible tourist doesn't), but arrives that much later. The mishap is responsible for his late arrival, and in a contest such a mishap should therefore be penalized. It is not customary to express such delays more closely than in a round number of minutes, and there is absolutely no need of split second watches in timing the stops.

Incompetency and unreliability of observers are another objection raised to the new rule, but this can be easily met by requiring each entrant to furnish one observer for each car entered, to serve only on cars of another make, and that observers change cars daily. Only with competent observers and general conditions similar to those obtaining in actual touring is there any chance for a practical, instructive contest. If the French insist on making the contest a race, they will most likely fail to get the sanction of the authorities for the whole of the course, but even if permission should be obtained, non-French manufacturers would not be eager to compete.

Levassor's Part in the Development of the Motor Car.

A discussion has recently arisen in England as to the credit due to Levassor for his work in the development of automobile design. It may be stated that M. Levassor, of the firm of Panhard, Perrin & Cie., came into possession of the French Daimler motor patents by his marriage to the widow of M. Sarazin, the special agent of Gottlieb Daimler in France, and, using the Daimler motor, built a road car that differed materially from that constructed by Daimler himself. Whereas Daimler placed the motor at the back of the car and obtained his change of speed by means of belts, Levassor placed the motor conspicuously at the front of the car under a hood and secured his change of speed by means of a set of laterally engaging toothed pinions in combination with a single friction clutch.

These two features, namely, the location of the motor in front and the change of gear by means of sliding pinions and a single friction clutch, have since been almost universally adopted abroad, and very extensively in this country for high powered pleasure cars, and it would seem that much credit is due Levassor for having found at the very beginning of the era of automobile experimentation a combination which, after twelve years of experience, has been adopted by a majority of all manufacturers. The credit due for the invention of the sliding pinion change speed gear is still somewhat uncertain. Although this type of gear is recognized by a majortiy of designers as the most practical at present available, its shortcomings are clearly apparent, and there are few who will deny that it is more or less of a makeshift and destined to be superseded in the course of time. Such an event would naturally detract materially from the merit of the invention of this gear.

No such reserve need, however, be made in giving credit to Levassor for his good judgment in placing the motor at the front of the car. The early automobile experimenters almost without exception inclined to the opinion that the motor and mechanism should be placed where they were inconspicuous and close to the driving wheels, and occupied space that could not well be otherwise advantageously utilized. Most of them tried to copy the appearance of the horse carriage as closely as possible, fearing that projecting machine parts or housings might suggest a traction engine or locomotive. Levassor, recognizing the importance of having all the mechanism well protected and readily accessible without disturbing the passengers, boldly broke away from these notions and indicated the correct path of progress in automobile design. For this contribution to the progress of automobile construction he is entitled to the greatest credit.

Automobiling in Cuba.

By Harry B. Haines.

The American automobilist visiting Cuba for the first time, and entering that wonderful country through its quaint and old fashioned gateway, Havana, gains an impression that is at once erroneous and disappointing. The little narrow, crooked streets, crowded and jammed with traffic, seem anything but inviting to the automobilist, but once the Prado is reached and crossed, the possibilities of automobiling in Havana become at once apparent, and the toot of the auto horn is no alien sound to that quaint old Spanish city.

My first impression of Havana was anything but a favorable one, from an automobilist's standpoint, for when my baggage had been passed through the custom house and I was fairly ashore, the narrow little streets, with their 2 foot sidewalks, crowding pedestrians into the little narrow alleys of streets, which were already jammed with traffic, seemed to my eye to be impassible for automobiles, and I wondered from what source the report had spread that Havana was really a city of good roads and of automobile attractiveness.

I sat back in the coche, and was driven swiftly through the busy streets of the lower section of the city, past the old two wheeled carts, and past men on horseback and women and children afoot, with an occasional bicyclist riding by, but no sign of an auto. Suddenly, however, we rushed out of a side street, the driver of the coche clanging his bell and scattering the pedestrians right and left, and there in front of the Inglaterra Hotel I saw my first automobile in Cuba. It was a 50 horse power Panhard owned by Col. J. J. Astor, and I was destined to meet the same car later on under less favorable circumstances, although at the time I had no idea that this was to be the case.

Before we had reached the hotel two other automobiles crowded with merry parties dashed up the broad Prado, going at fully 35 miles an hour, and dodging in and out among the coches and the carts with reckless abandon. Following behind was a large sightseeing wagon similar to those used in New York city and in many American seashore resorts, and it was crowded with tourists. I later learned that these large automobiles made daily trips during the tourist season to points of interest, American guides being sent along to explain things to those in the car.

It takes some time for an American to adjust himself to the ways of Cuba, and to realize that in Havana, although a great deal of business is transacted, there is no great rush and bustle, and people don't like to be hurried. It's too hot to hustle, and what's the use anyhow?

When I finally did get somewhat accustomed to things and began to sit up and take notice, I turned my attention to the automobile situation, which proved to be both surprising and interesting. I soon ascertained that the automobile was not only well thought of and popular in Cuba, but that it was rapidly becoming a prominent feature. I was surprised to learn that there were 365 automobiles in the city of Havana, and also four garages. That two companies rented out machines to tourists, one company maintaining sightseeing rigs and running daily trips during the tourist season, and also operating the cars in rural sections the other nine months of the year; and that another company of Americans maintained a regular daily service with eight machines between various Cuban cities, and was making the venture pay excellently, despite an investment of nearly $40,000.

The leading garage in Havan the West Indies Transportatio who have the lower floors of at Zulueta 28. They have a mo in every respect, with a com shop, electric charging plant an pair department in charge of A formerly employed in the St Fisk Rubber Company. A. C. royal good fellow, who has see Panama and other tropical co who speaks Spanish like a n charge of the company's inte Barnhart is a citizen of the Unit America, and was construction the De Forrest Wireless Teleg pany for five years. He went to take hold of the affairs of th dies Transportation Company 1905, and at that time there wa in the city, although a large foreign cars of high price wer wealthy Cubans who stored the selves and had their own men pairs. There are now twenty- American make stored in this storage charge is $15 a month cludes cleaning. Gasoline sells a gallon, engine oil at $1.10 a lubricating oil at $1 a gallon. 20 cents a pound, and mechani repairs is charged at 60 cents a of these prices are based o money, the Spanish dollar, w universally used coin, being wo less than the American dollar.

This enterprising company large trucks, all of them of the inder opposed, air cooled typ these cars carry from fifteen passengers, and the remaining commodate twenty-eight passe The machines have given good no great difficulty having been with overheating, showing th



The Old and the New Means of Communication at Marianao.



THE CUBAN PLANTER'S METHOD OF TRAVELING, WHICH THE AUTO IS SUPERSEDING.

cooled engine is practicable in tropical climates, and under constant and severe service.

An all year round service is maintained between Marianao and Guanajay, a distance of 32 kilometres, and between Guanajay and Mariel, a distance of 12 kilometres. The lines are well patronized, and the drivers of the old fashioned "gauguas" have practically been put out of business. This is the name given to the old stage coaches drawn by mules, which were, until the advent of the automobile, the only means of transportation between these inland towns of the island. The owners of these rigs reaped a rich harvest until the automobiles came, and then the natives deserted them at once and fell in with the innovation, realizing that the autos were just as reliable as the old mule drawn wagons, and were much speedier without being any more expensive.

Of course, the gaugua owners and drivers did not like the idea of being put out of business by the American devil wagons, and they became distinctly fussy and obnoxious. Mr. Barnhart was notified by several anonymous letters duly decorated with skulls and crossbones that if he did not call his autos off the road his life would be declared forfeit, and he would have to pay the penalty. He paid no attention to the threats, and the autos ran right along and were well patronized by the better class of natives. Then the gaugua men resorted to other tactics. They tried to wreck the autos by piling stones across the road and even by stretching ropes across at night. They found that water and gasoline wouldn't assimilate, and used that knowledge, causing some annoyance. They made all sorts of attempts to wreck the rigs, but the drivers, all Americans, were on the alert, and accidents were avoided. Finally, finding that they could accomplish nothing they gave up the fight and contented themselves with driving their rigs along and picking up passengers when the autos were out of commission for repairs or out of gasoline, as was sometimes the case.

The Guanajay cars start from the end of the trolley car line of Marianao, running thence to Punto Brava, to Hoyo Colorado, to El Caimito, to Guanajay, a distance of 24 miles, for which a charge is made of 60 cents per passenger. The trip occupies two hours' time.

The Guanajay to Mariel trip is 12 miles, and 50 cents a passenger is charged. From Guanajay a car runs to Artemisa, a distance of 10 miles, for which a fare of 40 cents per passenger is collected.

It is figured that to run the eight cars and keep them in commission the cost per day per car is $12, divided as follows: Wages for driver, $3; gasoline, $4; repairs, oil, depreciation, etc., $5 a day. The Marianao-Guanajay cars run every hour in both directions. The whole system is controlled by the following time card, which is rigidly lived up to, the cars arriving and departing on schedule, accidents not preventing.

TIME CARD.

WEST INDIES TRANSPORTATION COMPANY.

The automobiles of the West Indies Transportation Company will leave Marianao for Guanajay at 6:30 a. m., 7:30 a. m., 9:30 a. m., 11 a. m., 12:30 p. m., 1:30 p. m., 3:30 p. m., 5 p. m.

Guanajay for Marianao at 6 a. m., 8 a. m., 9:30 a. m., 10:30 a. m., 12:30 p. m., 1:30 p. m., 3:30 p. m., 4:30 p. m.

Guanajay for Mariel at 6 a. m., 8 a. m., 10 a. m., 12 m., 2 p. m., 4 p. m.

Mariel for Guanajay at 7 a. m., 9 a. m., 11 a. m., 1 p. m., 3 p. m., 5 p. m.

ZULUETA 28, HAVANA, CUBA.

On one or two occasions the machines have been unable to make their trips owing to a shortage of gasoline. This was the case on the day after my arrival in Cuba, and Mr. Barnhart made up a party of which I had the pleasure of being a member, and rode out to locate the stranded cars.

The run from the garage was out the Prado, and so on to El Vedado, the exclusive residential suburb of Havana, thence past the famous Colon cemetery and so on to Marianao, and over the Cuban race course to Arroyo Arenas, Punta Brava, Hoyo Colorado and El Caimito to Guanajay. The road is a beautiful one, smooth and finer than any American road that I have ever ridden over, and runs through a glorious country rich with tropical vegetation. Long rows of royal palms, cocoanut, palm and guava trees may be seen; fields of pineapples and tobacco and groves of bananas are common, and withal the scene, with the quaint Spanish houses, the funny two wheeled carts drawn by their slow oxen, the ever present rural guard mounted on his horse and armed with revolver and machete, is one ever changing, ever strange and new, and at all times interesting and attractive.

(*To be continued.*)



A TYPICAL CUBAN VILLAGE.

ELECTRIC IGNITION

Magnetism.

A magnet is a body which has the power of attracting certain other bodies called paramagnetic. The most important paramagnetic substances are iron and its various combinations. Nickel and cobalt are also slightly paramagnetic, but do not possess this property to a sufficient degree to affect their commercial values. There are two kinds of magnets, viz., permanent and temporary magnets. The former retain the power of attracting paramagnetic (magnetic for short) substances permanently, while the latter retain it only so long as a magnetizing force is applied. Permanent magnets can only be made of hardened steel, manganese steel being the best for this purpose, because it retains the magnetism best. In practice permanent magnets are usually found in two forms, bar magnets and horseshoe magnets.

When a magnet is freely suspended it takes up a certain definite position. A bar magnet, for instance, will point substantially north and south. The end of the magnet pointing toward the north is called the north, or positive, pole, and the end pointing toward the south is called the south, or negative, pole. Every magnet, of whatever shape, has these two poles, and



FIG. 1.—BAR MAGNET.

if a magnet is broken into two or more pieces each piece again has a north and a south pole. The reason a magnet takes up a certain definite direction when freely suspended is that the earth itself is a permanent magnet, having its magnetic south pole in the regions near the North Pole, and its magnetic north pole opposite, and it is a law of magnets that poles of unlike sign attract and poles of like sign repel each other. The force of attraction and repulsion is equal to the product of the strength of the two poles, respectively, divided by the square of the distance between them.

As there is an attractive and repulsive force between magnets at a distance from each other and an attractive force between

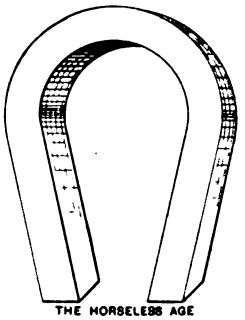


FIG. 2.—HORSESHOE MAGNET.

a magnet and an unmagnetized magnetic body, it is obvious that the magnetic force of a magnet pervades the surrounding space. It is also found by experiment that at any given point in the surroundings of a magnet the attractive or repulsive force has a definite direction. If a small magnetic needle, freely suspended, be brought close to the north pole of a large bar magnet and then be moved away along the path indicated at any moment by its direction, it will finally arrive at the south pole of the bar magnet. This experiment has led to the conception of magnetic lines of force which emanate from the north pole of a magnet and pass through the surrounding atmosphere to the south pole. The space surrounding a magnet in which there is an appreciable magnetic effect is called a magnetic field.

The lines of force which pass through the atmosphere from the north pole to the south pole pass through the magnet from the south pole to the north pole, thus forming a complete circuit. Magnetic lines of force follow very much the same laws as electric currents. The total number of lines, which corresponds to the current, depends directly upon the "magneto motive force" of the magnet and inversely upon the magnetic resistance of the circuit. The magnetic resistance is much greater for the air portion of the circuit than for the steel portion, and this explains the superiority for many purposes of the horseshoe magnet over the bar magnet, as in the horseshoe magnet the length of the magnetic path through the air is relatively short. In order that a permanent magnet may well retain its magnetism the magnet must be very long in proportion to its cross section, its poles must be close together and the opposed polar surfaces must be relatively large.

The lines of force extending between the poles of a magnet may be well illustrated by a simple experiment. A magnet is laid on the table and at a short distance above it is held a sheet of white paper soaked with molten paraffin, which paper is shaken while a bagful of fine iron filings is slowly poured onto it from a certain height. Each iron filing arranges itself with its length in the direction of the lines of force, and when the experiment is completed a perfect map of the magnetic field is obtained, as shown by the accompanying diagram.

A permanent magnet may be produced by drawing a piece of hardened steel over one pole of another permanent magnet. This method, however, does not give very satisfactory results, as magnets thus made are not very powerful. The method now generally employed is that known as electric magnetization.

By bringing a magnetic needle into the vicinity of a conductor carrying an electric current it will be found that the needle tends to set itself at right angles to the direction of current flow, thus indicating that an electric current has a magnetic effect. In fact, a conductor carrying an

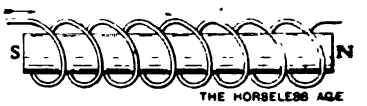


FIG. 3.—ELECTRIC MAGNETIZATION.

electric current is surrounded by circular magnetic lines of force. The magnetic effect of a current can be made very powerful by forming the conductor, or wire, into a coil of many turns, in which case all the lines of force pass through the coil and return on the outside. Such a coil behaves exactly like a magnet, and when freely suspended takes up a position with its axis extending north and south. The magnetic strength is proportional to the number of turns in the coil and the current flowing through it. If a hardened steel bar or horseshoe is inserted into the coil while the current is flowing it becomes at once magnetized, and by using a large number of turns in the coil and a strong current a very powerful magnet can be thus produced. After the bar or horseshoe is withdrawn or the current is stopped

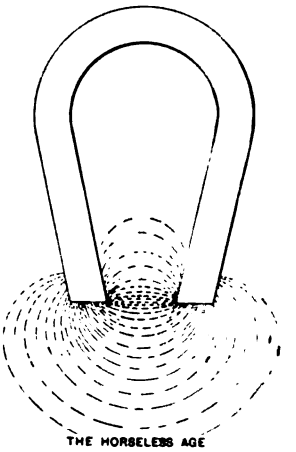
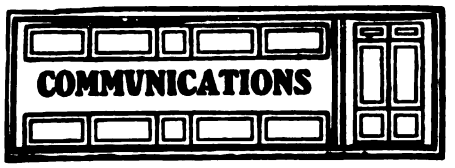


FIG. 4.—MAGNETIC FIELD OF HORSESHOE MAGNET.

it retains a considerable portion, though not all, of the magnetism thus imparted to it. It is a permanent magnet. The strength of permanent magnets decreases in the course of time, and is very detrimentally affected by shocks and heat.

If, instead of a hardened steel bar or horseshoe, one of soft iron or steel had been inserted into the coil, an even stronger magnet would have been obtained, but the magnetism of such a piece of soft iron or steel immediately vanishes almost completely when the current is stopped or the piece is withdrawn from the coil. Temporary magnets are thus made from soft wrought iron, steel or cast iron. They are of very great importance in the generation, control and application of electricity. It may be added that in the case of electric magnetization, the polarity of the resulting magnet always depends upon the direction of flow of current through the coil. If the coil be regarded as a screw and the current flows through it in the direction the screw is turned, then the north pole will be in that direction toward which the screw would advance.



Puzzling Action of a Gasoline Motor—A Query.

Editor HORSELESS AGE:

I had an experience last year such as I have never seen described in print, and I think a recital of it may be the means of some time aiding someone to locate a similar trouble. The car on which it occurred was a 1904 model of one of the best American makes, which I used with much satisfaction during the seasons of 1904 and 1905. At times in its first year I would notice that one cylinder would miss for a little time and then resume operation. This would nearly always occur after descending a hill with the spark cut off, but the engine revolving, driven by the weight of the car (there was a button on the steering wheel which when pressed would break the electric circuit to the spark coils). I made a regular practice of thus using the engine as a brake, closing the throttle as far as it would go and holding the thumb on the button, and could negotiate most hills of moderate grade without having to use the regular brakes, or, at most, with a little pressure on the foot brake pedal, which was not interconnected with the clutch and hence could be so used without disconnecting the engine from the transmission gear. This missing would only last a few seconds, and then the motor would resume business in its ordinary manner and go right along. The missing never began while the throttle was well open or in climbing hills.

My theory of the cause of this missing was that when the engine was revolving and splashing oil, but the plugs not firing, one of the plugs would foul, and consequently fail to fire when the current resumed; but as there were spark gaps on the plugs the fouling would soon burn off, and that cylinder would then be as good as ever. I did not use the car at all for about three months of the winter of 1904-5, and when I resumed running it this occasional missing was somewhat more pronounced, but not at all uniform. Some days it would be rather annoying and others it would not appear at all. I seldom gave it a thought. In the latter half of August, 1905, the car and I having been separated four or five weeks, I began to use it again, and at once found this missing much increased. It still began only after running down a hill with the spark cut out, or else after running for a little with the throttle nearly closed and the spark still on. When all the cylinders were firing they would continue to do so as long as the throttle was well open, and the missing never began on an up grade; but when it did begin it sometimes kept up in a most exasperating manner.

I found that I could generally stop this missing by switching to the other battery. The car was fitted with two storage batteries of two cells each, and I had connected them so that one sent the current through the wiring in the opposite direction to the other by grounding the positive of one battery and the negative of the other. A three point switch on the dash permitted the connection of either battery by simply moving the blade. After I found that reversal of the current would stop the missing, I ran for some time with no trouble beyond frequent shifting of the switch. That is, I would start out and run until I reached the bottom of the first down grade, then I would find a cylinder missing. I at once would reach forward and change the switch to the other battery, and the motor at once resumed regular firing and continued until the bottom of the next hill was reached and the throttle was opened to proceed, when again she would be found to be running on three cylinders. Switching back to the first battery would promptly stop this, and the car would go ahead, possibly climbing a long hill of a grade so steep that the second speed would have to be resorted to, with never a skip. As soon as the next downward dip was encountered the missing began on reopening the throttle at the bottom of the hill, and then the switch had to be changed again.

I now began to get interested in the affair, and made an effort to discover which cylinder was doing the missing. It proved to be No. 3, and a little adjusting of the vibrator on the coil seemed to improve matters; but on the next run the old miss was just as bad as ever, and when I tested the coils I found it had transferred itself to No. 1 cylinder. I stopped and monkeyed with that vibrator until it seemed O. K., and got through the rest of that trip well enough, but the next day it was the old story, and this time it was No. 2 cylinder that was at fault. I now went over all the wiring and tightened up every connection, cleaned the timer, etc., and for a day or two there was some improvement, and then it was as bad as ever.

The next development was for two cylinders to begin missing at the same time, and to my great disgust on a rough country road after making a dip down into a hollow with a steep ascent beyond I, for the first time in my use of this car, found her unable to pull herself up even in first gear, and had to push the clutch pedal and apply the brakes. I dropped back to the bottom of the hill (only a few yards), and after speeding up the motor and switching over the current, got her going enough to climb the grade; but by this time I was getting worried. I sought the advice of friends, and one of them suggested that more voltage to the batteries would help. I connected one cell of one battery in series with the two of other battery, and found she ran without a skip; but as the coils were French, and recommended for only four volts use, I was a little afraid of injuring them. Also it seemed only a makeshift, for the motor had once run well enough on the two cell current, and the trouble must have some cause which ought to be found and removed. As an increase of current surely helped, I thought possibly some was being lost in the switch on the dash or in the button on the steering wheel, so I ran a special wire direct from the battery to the ground connection on the coil box and another from the other battery pole to the ground, leaving out all switches. Of course, it was then impossible to stop the motor except by breaking one of these wire connections, but I made a 10 mile trip downtown and back with it and had no skipping.

I forgot to mention that the engine nearly always ran much better in the morning, when I commonly ran only into the business part of town; but in the afternoon, on a longer country trip, it would show its worst. Some advisers saw in this convincing proof that it was all in the batteries, which would recuperate at night and be fairly fresh in the morning, but I had charged and recharged the batteries too often to entertain any such notion. According to custom, when I tried my direct wires again in the afternoon the engine missed once more, so that scheme was a failure; but it showed me one thing—in connecting and disconnecting these wires I found the ground terminal on the coil box was distinctly loose and could be moved about in the hard rubber plate over the coils. Eureka! The trouble was found! I took off the coil box from the dash, disconnecting all wires, and carried it to a neighboring electrical worker. He was too busy to go at it at once and I had to forego seeing him dissect the box, and when I went back the next morning he had completed the job. His report was that the terminal had come unsoldered from the wire leading to all four coils and was merely touching it. He had resoldered the connection, and now all would be lovely! I put the coils back in place and wired up everything and went for a trial. She missed precisely as before!

Before this I had written the builders of the car about my troubles, and they had written me in answer that they thought it likely the cause was weak exhaust valve springs, which would allow the valve to stick partly open during the following suction stroke, allowing the burnt gas from the next later cylinder to be drawn in and mixed with the fresh gas entering through the inlet valve. These seemed very plausible, as when the throttle was nearly closed

there would be much less good gas and more suction to draw in the burnt exhaust; and even after the throttle was again fully opened the charge would be so contaminated that any slight weakness in the spark of any individual cylinder would cause that particular one to miss. They advised me to run the engine, find which cylinder was missing, and then press down on the spring washer on that particular exhaust valve stem and see if sharp closing of the valve did not correct the miss. I found it, however, very hard to get the motor to miss at all in the house or when I wanted it to do so, and I was so convinced that the fault lay in the ignition part of the motor that I kept on experimenting with wires and batteries.

Finally the factory people wrote that one of their inspectors would be in a nearby city and they would have him come to see my car. He arrived with two exhaust valve springs in his pocket, which he put in the worst two cylinders (without removing the valves), and then took the car out and ran her. One of the other two cylinders missed, but he said the springs were bad, and as soon as he went home he would send me a couple more and I could put them in and be happy. Well, he sent them, but when they came one was a full quarter inch shorter than the other, and shorter than my old springs also, so I could see little use in trying it. I did put them in, however, and ran the car a few days, and she missed about as successfully as ever! I then went to a factory where volute springs are made, and showed them my old springs. They said the pitch was too great and they could not be expected to stand up, so I had four new ones made of one number heavier wire and with two more turns in the same total length, giving a flatter angle to the spiral. When I came to put them in I removed all the exhaust valves, and found the stems of all considerably worn and cut and looking as if they had sprung out of straight. I draw-filed them a little, and smoothed them up with emery cloth, which, with the wear that had taken place in over 8,000 miles the car had run, made them a rather loose fit in the guides. However, I ground in all the valves and put the new springs in place, and from that day on my missing was ended. The factory was vindicated in its diagnosis, if not in its remedy and application of the latter.

Now all this may be an aid to anyone meeting with similar annoyance, but I should like to ask if such trouble is frequent, and if so, why someone has not applied some form of oiler to those valve stems? I presume it would be hard to get an oil which would not burn on and make the trouble worse, but do you know of any direct attempts in this line? B.

[The questions are submitted to our readers.—Ed.]

Finishing Cylinders.

Editor Horseless Age:

Of the many stages in motor car building, none is more important than that of finishing the cylinders, and no process of construction demands more accurate work. An imperfect cylinder is inefficient, and an inefficient cylinder is, of course, a very serious defect in a car. Every detail of this work, from the pouring of the metal to the last touches, necessitates skilled and accurate manipulation. As to the best method of finishing cylinders makers disagree, just as they do on the question of casting cylinders separately or in pairs. The most common practice, and one that has been almost exclusively used until recently, is to bore the cylinders. Under this method the cylinders are first accurately squared at the base, then the castings are braced or bolted to position on the bed of the boring machine. As no two cylinders are exactly alike, it is obvious that care is necessary in bracing them upon the bed, and provision is made for the slightest deviation from the pattern. When the casting is in perfect alignment it is bored by means of a long bar, which extends inside the opening, and is adjustable to any size of cylinder. Two cuts are usually made on two different machines, one adjusted to take off a specific amount of material and the other following with a slighter cut. For these operations a multiple borer is employed in many cases, which bores four cylinders at the same time. When one set of four has been bored, the serving tables are reversed, and the bars are served with four more cylinders. The reversible table is an interesting feature, inasmuch that when the adjustments have been determined the individual castings may be operated upon at will.

The grinding process is one that has come into use recently. As in boring, the cylinder casting is braced upon the table, and the operation is automatic. An emery wheel of any desired grade is secured to a shaft, which revolves within an eccentric and traverses the wall of the cylinder, the arc described by the eccentric being, of course, adjustable to the various sized cylinders to be ground. The wheel revolves at a very high rate of speed, and almost any desired depth of cut is obtainable.

The time required for grinding is much shorter than for boring. Some of the advocates of grinding maintain that this process is the only one that is thoroughly practical. The principal objection to grinding is the liability of the excess emery worn from the surface of the wheel to be forced into the pores of the walls from which it cannot be dislodged. The claim is strongly urged by the boring advocates who maintain that the emery forced into the pores of the walls will wear grooves or ridges in the piston and cylinder surface, and causes loss of power due to lack of sufficient compression.

Lapping is another form of grinding process, which, it is claimed, emery into the walls. Powdered oil are employed.

As to boring, the grinding maintain that it is slow, inaccurate a finished cylinder has to be "r process which requires consider and that more strain is imposed the bar and the casting, causing i stances a warping of the metal.

The writer recently had occasi serve the methods employed in m leading marine and automobi shops. In a majority of cases was shown for boring the casting instance, a marine engine buil questioned as to his preference e series of finished ground cylinde ing the hand over the surface of revealed a plate glass smoothness. was fitted to the cylinder and t applied the gauge, showing perf This builder has turned out son best engines in the country, and jority of the record breakers were with ground cylinders. Anothe plant was visited showing prefe the boring method, and some fine of the finished product were exhi this builder, like the one mentior has turned out some flyers.

The Electric Vehicle Company installed a multiple boring mach is one of the largest pieces of ap the kind in this country. The however, offer no arguments a grinding process, but claim that b ods are excellent if the work is done. In fact, they use both m some extent.

It may be observed that all ma ers of high grade motors are ver lar about annealing their cylinde finishing. This process does awa uneven strains incident to the c the cylinders in the molds after ca

William J. Jo

Transmission to Auxili Screen for Acetylene He

Editor Horseless Age:

Referring to the article headed mission of Power to the Auxiliari B. has evidently overlooked the of two types of so called silen which entirely overcome the obj noise, and practically are not af their stretching. In fact one chains compensates for wear and operating at a larger sprocket di wear and stretching occur.

The superiority of a belt for dr fan is due to the ability of a loo act as a resilient member, perm speed of the fan to be graduall i. e., the inertia of the fan to be overcome, when the engine spee denly changed.

That the fan offers considerab ance to sudden changes of speed by the fact that a belt when prope

will continue to drive the fan for a long period, and will break when tight enough to prevent a slight slippage. It is obvious that a positive chain or gear drive to do the work of the loose belt would weigh several times as heavy as the belt and pulleys.

In reference to a simple device for readily screening the glare of acetylene headlights, a device used on the arc lights of some locomotives seems to possess all of the requirements enumerated in your editorial. It is nothing more than a shutter arrangement, consisting of a series of slats or vanes, so hinged that when adjusted parallel with the rays the light will pass between them, and when adjusted perpendicular to the rays they cover the front of the lamp and lay close to the glass and afford a protection to same of no mean value. The vanes should be polished so as not to detract from the beauty of the lamp by day, when they would, of course, lay flat against the glass. J. A. A.

Urges Retaliation.

Editor HORSELESS AGE:

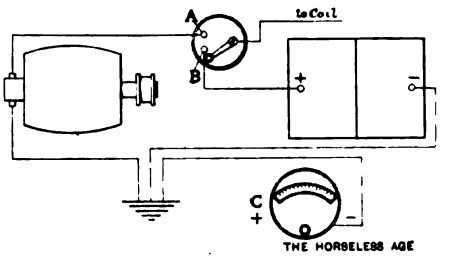
Since the farmer element is so interested in automobile legislation, why would it not be well to look after the interests of the ruralites by pressing a law compelling the use of wide tires on all vehicles? It is admittedly a preservative of good roads and a help for poor ones; and with the support of the rapidly increasing motor car element the law might be adopted in many of the States. A lively agitation of the subject might give them something to think about besides drivers' licenses and speed limit laws.

Then, not to be outdone in politeness, we might further show our interest in the public welfare by attempting to compel the carrying of lights on all road vehicles at night. Would not a strong move in these directions perhaps suggest a compromise to the mind of some of the more rabid public benefactors (?) who sacrifice so much time in our legislative halls for our benefit? Let everyone howl for wide tires and lights on all vehicles. E. F. G.

Ignition Query.

Editor HORSELESS AGE:

I am using an ignition dynamo and a storage battery for sparking my gasoline engine, the various parts of the outfit being electrically connected substantially as shown in the sketch. If the switch arm is set on contact B, the battery furnishes the current for ignition; if set on A, the dynamo does the firing, and if set to cover both A and B, both dynamo and battery are active. If contacts B and C are connected, the voltmeter will show the voltage of the battery, and if A and C are connected, it will show the voltage of the dynamo. Now, if the switch and voltmeter were mounted together on a base and so arranged that the switch arm could be set to cover both of the contacts, A and B, simultaneously,



and points A, B and C were permanently connected, would the battery be receiving a charge, or would it lose its voltage? It is understood that the switch arm would be placed on contacts A and B, and A, B and C would be connected only when the dynamo is running, and generating a voltage slightly greater than that of the battery.

X. Y. Z.

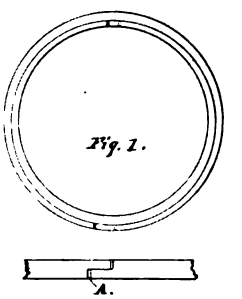
[This is exactly the right connection for charging the battery from the dynamo, and if the speed of the dynamo is high enough the battery will be constantly kept charged. If the speed of the engine should be reduced very much, as in climbing difficult grades, and in consequence the voltage of the dynamo drop below that of the battery, the battery would not only furnish the current for the spark but also send a reverse current through the dynamo. It is therefore essential to carefully watch the voltmeter and change the connection as soon as the voltage drops below the normal voltage of the battery.—ED.]

Concerning Piston Rings.

Editor HORSELESS AGE:

The lay public seem to pretty generally believe that piston rings halved and lapped at the joint will not leak. That this is a fallacy may be readily seen. Referring to the sketch of the joint at A, leakage into one side of the joint passes down under the ring and up on the opposite side, so that, while the passage is not quite so direct, the joint is but little, if any, better than the more easily made diagonal cut.

The writer's piston ring experience has led him to believe that rings made as here described solve the problem of perfectly tight rings at the minimum expense of making and fitting. As will be plain from the sketch (Fig. 1), each ring, or set of rings, is made up of two eccentric rings, one inside of the other. The inside ring is made with the usual scarf joint, while the outer ring is halved together at the joint. The joints are placed opposite, and a small pin in the joint of the inner ring



maintains their relative positions. The thick and thin sides of the rings, being opposed, makes the assembled ring of uniform thickness. This combination makes a packing ring that, with good workmanship, may be made absolutely tight, and with proper lubrication will remain so for an indefinite period.

It will be evident from the sketch that as the outer ring is worn and joint A opens, it does not allow the gases to blow through, as does the usual joint. In this case the joint is backed up solidly by the ring underneath, so that as long as the halved ends lap the ring is as free from leakage as when new. This construction allows the rings to move around in the piston, thus distributing the wear more uniformly, which is of decided advantage. The double opposed eccentric rings give better and more uniform pressure against the cylinder walls. J. C. B.

To Stop Punctures in Inner Tubes.

Editor HORSELESS AGE:

In your issue of February 21 there is an inquiry from a Mr. Davies, who wants to know how to stop slow leaks in an inner tube. I expected someone to come to the rescue in the next issue, but it seems no one did. While I have not used the following described remedy much on inner tubes, I know it works with single tube tires, and it does not injure the rubber or affect patches in any way. In single tube tires it should be used as described in a recent issue of THE HORSELESS AGE. If Mr. Davies will take one-quarter pint of commercial silicate of soda, the same quantity of commercial glycerine, a big tablespoonful of "rubberine" (a slate colored powder sold by bicycle repair shops), mix all together well and inject it into the tube, it will stop his trouble; if too thick to inject into the tube, add a little water, but do not get it too thin. If you cannot get rubberine, use powdered resin. The object of this admixture is to give the fluid more body, which is not required in a single tube tire to prevent it blowing out.

G. J. E.

Editor HORSELESS AGE:

In THE HORSELESS AGE dated February 21 O. E. Davis wants to know how to stop small leaks in inner tubes. If he will inject about a pint of water into each tire (first removing the valves), the "seeping" will likely cease if the tires are made of a good grade of rubber. Rubber sometimes gets so dry that it becomes porous. If this method fails to stop the leaks try a solution of one-half pint of water and a tablespoonful of powdered slippery elm bark to each tire. The powdered bark can be procured at the druggists. This solution can be injected by means of a common foot pump by first unscrewing the barrel, then pouring in the liquid and forcing it into the tire with the pump plunger.

M. J. MONICAL.

Remedy for Leaky Inner Tubes.

Editor HORSELESS AGE:

In the issue of February 21, 1906, O. E. Davies asks for a remedy for leaky inner tubes. I have solved the problem to my own satisfaction by using a tire fluid known as "Never-leak," such as is commonly used in porous single tube tires. This preparation is soluble in water, hence in case of puncture it can be washed off, and in no way interferes with repair of tube or casing. After six months' trial I have been unable to detect any injury to the rubber, and, in spite of assertions of tire repairers to the contrary, believe it to be a method of much value, although I have never heard of its being used on double tube tires before.

DE FOREST LAMBERT, M. D.

A Sample of New York City Justice.

Editor HORSELESS AGE:

In view of the fact that so much has been written regarding the way country judges hold up automobilists, it may be of interest to your readers to know of the "justice" handed out to me by Judge Leroy B. Crane, sitting in the Westchester police court in the great city of New York. I was arrested two weeks ago charged with driving my automobile at 25 miles an hour through Bronx Park, the officer claiming that he could tell when I passed a given point over half a mile away from him and in a straight line with him, again timing me at a point one-quarter of a mile away. When I came up before Judge Crane I claimed that the officer could not time me accurately in this manner, but the judge paid no attention whatever, and gave me the limit, $10.

The next case to mine to be tried was a young man arrested by the same officer and charged with breaking into the apartment of a widow, drawing a pistol on her and threatening to shoot her. She brought the charge of attempted assault. The officer in stating the case told Judge Crane that the man had a bad record, and had a pistol on his person when arrested. The judge asked the prisoner what he had to say. His only defense was that he had never seen the woman in his life until brought into court. He was given the nominal fine of $5. The woman had three witnesses, aged about fifteen years, but the judge did not deem it worth while to question them to corroborate the woman and the officer.

Now, in my case the judge told the officer that he wanted him to bring a charge against me of breaking the State law, in order that he might hold me for trial before the Court of Special Sessions, where the fine could have been $100. However, he did not ask the officer to bring a charge of carrying concealed weapons against the other man, for which the limit of punishment is a year's imprisonment and $500 fine.

In the mind of any man of ordinary sense there was certainly some question as to the speed at which I was running the machine, but there could be no question whatever of the fact that the other man was carrying a concealed wapon and breaking the law, for which the penalty is far in excess of breaking a park ordinance. Incidentally Judge Crane remarked that he wished it was within his power to send me to jail, as that was the only way to stop speeding.

I wonder what he thinks is a proper way to prevent the numerous hold-ups at the point of a pistol that the citizens of New York have been treated to recently; or does he think that the women of New York can look for any protection whatever when only a fine of $5 is given to a man breaking into their apartments and threatening them bodily harm? Surely the mere fact that a man owns an automobile should not prejudice him before the law. It seems to me that it is about time that the Automobile Association looked into such cases, with a view of ascertaining if there is not some way for us to get justice, and not be persecuted as we are all over the country.

NATHANIEL L. LAWRENCE.

Cooling Query.

Editor HORSELESS AGE:

Will you give a diagram as to the circulation in a water cooled motor where both a tank and a radiator are used? We are having some discussion as to the proper place to locate the pump, one idea being to put it between the tank and the cylinders, making the course of the water from the tank to the bottom of the jacket, from the top of the jacket to the top of the radiator, and from the bottom of the radiator to the tank, which is higher than the rest of the system; while others argue that the pump should be between the cylinders and the radiator, using the tank solely as supply to compensate for evaporation. J. H. W.

[The best arrangement is to have the circulation from the jacket to the radiator, radiator to tank, tank to pump, pump to jacket. The pump should always be placed in the circuit just before the jacket, where the water is the coolest.—ED.]

More Philosophy of a Kicker.

EDITOR HORSELESS AGE:

It takes more than one swallow to make a summer, and Mr. ——— ought to know that his and a few other odd ones' adherence to steam cars, oil cooled cars and other awkward, complex, complicated, cumbered cars doesn't prove anything. The great majority are on my side, and men who want the greatest efficiency, with the least toggery, are buying today the simplest cars. Some people have an idea that the more furbelows, frills and network of complications there are on a car the better it is. Most people buy that which appeals to their cobwebbed fancy rather than that which will bear the analysis of a good horse sense judgment. Few compare cars side by side, and lay out an analysis sheet of merit, point for point. I could write a hundred pages and prove beyond peradventure that my contention for and declaration of the best is beyond controversion, but it wouldn't convince people who are bound to chase an ignis fatuus, so I leave them alone with their idols; if they enjoy them 'tis well, as it will keep them occupied and useful in helping support a few of their kit and kin in freak devices. Some people are always looking for trouble, and never are they so happy as when in trouble. They seem to miss it, and are like the siren and angel of pair With my kind of a car they never have to do anything but ride. KICKER.

Engine Wanted.

Editor HORSELESS AGE:

I have a good heavy runabout automobile, with a 10 horse power double opposed cylinder horizontal motor arranged in front, but the motor is not powerful enough for our Pennsylvania hills. I would therefore like to get a motor of 20-24 horse power, four cylinder, air cooled, for shaft and bevel gear drive. My motor is 30½ inches long over all, and 19 inches wide in the direction of the car. It has an 18 inch flywheel, and weighs complete 255 pounds, while the car complete weighs 1,460 pounds. What engine can you recommend that would fit my machine? G. S. S., M. D.

[We do not believe that a motor suitable for your purpose is manufactured; if any of our readers know of such a motor we shall be glad to forward information concerning it to our correspondent.—ED.]

Date of Automatic Carburetor Invention.

Editor HORSELESS AGE:

Referring to the article, "Automatic Carburetor," appearing on page 352 of your issue of February 28, the claims of priority made in behalf of Messrs. Bradley & Pidgeon, naming date of 1902, could hardly be supported if a search of the Patent Office records was made. The writer worked along this line himself in 1902, and like others, thought it an original idea, but a search by his patent attorney developed that a patent had been issued for this feature to one Graham of England in 1895. The compensating air valve shown in the drawings of this specification is very similar to the construction employed in modern carburetors. The carburetor is also of the float feed type. C. M. MOHLER

Re Rusting of Rims.

Editor HORSELESS AGE:

Referring to the query headed, "Information Wanted," in your issue of February 28, I would say that the Fisk Tire Company will furnish your correspondent their new rim on request, free of charge, which rim, with its bolts and nuts, is made of white metal and does not rust. FISK USER.

EW VEHICLES AND PARTS.

he Biddle-Murray Three Ton Gasoline Truck.

A gasoline motor propelled truck, with a ir cylinder, 24 horse power engine, and ee tons load capacity, has recently been ced upon the market by the Biddle-Mur- Manufacturing Company, of Oak Park,

From the accompanying illustrations will be noticed that the designers of this have followed the standard practice in oline automobile construction, the parts ng proportioned to enable them to with- nd the strains in a slow moving, heavy ift vehicle.

The engine, clutch and power transmis- n are mounted upon a sub-frame se- ed to the main frame of the truck by el cradles, the double side chain drive ng used to transmit the power from the ferential shaft to the driving wheels. e power plant is so assembled on the -frame that it is possible to remove any e of the three distinctive parts without erference with the other two. This is a ture that is of especial interest to the air department.

The load platform of the truck is securely tened by means of oak pieces to the in frame of the vehicle. This platform 2½x5½ feet) is bound about by 3 inch nnel steel, forming a serviceable and ong fender around the entire vehicle. parate from the platform proper is erect- the seat staging, of approximately the m used in the ordinary type of horse wn vehicle construction. Under this is ated the copper gasoline tank of 25 gal- s capacity, which will furnish fuel for miles of active service under ordinary d conditions, it is claimed. There is a gallon reserve compartment in the tank emergency use.

Built into either angle of the above stag- are the coolers, whose artificial radia- n is secured by an exhaust fan located a flue at the back, drawing the air ough the radiators and discharging it der the truck. Forward of this staging, allowing ample leg room, a deck house is erected of large carrying capacity for batteries, tools, supplies, etc. This structure also serves the purpose of a dash, and is so secured that it can be easily removed.

The motor is of the modern four cylinder vertical type, water cooled, developing 24 horse power at 900 r. p. m., and the vehicle is so geared in its transmission as to show its maximum speed of 15 miles per hour with this speed of motor.

The clutch is of the multiple disc type, built in the flywheel and running in oil, operated in the same manner, by means of a foot pedal, as the clutch in the ordinary touring car. The foot pedal is provided with a toothed ratchet, with toe trip attached, to hold the clutch out of commission while the car is at rest. The only feature of this clutch mechanism differing from others is that it has attached to it a brake acting on the propeller shaft through the transmission.

The vehicle is provided with three sets of brakes: a powerful internal expanding brake on the hub of the driving wheels, assembled in the sprocket housing, controlled by lever at the right hand of the driver; a band brake assembled on the outside of the sprocket housing, controlled by foot pedal on the deck; the third brake, mounted on the propeller shaft, as referred to in the clutch description.

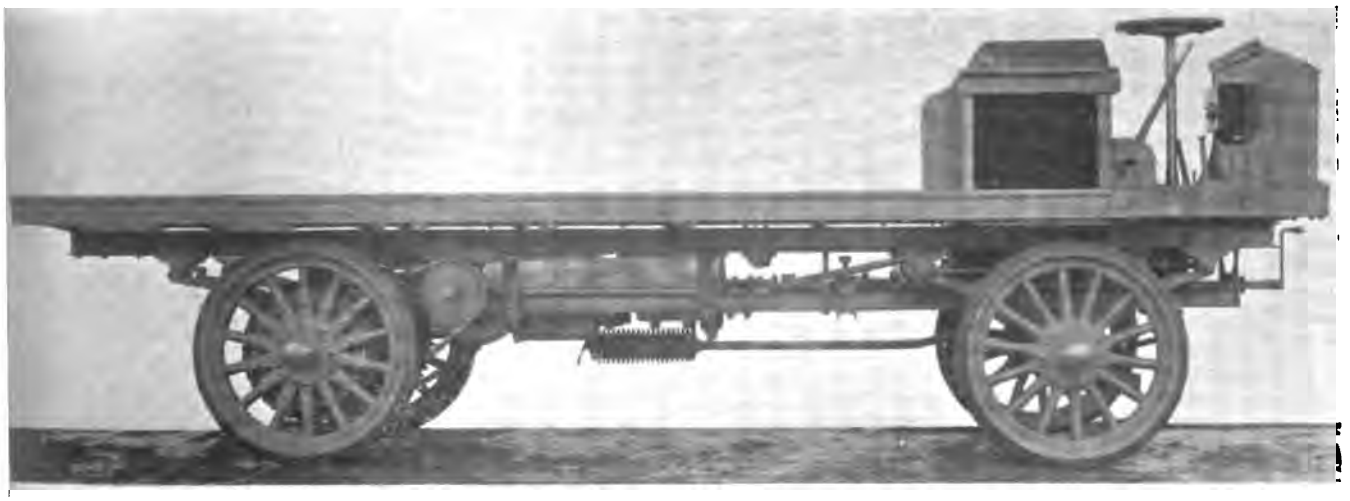
The transmission is of the selective gear type, giving four speeds ahead and one reverse, with controlling and interlocking mechanism secured to the sills of the car in front of the driver's seat where the single operating lever is within easy reach. This device is so constructed that it is impossible for the operator, however inexperienced, to engage more than one gear at a time or for gears to jar into mesh, and is claimed to be of such strength that it would be impossible for the strongest teamster to break. The transmission proper is so situated that the entire upper half of the case may at any time be removed from a loaded vehicle. The manner of construction also allows the car to be driven with the upper half of the case removed, the bearings being all independent of this part. The gears



REAR VIEW OF SEAT STAGING.

used in the transmission are of steel, hardened and tempered, cut with four pitch teeth of 2 inch face, with the exception of the bevel gear and pinion, which are of four pitch and 2½ inch face. The bevel gear of this set is hot riveted to the drum flange of the compensating gear, making it an absolutely secure and safe attachment. The driving pinion of this set is secured to the shaft by taper bearing with key and nut.

The main and intermediate shaft of the transmission are provided with three broad bronze bearings, each secured by four steel studs, thus providing for the shearing strain as each gear in turn is called upon to carry the load. The main shaft is 2 inch square steel, and the intermediate is 1¾ inches at the outside bearings and 2 inches in the centre. The two housings for the differential shaft are of Shelby steel tube, and these carry two 6 inch phosphor bronze bearings, and are secured in place by a bearing cap with six stud bolts to each bearing. In addition to these, the housings of this shaft pass through a heavy steel frame hanger, to which is attached the radius rod. This frame hanger also carries the front loop of the rear spring, which loop is of sufficient length to allow of chain adjustment. The frame hangers referred to are slotted, and carry a three-quarter inch steel coupling bolt for the purpose of clamping the differential shaft housing securely in place. The lower half of the transmission case is carefully machined, so that the centre of the bearings which carry the inside end of the differen-



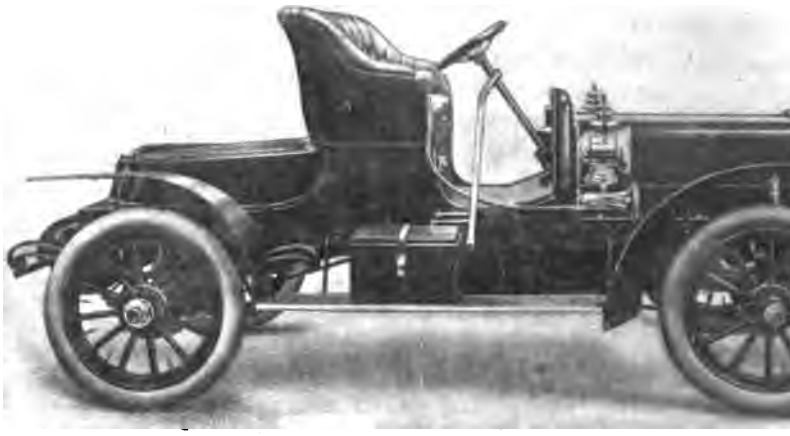
SIDE VIEW OF BIDDLE-MURRAY THREE TON GASOLINE MOTOR TRUCK.

tial shaft housings is in perfect alignment with the frame hangers. Thus it will be noted that when the transmission case is assembled on the sub-frame, the inside bearings referred to are not subjected to any strain whatever as to carrying the weight of the transmission at this point, but act merely as steady rests on either side of the differential gear.

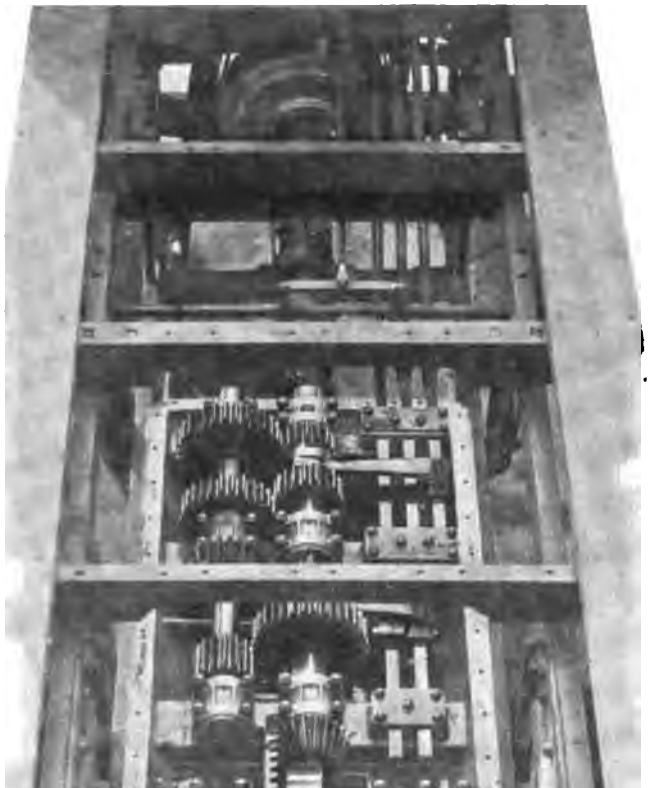
The power is applied to the transmission from the propeller shaft of the clutch through a double universal joint connected to the square of the main driving pinion by means of a split coupling secured by eight one-half inch coupling bolts.

The front axle is a 2½ inch I beam, with 4 inch drop between the spring seats. It is a drop forging integral with the steering heads. The rear axle is 2½ inches square. Both are equipped with the Timken Roller Bearing Axle Company's bearings. The wheels are artillery type, wood, 2½ inches and 14 spokes. The driving sprockets are attached to the rear wheels by means of a steel housing, which is provided with a bolting flange, to which the sprockets are attached by means of one-half inch coupling bolts. It has a bearing upon the inside hub of the wheel, secured to the same by means of the seven bolts used to secure the wood filling in the hub flanges, and also by bolts passing through a boss on each spoke, thus making it impossible for the sprockets to be pulled out of line or centre without wrecking the wheel. The four tires are Firestone, side wire type, 5x36 inches.

Particular attention is said to have been given to the parts from which trouble usually arises in automobile Storage batteries are used for s two are furnished with each v wire cable used is imported f and has unusually heavy insul coil is a Splitdorf, and is w volts and 80 pounds compre timer is a Lacoste roller conta ported).



WINTON MODEL K RUNABOUT.



BIDDLE-MURRAY CLUTCH AND CHANGE SPEED GEAR.

Wallwork's Non-Skidd Treads.

The Wells Light Manufact pany, of 44-46 Washington York city, have started to mar Wallwork patent non-skiddi treading covers for automobile cover is made of chrome leath being studded with diamond s of malleable iron. Fastened t of the tread all around, and o are extra pieces of leather, which is fastened a clasp. The of hook shape at the bottom, an between the rim and the tire. s the tire is inflated the hook is form to the shape of the flange producing a clincher for the t

New Gasoline Filt

William S. Jones, of Philade offering a new filter for gasol sene engines. It consists of fastened to the fuel supply pip near the carburetor. The gas the cup from the bottom, through a conical screen, wh against a flange in the upper cup by a spiral spring, which up all vibrations. The conical a mesh of 120 strands to the i bottom of the cut is a space fo dirt, which can be drained off a cock, or the whole strainer m apart and cleaned by unscrewi tom part of the cup, allowing and strainer to fall out. Whi line enters the cup from the drop pipe, the inlet pipe is o level with the outlet pipe, thus the same gasoline pressure.

ıver Special Gasoline Automobile Funnels.

'he Dover Stamping and Manufacturing npany, of Cambridge, Mass., are soon place on the market their new special oline automobile funnels. These funnels especially designed for filling automo- gasoline tanks and barrels. They have oop around the top to prevent slopping, besides having a fine brass wire strain- there is also an extra outside hoop for ding a chamois strainer. They also e large fluted tubes so that the gasoline run through fast and not become air ınd. The funnels are made of brassed and in several sizes.



Dover Funnel.

The Lea Speedmeter.

'he Motor Car Specialty Company, of ınton, N. J., have a new speedmeter in paration which will soon be placed on market. It will be an instrument for icating speed in miles per hour, com- ed with a total and trip odometer, sim- to the "Lea Speedistimeter," except t it is without the clock.

'he speed recorder is made on the prin- le of the German tachometers. All ving parts are made of steel, and where :essary hardened. The main spindle ıs on ball bearings, and there are no rm gears in the entire mechanism. The ndard instrument is graduated to show to a speed of 50 miles per hour, but :ial scales can be furnished showing as h as 100 miles per hour. The figures of such size that they can be plainly n from the seat. The total odometer ıds in miles and tenths of miles up to 000. The trip odometer reads to 99, and returned to zero by a knob on the bot- n of the case. The figures are black on white background, and the tenth mile fig- s are red.

'he attachment fixture consists of a ldle for fastening to the steering knuckle, ıracket for the ball bearing pinion and a tance rod fitted with two ball and socket ınections. It is claimed that this fitting universal and can be applied to any car de without change. Should any foreign ıstance catch between the gear and the pinion, the pinion is simply rocked around one of the ball joints and no harm is done. The instrument is attached to the dash- board or other part of the car, and the flexible shaft passes down through the floor to the gear on the wheel.

The McQuown Timer.

A timer and distributer known as "The McQuown Timer" is exhibited at the Bos- ton Show by the Monitor Speed Recorder Company, 274 Pearl street, Cambridge, Mass. The features claimed for this timer are that it makes a very short contact, no matter how slowly the engine may be run- ning. The short contact relieves the coil of unnecessary work, and so makes it for a single coil to run a four cylinder engine. The length of time of contact can be very closely adjusted. By a push button located near the operator of the car the starting spark may be produced, and by this same means, even with a non-vibrating coil, a number of sparks may be produced to clear the plug points of grease after the car has stood for a length of time. The timer is connected to the secondary shaft, or can be carried on the dash. The distributer is car- ried on a brass base, which is rigidly se- cured to the engine frame, hence it and the secondary wires are not moved by the ad- vance lever. The timer mechanism is car- ried in a tight brass case in front of and pivotally connected to the distributer.



Lea Speedmeter.



M'Quown Timer.

Trade Literature Received.

Reo Motor Car Company, Lansing, Mich.—Reo car for 1906, descriptive book- let, 24 pages.

Hub Automobile Exchange, Dorchester, Mass.—Circular describing the Dorchester runabout.

Gisholt Machine Company, Madison, Wis. —Bulletin describing their machines and tools for bar work.

The Fisk Rubber Company, Chicopee Falls, Mass.—Price lists of their rubber tires for 1906.

The Auto Safety Starting Crank Works, Chicago, Ill.—Circular describing the safety starting crank.

The Detroit Tool Company, Detroit, Mich.—Booklet describing their tools for general repair work.

Cadillac Motor Car Company, Detroit, Mich.—"Cadillac, 1906," a 32-page book- let describing their cars.

Rotary Motor Vehicle Company, Boston. —Booklet descriptive of the Intrepid vibra- tionless gasoline automobile.

Davis Manufacturing Company, Mil- waukee.—Circular describing their 4½x4 and 5x4½ opposed motors.

Knox Automobile Company, Spring- field, Mass.—"Knox Waterless Commer- cial Vehicles," a descriptive booklet.

Smith Auto Company, Topeka, Kan.— "Catalog-Treatise Upon the Automobile," by Dr. Clement Smith. In two volumes.

Gilbert & Barker Manufacturing Com- pany, Springfield, Mass.—Booklet describ- ing the Springfield underground storage tanks.

The Autobed Company, Boston, Mass. —Booklet illustrating and describing their autobed and combined autobed turntable and truck.

The American Motor Truck Company, Lockport, N. Y.—"The American Truck," descriptive folder showing their com- mercial vehicles.

C. F. Fulmer, Plainfield, N. J.—Circu- lar describing the Invincible Timer, com- mutator or circuit breaker; also the In- vincible spark plug.

Manufacturers Foundry Company, Waterbury, Conn.—Portfolios of views of factory and products; also illustrated booklet of their cylinder castings.

Daimler Manufacturing Company, Long Island City, N. Y.—"The Ameri- can Mercedes," a handsomely bound, il- lustrated volume describing the Ameri- can Mercedes car.

Standard Welding Company, Cleve- land, Ohio.—Four booklets, showing their seamless steel rings, tubing and rims, together with a description of their system of electric welding.

The Ariel Motor Car Company, Boston, Mass.—Advance folder of the new Ariel, entitled "Look for the Oval Front"; also circular from the Covell & Crosby Motor Company, 1621 Broadway, New York city, selling agents for the Ariel car.

OUR FOREIGN EXCHANGES.

Automobile Accident Statistics.

Beginning April 1 next, uniform statistics will be gathered regarding personal and material damages sustained in automobile accidents throughout Germany by the Imperial Bureau of Statistics. Question blanks will be sent by the bureau to the local authorities. Among the facts the blanks will ask information on are the name, profession and residence of the owner, the importance of the personal or material injury done, and the manner in which notice of the accident reached the authorities, through the driver himself or through ascertaining of the license number by an eye witness; also whether the driver attempted to escape unrecognized.

London Motor Bus Amalgamation.

A scheme is in process of consideration for the fusion of several of the motor bus companies of London. The inequality of the services upon many of the routes and the unremunerative systems which competition has enforced have suggested the necessity of amalgamation if the companies are to be carried on as profit bearing concerns. The scheme is at present in embryo, but the preliminary investigation is receiving the serious attention of a large financial corporation.

It is generally admitted that the public are very unequally served in the matter of the motor buses. On some of the busiest city routes competition has resulted in the already overcrowded thoroughfares being further congested by the supply of buses which greatly exceeds the demand. On other routes, again, the services are quite inadequate, and it is with the view to adjusting these inequalities, and at the same time improving the financial aspect of the companies, that the question of amalgamation has been brought forward for serious consideration.

Requisition of Motor Trucks for Military Purposes.

The Mechanical Transport Committee of the British War Office has addressed the Motor Van and Wagon Users' Association to the effect that they have under consideration the question of registering heavy motor wagons, such as light tractors, trucks and motor omnibuses, for the service of the country in time of war, the same as horses are now being registered. The plan is that the owner of a motor wagon should agree to give the War Department the right to make temporary use of such heavy motor wagon or to purchase it under conditions to be agreed upon. The War Department would pay the owner for this right a small sum for each wagon so registered. Heavy motor wagons so registered would be available for the War Department's use in manœuvres, when they would be hired for a continuous period not exceeding a certain number of days in any one year, the price paid for hiring to include the provision of drivers, up-keep of vehicle and all supplies, except water, fuel and lubricants. They would also be available for home defense in times of war, when they would be purchased by the War Department, and bought back at a valuation by the owner on completion of the War Department's use. In case of a war abroad, the wagons would be purchased outright by the War Department.

New Fuel Gas.

In a lecture on "The Production of Gas for Industrial Purposes," read before the Birmingham and District Electric Club recently, the author stated that he considered there was a great future for the use of the gas "ethylene" as a power producing gas. This gas is usually prepared by dehydrating ethyl alcohol. He remarked that there was opened up a field for the preparation and storage of energy produced by agriculture. In regard to beet, potatoes and other crops that produce sugar, which in turn produce alcohol by fermentation, the alcoholic vapor can be acted upon by the dehydrating medium as it is formed during distillation. Mr. Moon further remarked that as there is no liquid alcohol produced in the process, no excise duty would have to be paid. Ethylene, being a gas which is easily liquefied, could be stored in cylinders, and could thus be used for motor cars and other purposes where the power has to be made portable.

Automobiles in the English Elections.

The increased vote in the recent English elections is partly ascribed to the free use of motor vehicles, especially in getting out the rural vote, writes Consul Fleming, of Edinburgh. This, he continues, is helping to break down the antagonism of the farmers and villagers to automobiles. Every day evidences a more general use of these vehicles. As a matter of fact, speed regulations in that part of Scotland are now practically a dead letter. On the main roads into Edinburgh motor cars are frequently seen going 50 miles an hour, or 30 miles in excess of the limit fixed by act of Parliament. No effort is made to apply penalties except when accidents happen.

"Circuit Europeen" to Be a Limited Race.

At a meeting of delegates from the French, German, Austrian and Belgian automobile clubs held in Paris on Sunday, February 25, it was decided to postpone the contest a few days, so the start will take place on July 26, and the finish on August 19. No observers will be carried, and the classing will be based on the average speed up to the predetermined limit.

Automobiles are not allowed within the walls of the Vatican.

An important British automobile manufacturer has decided to give a three years' guarantee with his touring cars.

During the fiscal year ending December 31, 1905, 433 automobiles and 450 motor cycles were imported into Switzerland, as compared with 309 cars and 275 motor cycles in 1904.

It is reported that the French Council of State Committee has declared in favor of the abolishment of the automobile horn, and for the substitution in its place of the siren, or the electric bell.

At a recent meeting of the motor cab drivers of Berlin a protest was raised against the present system of training in their trade, and a resolution was passed requesting the city authorities to provide a training institution under municipal control.

An automobile bus line is contemplated between Teheran and Rescht, Persia, and two Renard trains have been purchased for a service between Teheran and Mesched. In view of the state of the roads in the Shah's dominions the success of these ventures is somewhat doubtful.

M. Poitel, 6 Rue Fontaine-au-Roi, Paris, has invented a cigar protector for automobilists, in the shape of a finely perforated silver thimble, which protects the cigar against the strong draught, and insures its regular burning. The protector is held by a small clip, and can be adjusted as necessary.

An endurance contest between Gothenburg and Stockholm, Sweden, was held by the Swedish A. C. on February 15 and 16, the cars being started from Gothenburg at 6 a. m. on the 15th. The run proved a most difficult one, as the contestants started in a rain and soon ran into a heavy snowstorm, so that it was barely possible to trace the roads, and several times it was necessary to shovel the cars out. The winner was a 24 horse power Fiat, while fourth place was secured by a 7 horse power Oldsmobile.

According to reports in Continental papers, W. K. Vanderbilt, Jr., recently had a rather unpleasant experience while touring in upper Italy. In the main street of a village named Pontedera he knocked down a five year old boy with his car, and was soon surrounded by a threatening mob. Vanderbilt drew a revolver, but was quickly disarmed and had to seek refuge in a near by shop. At that moment the police appeared on the scene, dispersed the crowd and took down the name and address of the motorist. As the boy was only very slightly hurt, Vanderbilt was allowed to proceed.

v Committee Chairmen of the A. A. A.

ıe board of directors of the A. A. A. their monthly meeting last Thursday the following present: S. L. Haynes, ıgfield (Mass.) Automobile Club; R. ɔln Lippitt, Rhode Island Automobile ; Dave Hennen Morris, Automobile of America, New York city; A. R. ington, Long Island Automobile Club; [. Elliott, Syracuse Automobile Club; ;. Woodworth, Rochester Automobile ; N. M. Pierce, Binghamton Automo- Club; A. G. Batchelder, New York ɔr Club; F. R. Pratt, New Jersey Au- bile and Motor Club; G. A. Post, h Jersey Automobile Club; J. H. Ed- s, Hudson County Automobile Club; lsor T. White, Cleveland Automobile and N. S. Belding, Automobile Club laryland. L. R. Speare, of the Bay Automobile Association, presided in bsence of President Farson.

e following new chairmen of commit- were appointed for the ensuing year: ıg committee, Jefferson De Mont ıpson, A. C. A., New York city; tour- :ommittee, Paul H. Deming, Detroit mobile Club, Detroit; highway com- e, Hon. W. H. Hotchkiss, Buffalo Au- bile Club; law committee and general ıel of the association, Sidney S. Gor- Chicago Automobile Club.

ɛsident Farson outlined the platform s administration in a letter to the board rectors, which embodied the following ngs:

The question of good roads, with na- l, State and local aid; and with this ew have asked Mr. Gorham to pre- a uniform bill to present to the va- State legislatures, the support of the nlow bill or a bill covering the ques- of national aid for presentation in ıington.

The question of a uniform bill to be nted to the various State legislatures ning the use of automobiles on the ays and in the city streets. Uniform on this question would be very ad- geous from every standpoint.

The American Automobile Associa- ;hould set its face like a flint against ɛss and insane use of automobiles by onsible and careless chauffeurs and tors.

\ closer relation between the various ıobile clubs of America and Europe.

\ better understanding of the rights of ıobilists.

Restrictions covering the question of ; so that the matter may be hedged with every safeguard.

\ uniform system of signboards ghout the country, under the sanction American Automobile Association.

ıey S. Gorham, the new secretary ieneral counsel, says that he wants a ɔmmittee, consisting of the attorneys ch of the automobile clubs in the as- ɔn and lawyers in each district there is a considerable individual membership. Each member of the law committee will advise members as to their legal rights without cost. In order to secure uniform legislation in the various States, bills will be introduced in each State Legislature embodying, so far as possible, the same points and only differing where it is necessary to conform to local conditions. This is thought to be the only way by which uniformity can be accomplished. These bills will contain provisions for the recognition of numbers and licenses issued by other States. When these bills have been drafted copies will be printed and sent to each member of the law committee for suggestions and criticism, and when finally completed will represent the ideas of the best lawyers in the country who have given the subject of automobile law special consideration. It will be the hope of the association to secure the enactment into law of these bills without modification of the principal features that will be embodied in each.

Practically the same plan will be adopted with reference to a good roads bill, providing for State aid, except that uniformity will not be so essential. The association will try to arouse an interest in favor of the passage of the Brownlow-Latimer good roads bill now pending before the national legislature, which provides for Congressional aid.

$150,000 for Good Roads in Ohio.

COLUMBUS, Ohio.—The first general appropriation bill by the present Ohio Legislature, which will be passed this week, carried with it $150,000 for State aid in road building. This is the first appropriation under the law allowing such action, and is a distinct disappointment to good roads advocates, who had hoped for half a million. B. W. Baldwin, chairman of the Finance Committee, approves of State aid, but refused to sanction a larger appropriation, for the reason, he says, that this is first, and he thinks the people should see how this sum is expended and sanction it before a larger sum is given. He expects it to do the cause good in that it will put the highway commission on its mettle in spending the money.

The Bowers bill, requiring auto owners to register their vehicles with the county auditor, has been recommended by the committee and will probably pass the House this week. The more elaborate bill requiring registration with the Secretary of State, prescribing speed rules, etc., is still dormant in committee.

Michigan Automobile Statistics.

That the automobile has not been exploited to any extent for commercial purposes, and is still mainly sold for pleasure, is shown by statistics gathered by the Michigan State Labor Bureau. Last year there were 13,702 automobiles manufactured in that State. Of that number 96 per cent. were intended for pleasure and 4 per cent. for commercial use. The value of those constructed was $18,061,900. There are thirty-four automobile factories in Michigan. An interesting feature of the report is the showing regarding the growth of the industry. It was first established in 1899, the next factory being erected in 1901. The thirty-four plants now in the State cost, it is estimated, $2,284,800. Statistics show that at least 59 per cent. of accessory stock used is manufactured in the State, including springs, wheels, axles, tires, etc. Last year five new factories were established. Ten of the plants have increased their capitalization since organization, twenty-eight reported that the outlook for the business is good, while one reported it fair, four as poor and one reported it was going out of business. Eleven styles of road machines are manufactured in the several factories.

Pennsylvania Motor Federation.

The Pennsylvania Motor Federation was organized in Philadelphia, March 1, for the purpose of banding together the motor clubs of the State to secure just legislation. Pittsburg, Philadelphia, Lancaster, Wilkesbarre, Reading, Germantown and Bristol were represented at the meeting. Letters were also read from clubs in other towns. The organization is independent of the American Motor League and the American Automobile Association, but membership is open to all clubs and individuals friendly to motor interests. President Isaac Starr, of the Philadelphia Automobile Club, was elected president, and Paul C. Wolff, secretary of the Automobile Club of Pittsburg, was chosen secretary and temporary treasurer.

Opposition to Auto Shows.

Henry Ford, of the Ford Motor Company, when asked his attitude toward automobile shows, said: "I hope they will be abolished, as they are a waste of time and money. Hereafter we will make no preparation at the factory for them. According to statistics I find that only one-third of the money for space, decorations and advertising is paid for by the gate receipts. The remaining two-thirds is paid by the manufacturers to see the show given by themselves."

R. B. McMullen, general manager of the association, expressed himself as in sympathy with these views.

"Thank-You-Ma'ams" for Chatham, N. J.

CHATHAM, N. J.—The Common Council, on March 5, unanimously passed a resolution providing for crosswalks 5 inches high to retard the speed of automobilists passing through the town. Work on the first of these crosswalks will be started by the road authorities as soon as the material can be obtained. Doubt as to the fate of the Frelinghuysen automobile bill is reported to have been one of the chief reasons for the action of the council.

Fourth Annual Boston Automobile and Power Boat Show.

Although of a local character, this show required so much space that both the Mechanics Building and the Symphony Hall were filled to overflowing. The show opened Saturday evening, March 10, in the Mechanics Building alone, it being impossible to prepare Symphony Hall on account of the regular Saturday evening concert of the Symphony Orchestra. This necessitated working a large force of decorators all night and Sunday to put the hall in readiness for the exhibitors on Monday. Fortunately, the regular decoration of the hall is such that very little extra was necessary, and a simple decorative scheme, in pink apple blossoms, was sufficient. The Mechanics Building, however, was elaborately decorated, the color scheme being one of red and green. All the spaces are carpeted in green, and the posts and walls to a height of 4 feet are covered with green burlap, edged with a broad gold band, above which the walls are finished in red. As in the other shows this year, the signs are uniform, being gold letters on a red ground, so as to harmonize with the other decorations. All the spaces are separated by green draperies hung from white iron rods with brass caps. The novel and crowning feature of the decorations, however, is a grape arbor, which extends over the entire length of all the aisles, is supported upon imitation marble posts and covered by a spreading grape vine with green leaves, which twines in and out through the lattice-work top. Hidden among the myriad leaves are numerous delicately tinted electric lights, the effect of which is very beautiful. At the intersection of the two aisles in the Grand Hall the arbor forms a band stand. The red and green effects have been carried out in the balconies, while the roof is decorated with many flags, streamers and bunting in the national colors.

The greater part of the seats in the first balcony had to be removed to make more space for complete car exhibits which could not be accommodated on the main floor. The motor boats, as at last year's show, are in the basement, where ropes, chains, flags and nautical emblems form the decoration.

There are 350 exhibitors showing ninety-eight different makes of cars, and a total of 300 machines. The total floor space occupied is estimated in the neighborhood of 90,000 square feet. One ticket admits to both exhibits, there being an entrance coupon to each building, and as the visitor does not have to attend both in the same day, he is practically allowed to see two shows for one admission.

THE HARVARD ENGINE.

The Harvard Marine and Automobile Engine Company, of Cambridge, show several new engines for automobile work. They build both air and water cooled cycle motors of either four or six cylinders. The four cylinder air cooled engine is 3⅛x3½ inches, and is rated by them as 15 horse power. Its weight with an aluminum case is 230 pounds. The six cylinder with aluminum case weighs 275 pounds, and develops 24 horse power. The novel claim made for these engines is that they will run properly without a fan, and that the valves will not require grinding for a whole season's running, notwithstanding the fact that the compression is as high as 80 pounds.

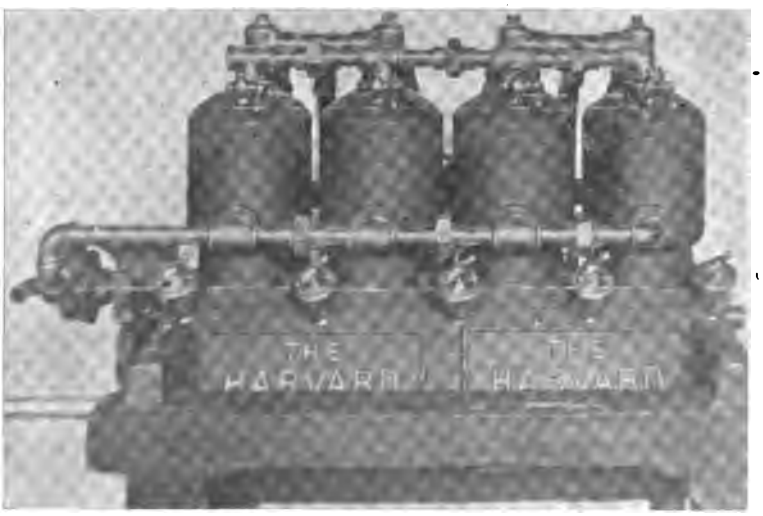
The cylinder heads are cast separate from the barrel, and are held to each other and the crank case by four long bolts. The heads are provided with cast fins radiating from the centre. Wire asbestos gaskets are inserted in a groove between the head and cylinder. Horizontal flanges are cast on the cylinders from top to bottom. The inlet valves are automatic and located above the exhaust, with the spark plug projecting between the two. The inlet cages are made tight by copper gaskets, and are held in position by fitting under the caplike ends of the four branches of the brass inlet pipe, to the lower end of which the carburetor is screwed. By removing the inlet pipes the valves may be taken out, but it is claimed this is only necessary about once a year.

The pistons are fitted with four step jointed eccentric rings, two of which are at the bottom end. The connecting rod is made of Shelby steel tubing, while the ends are of bronze and form the bearings. These are tapped and screwed into the tube and held by lock nuts. An oil groove around the middle of the piston leads the oil into the hollow wrist pin through holes to the bearing and into the inside of the hollow connecting rod, which is filled with felt wicking, which feeds oil to the crank pin. One of the claims for this construction is that the rod length can be varied to change the engine compression. Relief cocks are placed in the head of each cylinder. The crank shaft is hand forged steel and runs in five bronze bushings. The unencased two to one gears of fibre and steel are located on the forward ends of the shafts which project from the crank case.

THE ROSS STEAMER,

built by Louis S. Ross, of Ormond Beach fame, was exhibited at the Boston Show for the first time. This is the first steamer ever built with all the mechanism, including the fire tube boiler, engine and pump, forward of the dash. There are no tanks or machinery of any kind under or attached to the body. The car has every appearance of being a gasoline machine, and the details of the body, frame, springs and method of driving are in accordance with the best gasoline practice.

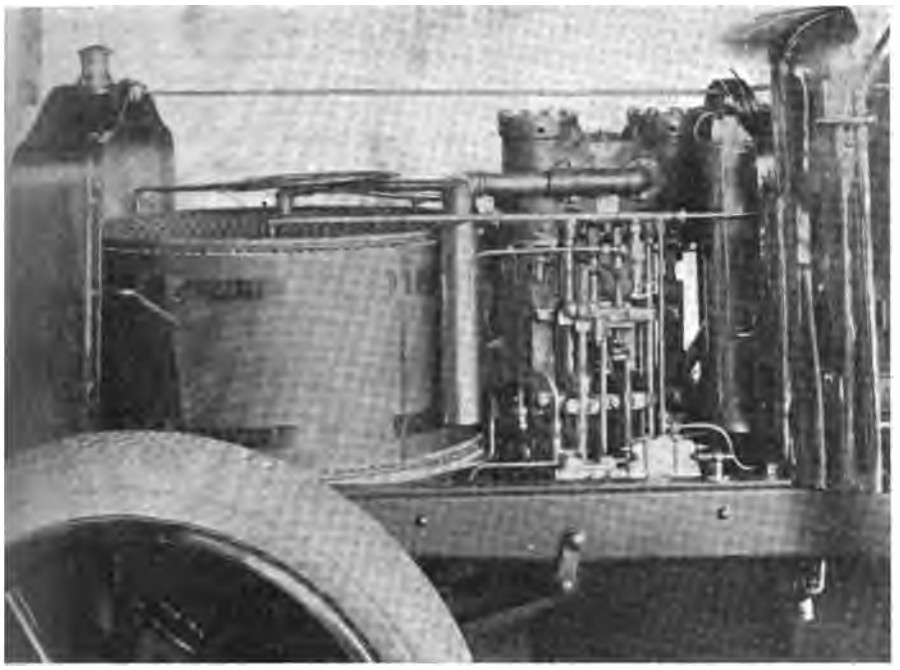
The boiler is of the copper fire tube type, and is 24 inches inside diameter, 14 inches high and contains 852 tubes. It is located directly back of a false radiator, as no condenser is used. The engine is a two cylinder, vertical, 4x5 inches, double acting. It follows somewhat marine engine practice, as the cylinders are supported on four vertical rods, which fasten to a flat metal base at the bottom. This base rests in a pressed steel pan, and is held to it by six "through" bolts, the removal of which allows the engine and its attached mechanism to be lifted out as a unit. A feature of the construction is the fact that all the



Harvard Water Cooled Motor.



Harvard Air Cooled Motor.



POWER PLANT OF ROSS STEAM CAR.

ırings of the engine and the gears ving the pumps are Hess-Bright. At rear of the engine shaft is a 30 pound wheel with a contracting band brake ed over it. Attached to the rear of the wheel is a universal joint and a shaft ding to the rear universal joint and el gear drive. As all the mechanism ınder a closed hood and no pipes are ıosed there is said to be practically no ger from freezing, even if the machine ıuld stand exposed for several hours. he gasoline supply to the burner is cut by the automatic action of a steam diaagm valve when the pressure reaches pounds. The oil and water pumps are a half time shaft driven by gears from crank shaft. The air pressure on the gallon seamless steel gasoline tank lod crosswise under the frame at the rear ıupplied by a small pump direct coned to the engine crosshead. An auxilair pressure tank in the form of a long ıder allows of filling the main tank ıout losing the air pressure. A supering coil is used over the fire and so nged that, if it ever burns out, by coning two pipes the steam can be taken ct from the boiler to the engine. The r supply to the boiler from a 40 gallon r tank under the front seat is controlled ı hand valve at the side of the seat. main gasoline shut off valve, which, ever, does not control the pilot, is on of the steering wheel, as is also the ttle lever. Of the two side levers, h are similar to those on a gasoline one controls the rear hub internal exling band brakes, while the other varies cut-off from full length to as short as twentieth of the stroke. A small auxilsteam pump is supplied and can be ed on from the dash.

ıe frame is pressed steel with Q & C ıwood steel steps attached and laminated wood guards. The front axle is an I beam steel drop forging and the rear axle is of the floating type fitted with Timken bearings, which are also used in the wheels. The car weighs complete 2,600 pounds. It is claimed for this machine that it is so simple that anyone can operate it. Safety from fire is also claimed, as the burner cannot be flooded, because the mixing tube is drained and no gasoline can drip, except onto the ground. The torch for starting is a part of the burner, and is operated by pressure from the Prest-o-Lite tank, thus doing away with hand torches.

THE HOLMES CARS

were shown here for the first time. The line consists of a two cylinder, vertical, 10 horse power, water cooled runabout; a four cylinder, air cooled, 20 horse power runabout; a four cylinder, water cooled, 20 horse power runabout, and a four cylinder touring car fitted with either an air or a water cooled motor of 18 or 20 horse power.

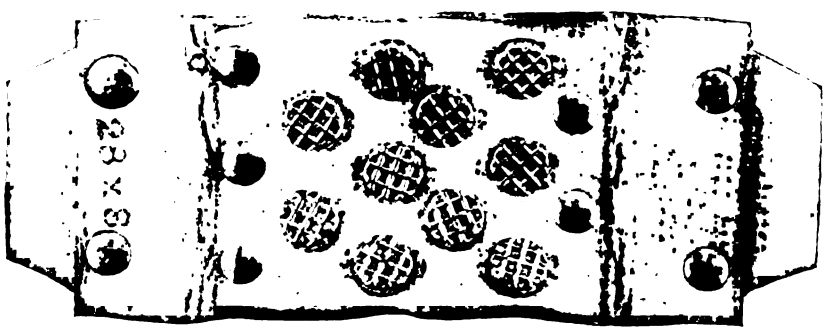
The distinctive feature of the machines is the friction drive, which consists of a movable friction wheel on a cross shaft, the ends of which carry the driving sprockets, with side chains to the rear wheels. Inside of this friction wheel is the differential. The wheel is faced with a laminated fibroid rim which it is claimed will wear for about 5,000 miles running. The cost of renewal is said to be about $2. This friction wheel is in contact with the rear of a large composition faced plate which takes the place of the flywheel, is splined onto the engine shaft and is free to move lengthwise to give the proper pressure on the friction wheel. The rear hubs are fitted with cone shaped brake drums which are engaged by a metal cone splined on the dead axle. These brakes are operated either by a foot lever or the side hand lever. The control of the friction pressure is by a foot lever, while the speeds governed by the motion of the friction wheel across the plate are governed by a side lever. The spark and throttle are on the steering column just under the wheel. The cars are fitted with a foot ratchet lever which throws over the motor for starting.

THE WOODWORTH DETACHABLE TREAD.

The Leather Tire Goods Company, of Newton Upper Falls, Mass., are exhibiting at the Boston Show their Woodworth detachable tread—a protector for automobile tires. It is made of leather studded with steel rivets. The leather is chrome tanned, and is not injured by water, it is claimed. The part that runs on the ground has three plies of leather in which are set steel rivets, with heads about three-sixteenths of an inch thick. The cover is made trough shape, coming well up on the sides of the tire, and has loops along each side through which passes a wire hoop in two sections with small tighteners at equal distances apart. The new construction used in the 1906 cover makes a partially flat tread, which increases the wearing surface and makes the studded strip hold its place exactly on the middle of the tire. It can be very quickly and easily applied. The tire is simply deflated, the cover placed in position, the tighteners are turned up and the tire is blown up. It is claimed that the cover prevents punctures, and reduces wear and skidding, as the tread of the tire is protected from all wear on the road, as well as from the small cuts and bruises that allow moisture and dirt to get under the rubber and rot the fabric.

THE IRON TIRE PNEUMATIC WHEEL

was shown for the first time by the Iron Tire Pneumatic Wheel Company, of New

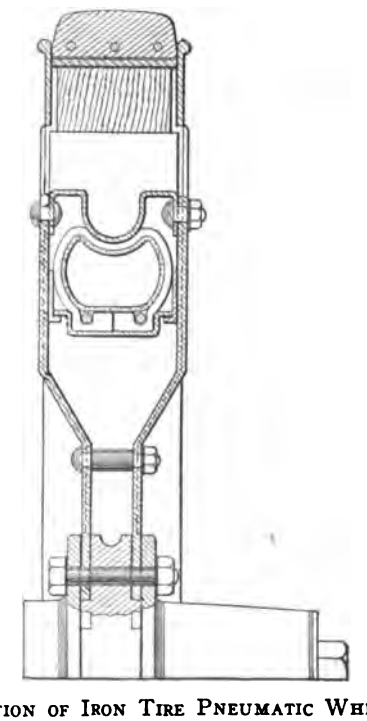


THE WOODWORTH DETACHABLE TREAD.



IRON TIRE PNEUMATIC WHEEL.

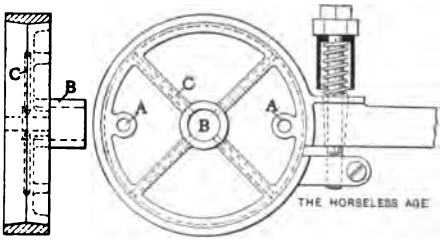
York city. A section of the wheel is herewith shown. The principle of this wheel is that of a "wheel within a wheel," with a pneumatic tire between them. Two sets of short spokes are employed to keep the wheels in the same vertical plane. These spokes are of traction, with the rib outward to give lateral resistance, and each one will support in tension a load of 5,000 pounds. The inner wheel consists of an ordinary hub, which runs on the axle, and is fitted with any suitable bearing and a set of short spokes, the outer ends of which are bolted to a steel rim, the outer surface of which is concave; this concave surface is the tread of the inner wheel, and rests on the outer circumference of the pneumatic tire, which is fastened rigidly to a steel rim. This rim is connected to the outside rim by another set of spokes, arranged in pairs to form triangles. The weight of the car comes on the hub and is transmitted through the short spokes to the concave rim, which rests on and compresses the upper half of the pneumatic tube. This tube is not subjected to road wear or punctures, and even if it should deflate the inner wheel would drop about 1 inch and the outer wheel would not change its shape, nor can an accident occur owing to the tire leaving the rim. When driving the hub settles below the centre as the pneumatic tube is compressed. The outer tire can be equipped with either a steel or solid rubber tire as desired. The pneumatic tube must be fastened to the concave rim, and thus transmit the torque of the hub to the outer rim. Many claims are made for this wheel as to its strength, wearing qualities and speed.



SECTION OF IRON TIRE PNEUMATIC WHEEL.

SHOCK ABSORBER.

The Hill Motor Car Company, of Haverhill, Mass., exhibit a shock absorber of somewhat novel construction. A drum with ribbed web and V grooved circumference is bolted to the side frame of the car, and is surrounded by a steel band, the ends of which are drawn together by an enclosed coiled spring. One end of the band is formed with an arm connecting by a link to the spring saddle. It will be noticed that the principle involved is that of the single acting brake, and it is claimed that the device gives about four times the resistance on the recoil of the springs that it does on the compression. The link is made long enough so it can be made the right length for any car.



A A, fastening bolts; B, grease cup; C C, grease holes.

VICTORY SHOCK ABSORBER.

Manufacturers' Shows at New York and Chicago Only Next Year.

At its meeting on Wednesday afternoon of last week the executive committee of the National Association of Automobile Manufacturers, Incorporated, adopted the following resolution:

Resolved, That no shows shall be sanctioned hereafter except one annual show each at New York and Chicago, and that the resolution relative to exhibits at unsanctioned shows be continued in force.

While this resolution was evidently directed against the practice of asking manufacturers to support so many smaller shows, it seems to have caused fear in some quarters that it meant only one show for New York, and that the one conducted by the A. L. A. M.

General Manager Samuel A. Miles, of the N. A. A. M., when asked about this interpretation of the resolution, said:

"The question of one, two or more shows in New York has not even been discussed. There is no intention on the part of the manufacturers to prevent a free display by all manufacturers, and while the word 'one' is used in the resolution, it is intended to express the intention that there shall be a show or perhaps more than one show at a stated time of the year, and not that there shall be a single show confined to any special class of exhibitors. That is to say, the New York show is regarded as the National Automobile Exhibition, which might be held in one, two or several different buildings.

"Although the licensed manufacturers are in the majority in this association, yet the unlicensed manufacturers are members of it, and as long as they remain so are entitled to the same consideration as the licensed manufacturers. Any action by which the association would not sanction their exhibition as a part of the National Automobile Show would naturally mean the severance of their connection with the N. A. A. M. The resolution in question contemplated no such action, I can assure you.

"It has also been suggested that the N. A. A. M. are opposed to the holding of shows in any cities except New York and Chicago. This is an erroneous impression. If the dealers of any city desire through local organizations to hold shows the manufacturers would probably rather encourage than discourage the project. They would look upon it entirely as the business of the dealers. What the resolution does mean is that the manufacturers have decided that they will not hereafter bear the expense of any shows, except those held at New York and Chicago. Heretofore local shows have been sanctioned by the association, and a successful attempt has been made to hold them down to a reasonable number. The dealers, however, instead of supporting their own shows, have, in a great many cases, called upon the manufacturers to bear the expense of space rental, to send demonstrators and special cars for exhibition, and in some cases to bear the expense of local advertisng. It is this to which the manufacturers object. In other words, they have decided that if the dealers desire to hold shows they must do so at their own expense.

"The assumption that the action of the manufacturers was intended to prevent or in any way injure the proposed open air show of the New York Automobile Trade Association at the Empire track the last three days of May is erroneous. The intention is, however, that this show, like all others, must, if it is held, be supported by the local dealers, and that the manufacturers will not contribute to the expense."

This resolution also applies to the open air show planned by the American Motor Car Manufacturers' Association for next fall.

The committee reiterated its resolution of last October against the holding of contests in the United States not approved by

ınd barring members of the association n taking part in such contests.

ommittees for the coming year were ounced by President E. H. Cutler as ows:

lembership—S. T. Davis, Jr., G. W. nett and Percy Owen.

how—M. J. Budlong, G. W. Bennett, T. White, C. C. Hildebrand and W. E. zger.

ailroad Transportation—Windsor T. ite, Charles Clifton and W. R. Innis.

uditing—Percy Owens, A. L. Pope and L. Goss.

ood Roads—S. D. Waldon, S. T. Davis, and E. R. Thomas.

egislation and Legal—G. W. Bennett, R. Innis and A. L. Pope.

ontest—S. D. Waldon, W. T. White, S. Davis, Jr., L. H. Kittridge and A. L. e.

will be noted that the show committee been increased from three to five ibers.

. E. Metzger was elected a member of executive committee to succeed Roy D. ain, resigned.

neral Manager Miles reported that the profits of the Chicago show were $25,- one-half of which will be retained for work of the association and the other divided among the exhibitors.

ıe legislative committee presented a re- on the test case in New Jersey to the t that it had passed through three ts in five months, and would probably ı the highest New Jersey court by July. York and New Jersey legislative af- were also discussed.

ıe route for the annual Glidden Cup was discussed informally. The officers ıe A. A. A. have asked the manufac- s to make suggestions regarding the : and to state if any changes are ıed essential in determining the win- car. It is the purpose of both organ- ons to make this tour of more benefit year than last.

neral Manager Miles has renewed his of the Chicago Coliseum for three for automobile display purposes.

ıportant Automobile Figures.

me statistics of unusual interest con- ng the automobile industry in the ed States have just been brought out e course of the litigation now progress- ıgainst certain manufacturers, dealers users for infringement of the Selden t No. 549,160, which is held to be a ımental grant, covering all gasoline ıobiles. The plaintiff in all the suits ng is the Electric Vehicle Company, in order to prove the extensive rec- ion which the Selden patent has been ded by the industry, President M. J. ong was called to the stand to testify rning the amount of business that has transacted under licenses granted the patent.

summary of Mr. Budlong's testimony s the following records to have been kept by the licensers, all the figures having been furnished by manufacturers in depositions under oath. According to these official figures, as sworn to in the United States Circuit Court, the total number of vehicles manufactured and imported under license, from January 1, 1903, to January 1, 1906, was 41,696. The valuation of these cars was $63,141,437.22, and the royalties paid on them to the licensers were $814,- 183.52. All of the figures given represent cars actually sold.

The increase of production in 1904 over 1903 amounted to 30 per cent. in the number of vehicles, and the increase in the value of the gross sales was 58 per cent.

The increase of 1905 over 1904, in the number of vehicles, was 32.5 per cent., while the increase in the value of the product sold rose to 66.2 per cent.

The total business in 1905, according to the testimony, amounted to 17,840 vehicles, having a valuation of $31,814,758.99.

These figures reveal some averages of peculiar interest. Taking the total number of cars produced by the licensed makers and their selling prices, it is shown that the average selling price for cars of all sorts in 1903 was approximately $1,170. In 1904 the average price was $1,422. In 1905 it was $1,784. For 1903, 1904 and 1905 the average selling price of domestic cars was $1,429 and of imported cars $6,710.

This is the first time that any such thing as reliable, official figures have been furnished, and as there are thirty-seven concerns now operating under the Selden patent, who handle a majority of all the motor cars made and sold in this country, these statistics from the court testimony throw a broad light on the situation.

$60,000 Net Profit from the New York A. L. A. M. Show.

The show committee of the A. L. A. M., at its meeting last Friday, reported that the association and the Madison Square Garden management had each received $30,000 net profit from the 1906 show, making it the most profitable automobile exhibition ever held. The profit of the association was rebated to the vehicle exhibitors entitled to share, and it amounted to 60 cents per square foot, or about 35 per cent. of what they paid for exhibition space.

The committee, consisting of Col. Geo. Pope, Marcus I. Brock and C. R. Mabley, was continued in office.

The show committee of the American Motor Car Manufacturers' Association met at the Iroquois Hotel, Buffalo, March 9, with the following members present: Benjamin Briscoe, chairman; J. B. Bartholomew, James Couzens and A. O. Newby, Places for holding the fall outdoor show recently decided upon were discussed, and Kenilworth Park and the New Armory, Buffalo, and the State Fair Grounds, Detroit, are said to have been most favored. No decision was arrived at. The committee adjourned to meet in Chicago March 30.

Commercial Vehicle Notes.

The Boston fire department has purchased gasoline runabouts for the district chiefs.

The Rapid Motor Vehicle Company, of Pontiac, Mich., will soon place 12 and 20 passenger omnibuses on the market.

John Goodrich and Wm. Nixon, of Newburgh, N. Y., are investigating the practicability of the auto fire engine.

William C. Sieker, of Milwaukee, is to be the head of a company that will operate a motor car line between Manitowoc, Michicott and Kewaunee, Wis.

Joannes Brothers Company, of Green Bay, Wis., have ordered a Reo touring car for use by their traveling salesmen in covering territory remote from railroads.

An automobile stage line is to be established on the Darby pike between Philadelphia and Chester, Pa. Application for a charter will be made to the Governor of Pennsylvania in April.

Joseph Goetz, of Dayton, Ohio, has formed the Auto Notification and Public Service Company. Memberships will be sold at $1 each. Already five automobiles have been secured by the company.

Henry Solomon & Son, wholesale grocers, of Savannah, Ga., have purchased a 2 ton motor truck, which has the distinction of being the first motor driven commercial vehicle in the State of Georgia.

Dr. A. James De Nike and Charles Brooks, of Whitehall, Mich., will start an automobile line between that town and Muskegon in the spring. A stage line to Sylvan Beach during the resort season is also being considered.

A motor stage line has been established from Albany to Latham's Corners, N. Y. Stops will be made at Loudonville and Newtonville, and five round trips will be made daily. The fare for a round trip will be 40 cents. Application has been made for the contract for carrying the mails.

A large automobile stage was given a trial at Easton, Pa., recently, to ascertain if it would be a practicable vehicle to use in taking passengers from the terminal of a new trolley line in Phillipsburg to Easton. The new company cannot build its line, which extends to Washington, N. J., into Easton on account of franchises held by the old company.

Deere & Mansur, manufacturers of agricultural implements, Moline, Ill., have placed an order with the John W. Buck Company, of Davenport, Ia., for a 6 ton motor truck to be built by the Kansas City Motor Car Company. It will have a body extending 18 feet from the driver's seat, and will be able to carry at one load three times as many disc harrows as a horse truck and twice as many corn planters. Much larger loads of washers, bolts, rivets, steel and all heavy material for manufacture can be hauled from the freight stations than by horse power. The saving in time will thus be considerable.

LEGISLATIVE and LEGAL

Automobile Bills Before the New Jersey Legislature.

TRENTON, N. J.—Five measures drawn with the purpose of regulating the operation of automobiles are pending in the Senate. The most important is the committee substitute for the Frelinghuysen bill, which is on second reading in the Senate. It is believed that it will pass the Senate, but what will happen to it in the House is a matter of conjecture.

Senator Cornish, of Warren County, has introduced two bills, one of which makes it a misdemeanor for the driver of a motor vehicle to refuse to bring his machine down to a speed of 7 miles an hour when passing a horse traveling in the opposite direction, if signaled to do so. It makes it a misdemeanor also to run a vehicle faster than 1 mile in two minutes or to display a fictitious number of registration. The act is not to affect automobile fire engines or ambulances. The penalty is a fine of $500 or sixty days' imprisonment. The other measure, which is a companion bill, requires all vehicles to keep to the right when passing other vehicles on the road or when overtaken by them. The penalty for each violation is $10.

Senator Minturn, of Hudson County, has a bill in the Senate providing for the establishment of toll gates at certain intervals on macadam roads, and authorizes the collection of toll from automobilists passing over those highways.

An important bill introduced by Senator Jackson, of Middlesex County, is in the hands of the Judiciary Committeee. It has the backing of the Road Protection Association of New Jersey. It provides that no motor vehicle shall be operated in the State until the owner of it has secured a certificate from the Secretary of State and filed with that official a description of the vehicle and the address of the owner, and that no person under the age of eighteen years shall be permitted to operate the machine.

The number of the registration certificate must be displayed on the front and back of every motor vehicle above the level of the tires, and kept clean of grease and dust, so as to be visible at all times during daylight. No motor vehicle is to be permitted to run over the highways of the State if it has a traveling capacity of more than 20 miles an hour and weighs more than 20,000 pounds.

The Secretary of State is required to send to the assessors in every taxing district in the State before the first Tuesday in May of each year a correct list of motor vehicles registered in his office, giving the names and addresses of the owners of the machines, that they may be assessed as other property.

Every motor vehicle must carry during the period from one hour after sunset until one hour before sunrise at least two lighted lamps showing white lights, visible at least 200 feet in the direction toward which the automobile is proceeding, and shall also exhibit one red light visible in the reverse direction. The registration number of the automobile must be on these lamps, and kept in such condition that it may be easily read when the vehicle is in motion.

The equipment of the vehicle with a chain or other metal grip device is prohibited when used on macadam or other made roads, except on asphalt, cobble, Belgian block or vitrified brick pavement. The width of tread of automobiles is limited to 62 inches, and the body of the tonneau must not be wider than 7 feet.

Violators of these provisions may be arrested by any peace officer and taken before a committing magistrate, who shall hear the complaint forthwith, and upon conviction punish the offender with a fine of $25 for the first offense, a like fine and imprisonment in the county jail for a period of not more than five days for the second offense, a fine in the same amount and imprisonment of not more than thirty days for the third offense. Upon a third conviction the registration of the vehicle is to be canceled and the person who applied for the same is to be prohibited from applying for the registration of any motor vehicle in the State for a period of five years. All fines collected under this act are to be turned over forthwith to the collector of the county in which the offense is committed.

Automobilists must carry their registration certificates with them, and if in case of arrest they cannot show their certificate the magistrate is authorized to hold their machine until the certificate is produced.

It is provided that the Secretary of State shall be paid $1,000 a year in addition to his present salary to defray the cost of registering the vehicles and sending lists of them to the assessors. The law if enacted is to take effect June 1, 1906.

Automobilist Wins Before Farmers' Jury.

COOPERSTOWN, N. Y.—The negligence suit brought by Mrs. Frances J. Reynolds against George B. Baird, of Oneonta, for $5,000 damages for injuries received in an accident at Oneonta, September 17, 1904, was tried here before Justice George F. Lyon and a jury, ten of whom were farmers, February 26 and 27. The result was a verdict of no cause of action. This is regarded as one of the first cases, if not indeed the very first, ever won before a farmers' jury by a defendant automobilist against whom negligence had been alleged in a damage suit.

The evidence showed that Mrs. Reynolds was riding in a wagon driven by a man named Dye, which had collided with one of the posts of a bridge over the Susquehanna River at Oneonta. The three occupants had been thrown out, and all more or less injured. The plaintiff tried to show that the approaching automobile had frightened the horses, and that Mr. Baird had not stopped his machine when requested to do so by signals while still 10 or 12 rods distant.

Mr. Baird and his wife testified that the machine had been stopped 25 feet from the bridge, and that after stopping with the transmission brake the team had first shown fright, whereupon Mr. Dye, the driver, had struck the near horse with his whip, after which the collision with the bridge post had occurred. It was shown conclusively that the near horse was a "puller," and had on a jaw breaker bit.

Mr. Baird assisted the injured, and took them home in his car.

Justice Lyon, after stating the laws governing automobiles, said that counsel for one of the parties had commented on the poverty of the plaintiff, and the expensive raiment and diamonds of the defendant, and the judge thought it would be a sorry day for Otsego County when her jurymen were influenced in the decision of cases by the poverty or wealth of the parties or witnesses in court, where all were equal before the law, whatever their rank or condition.

After an hour's deliberation the jury brought in the verdict of no cause of action.

Will Not Tax Automobiles in Canada.

QUEBEC, Canada.—A Montreal delegation representing the Automobile Club of Canada, and including several owners of cars not members of the club, as well as representatives of manufacturers, also several Quebec and Sherbrooke automobilists, called upon Premier Gouin and Provincial Treasurer McCorkill on March 3 to protest against the proposed tax on automobiles.

The automobilists contended that it was unfair to tax automobiles more than any other vehicle, simply because they cost more money; also that such a tax would hurt the automobile industry in Canada and would decrease the use of such vehicles. Mr. McCorkill promised that the contemplated tax would not be imposed this session; but added that it was the Government's intention to subject all chauffeurs to an examination to show that they were competent to drive machines. The only money asked for would be a small registration fee. A set of regulations will be formulated to which the automobilists will be required to conform. The speed limit in cities and towns will be 6 miles an hour, and in the country 15 miles an hour.

CONCORD, N. H.—Edward N. Pearson, Secretary of State, has published the New Hampshire automobile law in booklet form, together with the list of 703 automobiles registered by their owners up to February 1, 1906. It will be sent to those interested upon application.

MINOR MENTION



It is reported that E. T. Burrowes, of Portland, Me., is about to manufacture automobiles.

Greene, Tweed & Co., manufacturers of the Pony Rochester lubricator, have moved to 109 Duane street, New York city.

The Rapid Motor Vehicle Company, Pontiac, Mich., have occupied their new factory, where 50 men are employed at present.

The Kansas City Motor Car Company have moved to their new plant, where they will manufacture automobiles and motor delivery wagons.

The Rossel Company of America was recently formed to market the French Rossel car in this country. The headquarters will be in New York city.

We have received the first issue of the *Steam Car and Electromobile Review,* a monthly, published at 4 and 5 Gough square, Fleet street, London, E. C.

The personal property of the Monarch Automobile Company, of North Aurora, Ill., was sold at bankruptcy sale on March 5 to L. M. Grant, of Chicago, for $3,700.

The Hine-Watt Manufacturing Company, of Chicago, have contracted for the entire output of the factory of the Auto Chimes Company, of Indianapolis.

Georges Dupuy, 31 West Forty-second street, New York city, is endeavoring to place an agency for the Fraignac-Desgouttes car, manufactured at Lyons, France.

The Canadian Automobile and Motor Exhibition Company will give a show at Montreal the week of April 21 under the auspices of the Automobile Club of Canada.

The Chicago Automobile Club has leased the ground at 13-17 Plymouth court, just south of the Jackson boulevard, as a site for the erection of its new clubhouse.

Princeton students have organized an automobile club, with the following officers: President, Sterling Morton; vice president, Dyer Pearl, Jr.; secretary and treasurer, David M. Davis.

Anderson & Price, the hotel proprietors, have issued a map of Bretton Woods and surroundings in the White Mountains for the benefit of automobilists. It shows ten different trips.

H. R. Jenne, chief inspector and assistant foreman of the United States Armory workshops at Springfield, Mass., has resigned to become assistant superintendent of the Corbin Motor Vehicle Corporation, New Britain, Conn.

Fire in the car barns, Forty-ninth street and Eighth avenue, New York city, March 10, destroyed twenty-five electric vehicles owned by the New York Transportation Company, besides damaging 100 more, causing an estimated loss of $50,000. The fire is supposed to have been of incendiary origin.

The Winton Motor Carriage Company's plant is being enlarged to 259,100 square feet of floor space. New branch houses are in course of construction in New York and Cleveland.

The Oscar Lear Automobile Company will move from Columbus to Zanesville, Ohio, some time during the present year, the latter city offering a bonus of $100,000. The company manufactures the Frayer-Miller car.

The municipal civil service commission of Rochester, N. Y., will hold an examination for an eligible list of chauffeurs for the police patrol automobiles, at which leading automobilists of the city will act as judges.

A physician of Redfield, S. Dak., writes that the roads in that vicinity have been so icy this winter that to use a car on them would have resulted in ruining the tires in short order. There seems to be quite a difference of opinion, however, as to the effect of frozen roads on tires.

In an item at the bottom of page 369 in our last issue, relating to an automatic gas lighter based on the property of selenium by virtue of which its electrical conductivity greatly increases when it is subjected to light rays, by a typographical error "selenium" was made "aluminum."

The Garford Company will build a large automobile factory at Elyria, Ohio, involving the expenditure of about $300,000 in buildings and equipment, and the transfer of $100,000 worth of the equipment from the present Elyria and Cleveland factories. One thousand men will be employed.

The Poly Prep Automobile Club has been organized by the students of the Polytechnic Preparatory School of Brooklyn with the following officers: President, Roy E. Pardee; vice president, James B. Cronin; secretary, J. C. Van Cleaf; treasurer, E. C. Gillespie.

The following officers were elected at the annual meeting of the Birmingham Motor Club, March 6: President, R. S. Munger; vice president, Dr. J. E. Dedman; secretary and treasurer, C. B. White; members of board of governors for two years, R. E. Smith and Dr. F. A. Lupton. Several members made interesting remarks on the good roads movement.

The Standard Roller Bearing Company, of Philadelphia, have increased their capital stock from $2,000,000 to $3,500,000, for the erection of a new four story factory, 150x200 feet, for the manufacture of annular ball bearings. This is in addition to the four new buildings just completed. When the new building is finished over 1,000 people will be employed in the entire plant.

It is reported that the International Harvester Company are trying to get an automobile for the use of their canvassers. A machine has been built at the Keystone Shops, Sterling, Ill., somewhat along the lines of what used to be known as a "democrat wagon," which, it is thought, may answer the purpose. It has high wheels fitted with solid rubber tires, and is driven by a single cylinder gasoline engine and double chain drive.

Count de la Valette, a member of the executive committee of the Automobile Club of France, has been sent by the club to investigate the general automobile situation in this country. He intends to make a tour of New England and later of Detroit, Cleveland, Toledo and Chicago. He will inspect factories in these cities and other cities and gather statistics and data for French manufacturers.

Agency and Garage Notes.

George S. Adams has secured the agency for the Queen car in Elgin, Ill.

J. S. Howard is erecting a garage on South Los Angeles street, Anaheim, Cal.

The Holmes-Booth Auto Company, of Cleveland, Ohio, have taken temporary quarters at 398 Erie street.

Frank A. Beck will open a garage at 25 West St. Clair street, Indianapolis, as soon as the building is completed.

Allen, Asten & Co. have opened a temporary garage at 90 Arch street, Greenwich, Conn., and will handle the Reo cars.

The Brooklyn Automobile Exchange has opened a garage at 224 State street, Brooklyn. A. Durham is the proprietor and W. Barber manager.

Hegeman & Arnold, 1239 Fulton street, Brooklyn, have secured the agency for the Compound car. Robert Kolbee has secured the Compound agency for Syracuse.

The Elgin Auto Company, Elgin, Ill., are to erect a garage on South street, where they will handle the Buick car. C. J. Heine and A. Y. Reed are the officers.

The Somerville Automobile Company, West Somerville, Mass., have taken the agency for the Rambler cars, and are to open their garage and repair shops March 20.

The new Fort Pitt Automobile Company, of Pittsburg, Pa., will erect a garage, to cost $10,000, at Baum street and Euclid avenue. They will handle the Stearns, Waltham, Orient and Oldsmobile cars.

The Winton Company has purchased the Hi-land garage, Baum and Beatty streets, Pittsburg, Pa., and will take possession April 15. Earl H. Kiser will be manager. The Hi-land Automobile Company will occupy new quarters.

The Blakeslee Electric Vehicle Company, Cleveland, Ohio, have appointed A. F. Clark, 202 North Broad street, Philadelphia, as their Eastern representative, and the Commercial Auto and Supply Company, of 715 Thirteenth street, N. W., Washington, agents for the District of Columbia, Virginia and Maryland.

A company has been organized at New Richmond, Wis., for the erection of a garage and repair shop to accommodate Minneapolis and St. Paul automobilists,

who find New Richmond within comfortable running distance.

Whiting & Mudgett will open a garage at Santa Cruz, Cal.

Leslie C. Dorland has the agency for the Walker car for Poughkeepsie and vicinity.

The Roanoke Automobile Company, Roanoke, Va., is planning an $8,000 garage.

Charles Miller, of New York, will soon open an agency on Jefferson avenue, Detroit.

William Wandersee has opened an automobile supply store on Lafayette avenue, Detroit.

The Rapid Motor Vehicle Company, of Pontiac, Mich., have established an agency in Boston, Mass.

F. O. Babbitt and T. H. Matthews, of Worcester, Mass., will open a garage at Fitchburg.

Titman, Leeds & Co., 317 North Broad street, Philadelphia, have secured the agency for the Studebaker cars.

Harry S. Haupt, of 733 Seventh avenue, has taken the agency for New York city for Rauch & Lang electric vehicles.

The New York Motor Car Company, of West Thirty-eighth street, New York city, are agents for the St. Louis car and Atlas trucks.

The Soules Motor Company have established an agency on Woodward avenue in Detroit, of which Wm. Neuman is manager.

The Detroit Gas Engine and Machinery Company has just opened an agency on Congress street, Detroit, of which M. E. Jones is manager.

The Shawmut Motor Company, of Stoneham, Mass., have opened an office at 1091 Boylston street, Boston, with J. A. Highlands as manager.

Lewis & Matthews Company, of Stanhope street, Boston, are soon to remove to a garage on Columbus avenue where they will handle the Ariel cars.

The building which will be occupied as the branch salesrooms of the Ford Motor Company is in the course of construction on Jefferson avenue, Detroit.

The E. H. Van Duzen Motor Company, Birmingham, Ala., of which E. W. Van Duzen, Jr., is president and sales manager, have the agency for the Rambler and Reo cars.

Henry Morgan & Co., of Montreal, have purchased the automobile and motor boat business of the Dominion Motor Car Company, and will occupy a new garage which is being fitted up. They have the agency for the Maxwell-Briscoe cars.

The Michelin Tire Agency, Leon Rubay, proprietor, 226 Columbus avenue, Boston, has secured the New England agency for the Michelin tires. A complete line of Lacoste goods and French automobile supplies will also be handled.

The Rainier Company has closed agency contracts for the sale of Rainier cars during the present year with the Van Automobile Company, of St. Louis, for the State of Missouri and southern Illinois; the Paxton Motor Car Company, of Cleveland, for the State of Ohio; A. H. Hayes, San Francisco, for the State of California; the Plaza Automobile Company, of Brooklyn; T. S. Morse, of Lenox, Mass., for the Berkshire district. This company will also open a Philadelphia branch shortly under the management of A. J. Picard.

The Marmon car will be handled by the following agencies: The Brazier Auto Works, Philadelphia; George R. Sneedeal Auto Company, Baltimore; Piedmont Motor Car Company, Atlanta, Ga.; Nashville Motor Car Company, Nashville, Tenn.; the Van Automobile Company, St. Louis; O. S. Heller, Binghamton, N. Y., and the Gibson-Short Cycle and Auto Company, Indianapolis, Ind.

New Incorporations.

Boston Mechanical Company, Boston, Mass.—To manufacture carburetors. Incorporators, C. F. Whitney, H. E. Whiting and H. L. Dexter.

The Automobile Maintenance Company of America, New York city.—Capital stock, $200,000. Directors, Frank Van Order, Wm. Meick, C. F. Keyes.

New York Motor Truck Company, New York City.—Capital, $85,000. Incorporators, N. W. Schlatter, Jersey City; J. W. Deane and Wm. Conover, New York.

W. J. Duane & Co., New York City.—To manufacture motors, engines, etc. Capital stock, $5,000. Incorporators, W. J. Duane, F. A. Phillips and A. Y. Pringle.

American Anti-Puncture Tire and Automobile Company, New York City.—Capital stock, $50,000. Incorporators, O. L. Ellison, Dr. C. A. Hegemann and E. L. Barney.

Lincoln Park Automobile Company, Chicago.—Capital stock, $1,000. Garage, automobile and supplies. Incorporators, Hugo Marcus, James Gruenfeld and Julius Gruenfeld.

The Auto Livery and Sales Company, Cleveland, Ohio.—Capital stock, $25,000. Incorporators, Christian Gill, Charles E. Carpenter, W. H. Marlott, H. H. Carr and E. J. Hull.

Dingle Wetherbee Company, Brookline, Mass.—Capital, $25,000; to deal in automobiles. Incorporators, Elliot C. Lee, Brookline; S. K. Dingle, Boston, and R. A. Jordan, Brookline.

Pneumatic Tire Shield Company, Newark, N. J.—Capital, $200,000; to make tires and appliances. Incorporators, S. Wilson and J. Brunton, New York city, and A. G. Mager, Newark.

The Alaska Automobile Transportation Company, Olympia, Wash.—Capital stock, $500,000; to operate automobiles from Nome, on Behring Sea, to Solomon City, 32 Miles, and other points.

The Electric Automobile Company, Savannah, Ga.—To deal in and care for electric automobiles. Capital stock, $20,000. President, Joseph F. Walker; vice president, R. M. Hull; secretary and manager, Stephen M. Harris. Directors, J. J. Rauers, A. B. Hull, Davis Freeman, Chas. F. Graham, Hal. H. Bacon, W. V. Davis, Wm. B. Stephens, G. Dexter Blount and Sig. Gardner.

The Automobile Maintenance Company, La Porte, Ind.—Capital, $5,000. Incorporators, John Wollf, Axel E. Lindgren and Martin Weber. To manufacture parts of automobiles and make repairs.

The Endurance Motor Car Company, New York City.—Capital, $35,000. Incorporators, Harold Mabie, Hackensack, N. J.; H. W. Johns, Bronxville, and A. W. Parker Smith, New York city.

The Manly Drive Company, Jersey City, N. J.—To manufacture a variable speed gear. Capital stock, $200,000. Incorporators, A. H. Overmann, T. M. Rowette and F. I. Lockman, all of New York city.

The Brownell-Trebert Company, Oakland, Cal.—To deal in automobiles, boats and other vehicles and power for same. Capital stock, $50,000. Incorporators, Frank A. Brownell, Henry L. F. Trebert and Paul LeHardy.

Eagle Automobile Company, Rahway, N. J.—To manufacture automobiles. Capital stock, $60,000. Incorporators, F. C. Van Dernater, E. Van Dernater, A. G. Spencer, G. W. Loft and H. S. Griffin, all of Rahway.

The Auto Cushioned Hub Company, Jersey City, N. J.—To manufacture automobiles, vehicles, etc. Capital stock, $100,000. Incorporators, W. M. Lawyer, Brookline, Mass.; J. C. Wayner, Lancaster, Pa., R. Head, New York city.

Baltimore Motor Carriage Company, Baltimore, Md.—Capital, $10,000; to deal in and repair automobiles. Incorporators, George Buckholtz, Wallace C. Hood, Harry M. Benzinger, James S. Caldwell, Edwin R. Stringer and Walter E. Collier.

Wallace Brothers Automobile Company, New Rochelle, N. Y.—Capital, $25,000; to deal in and repair automobiles. Incorporators, James Wallace, William Wallace, Charles R. Maltby, of New Rochelle, and William B. Dungan, of New York city.

The Southwestern Transit Company, Guthrie, Okla.—To operate stage lines in Oklahoma, Indian Territory and Texas. Capital stock, $35,000. Incorporators, Shirley A. Bradish and Thos. J. Lowe, of Guthrie, and Ernest R. Ames, of Prague, Okla.

The Snutsel Auto Supply Company, 1534 Broadway, New York City.—To manufacture, import and export auto supplies and accessories; also to conduct a wholesale and retail business. President and general managers, Paul L. Snutsel; vice president, Joseph C. Hoffman; secretary and treasurer, Rudolph Weinacht.

The Automobile Dealers' Association of Baltimore.—To promote sociability among the automobile dealers of Baltimore, to protect and advance their interests, and to engage in the general automobile business. Capital stock, $1,000. Incorporators, Richard Keating, Edmund T. Buchanan, George R. Snoderly, Thos. C. Goodwin, Howard Gill and Robt. J. Hamill.

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Horseless Age

LUME 17 MARCH 21, 1906 NUMBER 12

WINTON

Pittsburg Branch House Opened



The Winton Motor arriage Company egs to announce at it has purchased e HILAND GAR- GE, Baum and eatty Sts., Pitts- urg, and will take xclusive posses- on of the prem- es on April 15th, 06, conducting A INTON BRANCH OUSE, at which inton patrons in ittsburg and vicin- y will receive the me prompt, thor- gh and conscientious attention as if the Winton factory, with all its splendid equipment and cilities, were located in Pittsburg.

The WINTON MODEL K is now on exhibition at the Hiland Garage, in charge of Mr. arl H. Kiser, branch manager, who is prepared to make demonstrations and to supervise the re and repair of Winton cars of any model, from Winton phaetons, manufactured in 1897, to e Winton Model K of 1906.

The 30 H. P. Winton Model K sells at $2,500. Compare it, feature for feature, with any r on the market selling at $3,500 or higher.

Detailed information can be secured at Winton Branches in Pittsburg, New York, Philadelphia, Chicago, Boston d London, at Winton sales agencies in all important cities, or by writing for "The Motor Car Dissected" to

The WINTON MOTOR CARRIAGE CO.

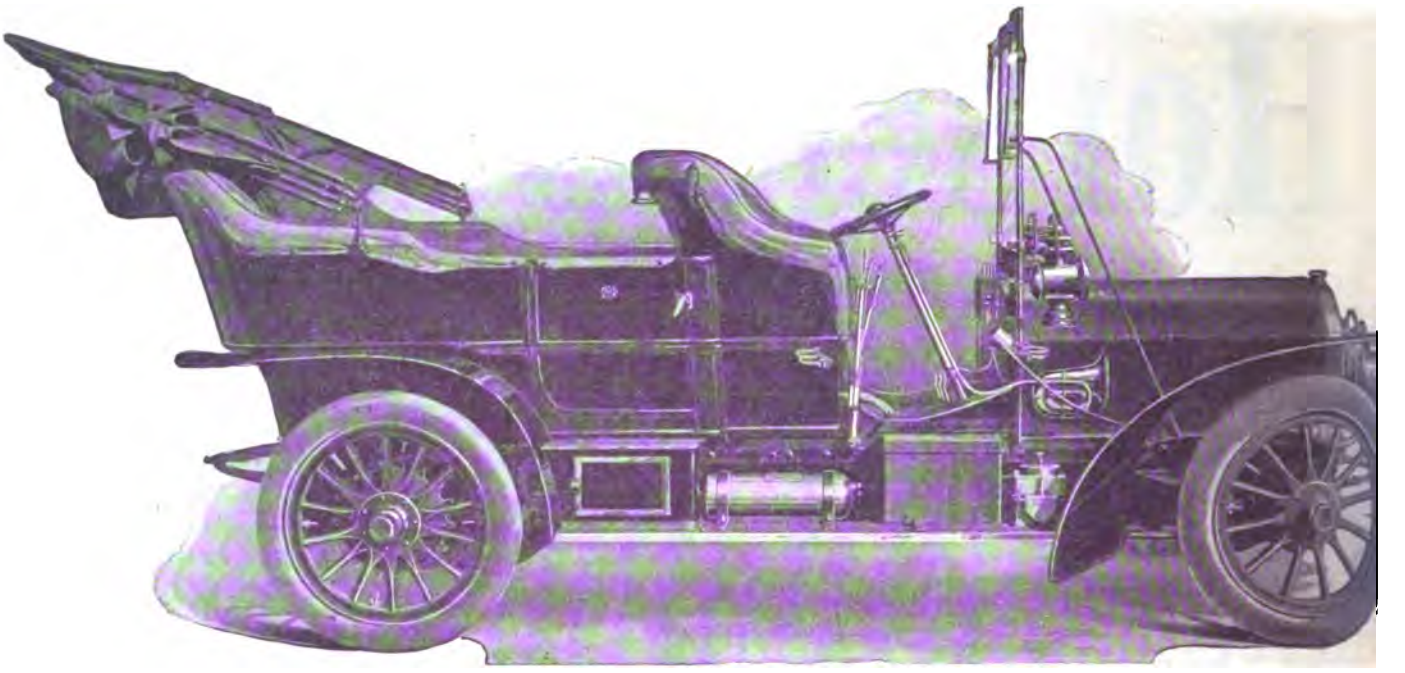
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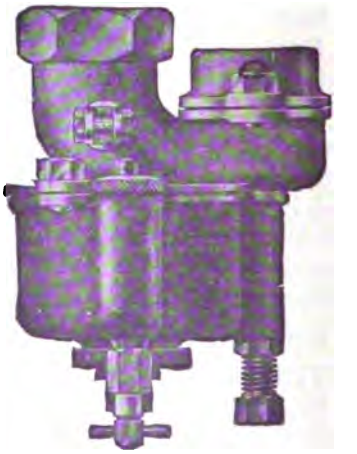
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The Trend Toward Specialization.

By Albert L. Clough.

In the very early days of the automobile industry almost literally every part of the vehicle was constructed at the factory which produced the finished car. Hardly anything was bought outside except the raw materials. One of the earliest successful American gasoline cars, for example, was actually completely constructed at the factory, with the exception of the tires. The wire wheels, radiator and even the ignition coil were made at the factory out of raw materials. It was often a proud claim of these manufacturers that all parts were constructed under the personal supervision of the inventor and after his own designs, but this was perhaps "making a virtue of necessity," as there was no automobile parts market in those days, where everything from a spark plug to a complete running gear could be obtained.

It has been a very usual claim of superiority put forth by manufacturers ever since that practically all parts of their cars, with the exception of certain accessories and the wheels and tires, were built by themselves in their own shops, and motor car builders who purchased many of their parts have been stigmatized as "assemblers" and treated with very scanty regard by those in the industry who possessed large and complete plants for the production of almost every element of a mechanically driven vehicle.

TOWARD AN ASSEMBLING BASIS.

Nevertheless, the number of parts manufacturers has steadily increased, their product has been improved in quality and variety, and the proportion of "boughten" parts entering into recently constructed cars is greater than ever before. Builders of the very highest priced cars as a class still make use of comparatively few parts purchased outside, but the average American motor vehicle embodies them in large numbers—to a greater extent, perhaps, than the average user realizes. The whole industry, it would seem, is tending toward becoming an assembling art, although it is still far removed from such a condition. It is not impossible, however, that the future may witness a further tendency in this direction.

THE PRO AND CONTRA OF THE MOVEMENT.

There is, as usual, something to be said upon both sides of the question. It is a distinct satisfaction to the designer (and doubtless in some cases an advantage to the purchaser of the cars) that the distinctive ideas of the engineer as to material, dimensions and conformation of parts shall be capable of being exactly followed. If all parts are constructed from raw stock in the factory, this can be accomplished; but if certain parts are to be purchased outside the factory, the designer is usually forced to sacrifice his individual preferences and judgment to a certain extent, as the parts manufacturer's ideas can hardly be expected to harmonize in every particular with the predilections of the individual automobile engineer. The motor car designer will thus be forced to adapt the most appropriate stock part which he can find in the market to harmonize with the rest of his "layout," and some sacrifice in unity of design may result. Extensive practical tests of "boughten" parts may have to be conducted by the designer who has to adopt them, in order that the material may be demonstrated to be as represented and that the adequacy of the part in point of strength and other qualifications may be proven. Careful inspections must be constantly conducted to see that the parts manufacturer maintains his guaranteed quality. Failure to realize prompt delivery of such parts from their makers is another annoying difficulty which a dependence upon outside sources of production brings into prominence. The manufacturer who builds all his parts in his own factory can embody in them all the details which his experience has shown to be desirable and can secure a harmonious relation between all parts that is not otherwise easy of attainment; he can be sure of the use of a certain grade of raw material in each part, and he has only himself to blame if the parts are not ready on time. If he is a very large manufacturer he may make each part in sufficient numbers so that his cost of production may be as low or even lower than that of the parts manufacturer, and he can thus save the profit which would otherwise go elsewhere.

GREATER REFINEMENT IN SPECIALIZATION.

On the other hand, the parts manufacturer, if he confines himself to a restricted line of production, becomes, or should become, a very expert specialist in the production of a few articles, and can lavish upon their refinement an amount of attention which the automobile manufacturer, in the midst of his multifarious cares and perplexities, can hardly devote to a single part of his product. He studies the needs of the automobile manufacturers at large, tests out his own product with the single purpose of perfecting it and treats its development as the serious problem in hand, rather than as a single detail forming a part of a complicated whole.

ECONOMY IN SPECIALIZATION.

Viewing the subject from a strictly economic standpoint, it seems a very doubtful practice to duplicate in the factory of each automobile manufacturer the expensive tools and other equipment necessary for the limited production of a certain part, the total demand for which by all the manufacturers could be supplied by two or three factories making a specialty of its production and turning it out in enormous quantities, with all the economic advantage which almost inevitably results from doing one thing on the large scale.

The tendency toward standardization of automobile mechanism, which has begun to be evident during recent years, tends to increase the practice of purchasing automobile parts outside of the factory where they are to be used, because, as the corresponding parts of cars in general become nearly alike, the parts manufacturer is more easily able to fit any probable requirement than would otherwise be the case. Large automobile manufacturers are at rather an advantage over small concerns in dealing with the parts manufacturers, as their orders are of sufficient size to warrant the making of certain desired changes in stock designs by which the requirements are better met. Such large concerns can obtain favorable prices from parts manufacturers on goods made in accordance with their own specifications.

WHEELS, SPRINGS AND BODIES.

As might naturally have been expected, automobile wheels, springs and bodies have been, from quite an early period of the motor car industry, quite generally bought rather than made by the motor car manufacturers, for these three parts of the car could readily be produced by those makers who had been building corresponding parts for horsedrawn vehicles. It would probably be difficult to find a manufacturer who makes his own vehicle springs, as the art is a difficult and specialized one. The same can be said, though less emphatically, of wheels. Of course, there are a large number of motor car concerns which make their own bodies, but the body builders are increasing in number and gradually acquiring more of the business.

FRAMES.

Up to a few years ago, automobile frames were generally built up at the factory out of wood and steel sections, which latter were bent, drilled and riveted in the home shop and considerable blacksmith work was done upon them in the way of spring hangers and other ironing. With the advent of the pressed steel frame, which has now become so general a feature of modern cars, the practice of building frames by the automobile manufacturer has been largely given up. The plant for producing pressed steel is of such a character that it is practically out of the question for the ordinary manufacturer to instal it. Frames are now usually bought upon specification from the pressed steel people.

AXLES.

A canvass of automobile factories will convince one that a considerable number of manufacturers are buying their axles complete, especially rear axles of the live type, both chain and shaft driven. Front axles are less commonly bought, as the labor involved in their construction is much less, and we still see many tubular and solid section front and rear axles built by the car manufacturers themselves. Special section front axles are generally forged by some outside concern to specifications and the steering fittings in any case are very frequently produced by outside drop forging concerns unless the manufacturer happens to possess a plant complete enough to include a drop forging department. Shaft driven axles, if bought

complete, often include the propeller shaft, bevel gear train and differential. Such axles and driving gear, if built in the factory, are very frequently equipped with ball or roller bearings and differential bought outside, and with driving gears cut by some outside machine shop which makes a specialty of gears.

ENGINES.

Automobile engines are still mostly built by the manufacturers whose cars they are to propel, but there have been a few notable exceptions in the past, and among 1906 models there are several cars which are avowedly equipped with motors purchased complete from the engine manufacturers. Now that the four cylinder motor has become so general and approaches so closely a typical form, the operation by every automobile manufacturer of a complete engine building plant may seem to some like an economically inadvisable multiplication of plants, especially as excellent engines are upon the market. Engine builders should be and doubtless are ready to produce motors embodying slight changes from their regular models to adapt them to the requirements of individual manufacturers, in case such motors are ordered in sufficient numbers.

Automobile builders who make their own engines are still largely dependent upon outside concerns for different parts of the work. The casting of motor cylinders is becoming a special branch of the founder's art, and many manufacturers prefer to have them cast by some outside concern who make a specialty of it rather than to do the work themselves. The work of finishing the cylinder bore is sometimes "let out" to some shop having special facilities for boring and grinding. Certain high grade machine shops now make a specialty of the production of crank shafts in accordance with manufacturers' specifications, guaranteeing the correctness of the dimensions obtained by grinding. Automobile manufacturers resort to these concerns to a considerable extent, especially those whose machine tool equipment is limited. The statement is frequently made that this work can be done more cheaply outside than at the factory. Manufacturers who possess no drop forging plant buy their connecting rods, valves and a large number of fittings for other parts of the car, such as control levers, pedals, brackets and so forth, of outside manufacturers of this sort of material. Now that special bronzes are so largely employed in automobile construction and cast steel to a less extent, outside foundries are very largely relied upon for this part of the material.

COOLING APPLIANCES.

It was not very long ago that each manufacturer built his own radiators, but now we find them bought of the radiator manufacturers in a large proportion of cases. The concerns which have made a specialty of their production have devoted a very large amount of time and capital to the refinement of cooling devices, and have produced results which would have been difficult of attainment by automobile manufacturers to whom the cooling question is one of many, instead of the sole problem in hand. Circulating pumps are now offered to motor car manufacturers by outside concerns and are being largely made use of.

Some of the more fastidious manufacturers who have special ideas of their own still manufacture their own carburetors, but a great majority of car builders employ stock carburetors. When these are contracted for in considerable numbers they can be obtained with modifications adapting them perfectly to the particular engines with which they are to be used. It is highly probable that, in the near future, practically all carburetors will be produced by concerns which have specialized upon this difficult subject.

IGNITION DEVICES.

From a very early period in the history of the automobile art, the manufacture of jump spark coils has been a specialized and separate industry. The same thing may now be said of the manufacture of jump spark plugs, although until recently quite a number of manufacturers made their own plugs after their own peculiar ideas. Quite a number of car manufacturers still construct their own timers and distributers, but now timers produced by makers who have specialized upon this branch are being used by a large proportion of car builders. In general, it may be said that the whole ignition equipment, including magnetos or dynamos, coils, timers, distributers and plugs, is bought outright. This is manifestly for the good of the industry, as the electric art is one quite widely removed from that of car building. The lubricating apparatus is all bought outside, except in certain rare instances.

CHANGE GEARS.

Although there are a number of sliding gear change speed devices offered by parts manufacturers, a very large majority of manufacturers still produce their own, and the same thing may be said of planetary gear. Of course, there are a great many gears and pinions which are cut outside the factory where they are to be used, a good many aluminum and composition gear cases are made by outside foundries and the ball bearings for gear shafts are all bought and not made in the home factory. Clutches are still mostly made at the factories of the car builders, although engines with clutches attached are freely offered in the market and are used to a limited extent.

Universal joints, formerly almost always made by the automobile manufacturer, are now being displayed in many instances by joints produced upon a large scale by specialized manufacturers.

Brakes are almost always of home production, up to the present time, unless rear axles are bought complete, in which case they are often furnished as a part of the axle structure. Sheet metal hoods, fenders and steps are bought outside by a large part of the car producers.

CONCENTRATION ON ASSEMBLING AND TESTING.

The labor of assembling a motor car represents a considerable proportion of the cost of the entire vehicle and the manner in which it is performed will determine whether a good or an inferior car is produced. No matter how good the design, workmanship and material of the parts may be, the result may be marred by faulty assembling. The automobile manufacturer will always have to be responsible for the assembling and testing of his product, and it is not unlikely that, as time goes on, some of the manufacturers' energy which is now otherwise directed, may be expended upon the improvement of these two all important processes. The assembling and testing of each individual car has almost of necessity to be considered as a separate and definite problem and thus there are few large economies which can be made upon these operations, when conducted on the large scale over its conduct on a modest basis.

The ability to buy in the open market in a finished condition a great part of the elements entering into the construction of a motor car tends to place the small manufacturer more nearly upon a fair basis with the large one, except that his orders for parts will be smaller and his costs in some cases greater. Perhaps this advantage will largely be offset by the heavy fixed charges which will have to be borne by larger and more extensively equipped manufacturers, who may some time find that much of their special machinery is rather an encumbrance than a profitable assistance to the conduct of their business.

CONCLUSION.

From what has been said, which is based upon rather extensive observation, it is evident that the motor car business is becoming less and less a "self contained" industry. That there are many of the best manufacturers who yield but slowly to the tendency which exists toward relegating much of their production of parts to outside concerns is undoubted, but it is seemingly a fact that automobile manufacturers at large are depending more and more upon the outside production of finished and unfinished parts. The assembling of parts produced by outside specialized concerns, the finishing and fitting of parts received from outside in the rough and of materials which are best produced by outside shops, and the complete production of certain engine and change gear parts, seem to comprise, roughly speaking, the work of the average automobile factory.

If the practice of buying engines and change speed gears complete should increase in the future, as it conceivably may the industry will be not far removed from one of pure and simple assembling. Such a condition exists in the horsedrawn carriage industry at the present time.

Cams.

By Morris A. Hall.

In the design of any machine part it is found that there are many other parts of the machine which are dependent upon it, while it in turn depends upon other parts, so that the action of one part is based wholly or in part upon the actions of the others. This being the case, it becomes necessary to know and discuss these actions of the interdependent parts before we can know and discuss the actions of the part in question.

So in the design of cams we ask first: What does the cam do? What is its action? How does it do its work? From what does it obtain the power to do the work?

In answering these questions we would say that the cams control the valve action,

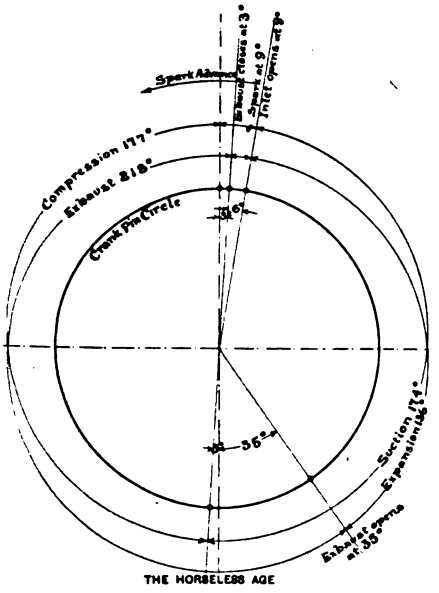


Fig. 1.

and thus the engine; that they regulate the admission of the fuel gas and the discharge of the burned or wasted gases, and that they are usually keyed to the cam shaft, which is gear driven from the crank shaft. Then, if we have previously determined the time of opening and closing of the different valves—that is, if we have assumed the valve diagram which we wish to obtain in our engine—it becomes necessary so to design our cams that they will give the desired diagram.

It was at one time current practice among the best manufacturers to open and close the valves on dead centres, but latterday practice tends toward the smooth, quiet running motor, in which we find that the time of exhaust is increased with good results. If the exhaust be opened before the end of the expansion stroke the gases will pass out into the exhaust pipe and exhaust slowly at the higher pressure. At the explosion point the gases are probably under 350 pounds pressure, but at two-thirds of the stroke, or 60 degrees before the lower dead centre, the pressure has been reduced to 85 pounds, and at four-fifths of the stroke, or 36 degrees before the dead centre, to 70 pounds. If the exhaust be opened at this point the gases will begin to expand into the atmosphere, until the whole charge is reduced to atmospheric pressure, which will be about the lower dead centre. When the piston returns on the scavenging stroke it pushes out all of the low pressure gases left in the cylinder, thus making a very quiet exhaust and completely cleaning out the cylinder.

Following out this line of argument, it is reasonable to assume that 35 degrees before the lower dead centre is the proper point of exhaust opening, and to fix the point of exhaust closure at 3 degrees past the upper dead centre, so that the inertia of the moving gases may effectively clean out the cylinder. Similarly, with the inlet opening at 9 degrees on the inlet stroke, it is usually held open until the lower dead centre, or sometimes 3 degrees past, to allow the inertia of the inrushing gases to completely fill the cylinder, thus insuring a full charge. As the movement up or down for a 3 degree angle is only one-sixty-fourth inch or less, it can be seen that there is no harm in keeping the valve open this much longer. If it is further decided that the spark is to occur at 9 degrees before dead centre, on the compression stroke, the whole diagram has been determined upon, as shown in Fig. 1. Of course, this diagram may be altered, in which case what follows would necessarily also have to be altered. We could open our exhaust sooner, say at 40 degrees before dead centre, which would add 5 degrees to our exhaust opening, making it 223 degrees, or we could carry our inlet opening back to 5 or 6 degrees, and close it later, say at 5 or 6 degrees, thus increasing our suction to 180 degrees or more. The following applies only to the specific case shown in the diagram, Fig. 1.

Now, having the diagram, we can proceed to design the cams, for we know that we must have one cam to hold the inlet valve open for 174 degrees on the crank pin circle and another to hold the exhaust valve open for 218 degrees. As the cam shaft makes only one revolution to two of the crank shaft, the angular velocity is thereby halved, so the cam angles only need to be one-half of the valve diagram angles to give the desired results. That is, the angles will be $174° \div 2 = 87°$ for the inlet, and $218° \div 2 = 109°$ for the exhaust. Thus, we know why our cams are laid out to give an angle of opening of 87 and 109 degrees, respectively.

It is here assumed that the size of the cam shaft has been determined, or is known, or it may be figured by the following rule: Diameter = .057 × cylinder diameter + .65", taking the nearest thirty-secondth to the result thus obtained. For a 4½x5 inch engine this gives .906" = $\frac{29}{32}$" or seven-eighths of an inch may be used, as it is large enough.

It is also assumed that the thickness of the cam shell has been determined. The

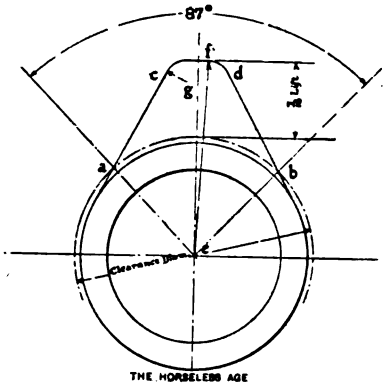


Fig. 2.—Inlet Cam.

writer believes five-thirty-seconds to be thick enough for slow speed, and three-sixteenths for high speed engines, considering case hardened cams. Then we must figure the lift, for this must be known to lay out the cam. This may be figured in many ways, the most rational of which is that based on the area of the passages necessary to pass the gases when moving at velocities of 85 feet and 100 feet per second, respectively. Having thus found the necessary area, we decide on the diameter of valve opening. The gases pass through the valve opening in an annular sheet which extends around the circumference of the valve, with a width equal to the lift times the sine of the angle of the valve seat. As this is usually 45 degrees, the writer has so taken it. So the area through which the gases finally pass is equal to the circumference of the valve opening times the lift times .707 (sin 45°). Usually the area is known (figured above for valve diameter), so we figure backwards from this and get the lift by dividing this area by the circumference times .707 (sin 45°); thus,

$$\frac{\text{Area of passage necessary}}{.707 \times \text{circumference of valve opening}} = \text{lift.}$$

In case a person did not wish to go through all of this figuring, the formula $\frac{\sqrt{NL}}{132}$ gives the inlet lift and $\frac{\sqrt{NL}}{132}$ gives the exhaust lift. In these N is the number of r. p. m. and L the stroke in inches. Thus, it will be seen that a longer stroke engine, which would take in and exhaust larger quantities of gas, would have

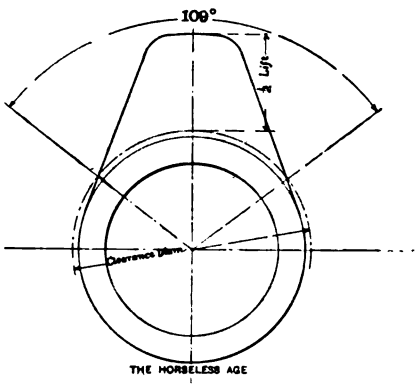


Fig. 3.—Exhaust Cam.

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Table 5.

Speed	A° Lift. Horse Power	Speed	A° Lift. Horse Power
498	30.3	507	34.9
490	30.4	508	35.1
488	30.4	498	35.2
490	30.3	490	35.4
488	30.3	488	35.4
490	30.3	490	35.4
488	30.3	488	35.4
490	30.4	490	35.4
488	30.4

this engine of 2.921. If we wish to reduce the valve lift to one-quarter inch (6.34 mm.), we must have a valve of 2.921 + .25 = 11.68 inches circumference, which is equal to 3¾ inches diameter. This size of valve is manifestly impossible, so we must either resort to two small valves or use a large lift and a correspondingly smaller valve. With two valves, we would require them to be 1⅞ inch in diameter each, so that this is a doubtful proposition, particularly when we stop to think that the small valve lift is perhaps only a hobby.

By applying this method of calculation to the other lifts, we find that for the different lifts we should require corresponding valve diameters as follows: five-sixteenths inch lift, 3 inches diameter; three-eighth inch lift, 2½ inches diameter; one-half inch lift, 1⅞ inches diameter; nine-sixteenth inch lift, 1⅝ inches diameter. Balancing the two extremes, viz., small diameter valves with great lift, and large diameter valves (or double valves) with very small lifts, the proportions adopted are very sensible.

Experiments on the Use of the Engine as a Brake.

(Paper read by W. Watson, D. Sc., F. R. S., before the Automobile Club of Great Britain and Ireland, February 15.)

There having been considerable discussion in the automobile papers on the use of the engine as a brake, and the views expressed by various persons being so completely at variance, I think that some quantitative experiments on the point may be of interest. Further, since some of those who admit that the engine can exert a braking effect appear to be most uncertain as to how the braking action takes place, I have endeavored to show by experiment exactly how the power absorbed is spent. Not having any means of measuring the loss which takes place in the transmission gear between the engine clutch and the road wheels, I have had to content myself with measuring the power absorbed by the engine alone.

The engine used for the experiments is a comparatively slow running two cylinder four cycle engine, with mechanically operated inlet valves, and is governed on the throttle, the lift of the valves being fixed. The bore is 88.9 mm. (3.5 inches), and the stroke 101.6 mm. (4 inches), the cranks being at 180°. The engine was coupled up by means of a belt to an electric motor and the power taken by the motor was deduced from the readings of a standard ammeter and voltmeter placed in the circuit.

In order to be able to apportion the power required to drive the engine between that spent in overcoming friction and that spent in doing work on the air drawn into the cylinders, it was necessary to take indicator diagrams. These were obtained by means of a Hospitalier-Carpentier manograph. The general arrangement of the engine and manograph is shown in Fig. 1. The manograph A is connected by

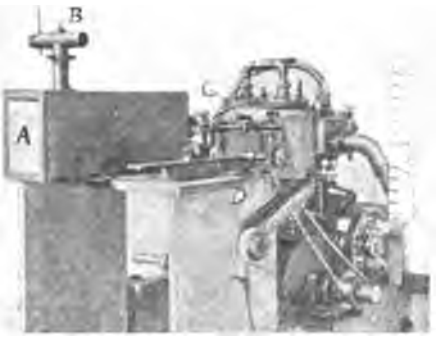


FIG. 1.

a short, branched tube, with the cocks C, so that either cylinder can at will be connected to the instrument. The reciprocating motion corresponding to the piston travel is communicated by means of a roller chain and two sprockets, a clutch D being placed between the upper sprocket and the manograph. This clutch can engage in two positions 180° apart, and the reason for using it is illustrated.

Fig. 2 represents two diagrams taken immediately one after the other; but the connection between the manograph and the engine through the clutch has been altered, so that while in one case the explosion takes place when the spot of light is at one extremity of its path, in the other it takes place when the spot is at the other extremity, the photographic plate having been slightly displaced between the two, so as to separate the diagrams to a certain extent. It will be noticed how the diagram is distorted at one end. Thus, on the left hand side the pressure line, in place of being vertical, is very much inclined, and, further, the scale is contracted at this end. If, however, all diagrams are taken with the peak of the diagram to the right, the distortion has not much effect on the area enclosed, since the pressure at the end of the stroke is comparatively small.

A typical diagram for the engine when developing its full power is shown in Fig. 3. This diagram was taken when the speed was 700 revolutions a minute, and the mean effective pressure is 6.14 kgs. per square centimetre (87 pounds per square inch), the i. h. p. being 5.94. It will be noticed that the exhaust and inlet strokes take place almost exactly at atmospheric pressure, for the valves being of ample size, very little throttling takes place. On this and the other diagrams the inlet stroke is indicated by a single arrow head, the compression stroke by two, the working stroke by three, and the exhaust stroke by four.

All the braking experiments have been made with the engine running at 590 revolutions per minute, and with the temperature of the cylinders about 50° Cent. The speed having been adjusted by means of a variable resistance in the motor circuit, the watts absorbed by the motor were obtained by reading the ammeter and voltmeter. The watts required to run the motor light having been measured, and likewise the armature resistance, it was possible to deduce the power taken to drive the engine.

The first experiment consisted in measuring the power required to run the engine when no variations in pressure took place in the cylinders, the whole of the power being absorbed in doing work against the friction of the moving parts of the engine. In order that the pressure should not appreciably vary in the cylinders, the plugs over the valves were removed, when no measurable change of pressure was shown on the manograph. The power required to drive the engine was 0.75 horse power (see table below).

TABLE.

Horse power at 590 revolutions per minute.

	To Drive Engine.	After Deducting Friction.	Indicated.
1. No compression	0.75	....	....
2. Throttle open	1.03	0.28	0.27
3. Throttle closed	1.22	0.47	0.46
4. Throttle open, compression cocks half open	1.39	0.64	0.70
5. Throttle closed, compression cocks half open	1.49	0.74	0.79
6. Throttle open, compression cocks full open	1.63	0.88	0.91
7. Throttle closed, compression cocks full open	1.69	0.94	0.94
8. Throttle open, exhaust valve always shut	[1.60]	....	0.85
9. Throttle open, exhaust valve open during third stroke	[2.40]	....	[1.65]

Next, the valve plugs having been replaced, the power required to drive the engine in its ordinary running condition, with the throttle full open, was found to be 1.03 horse power. Hence, deducting the 0.75 horse power required to overcome friction, there remains 0.28 horse power as the power expended in sucking air into the cylinders, compressing and expanding this

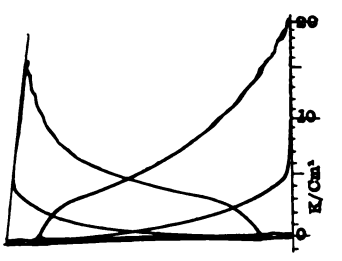


FIG. 2.

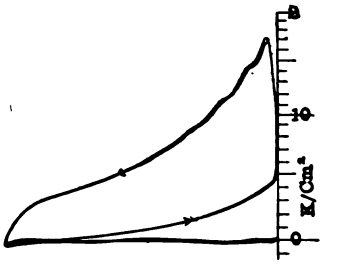


FIG. 3.

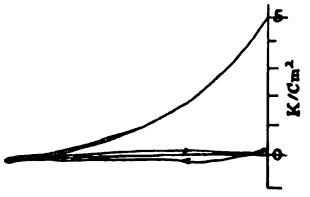


FIG. 4.

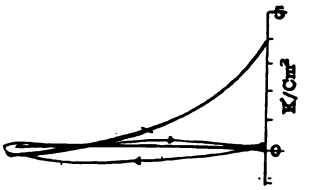


FIG. 5.

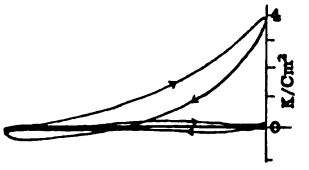


FIG. 6.

air very nearly adiabatically, and then forcing it out through the exhaust. The corresponding indicator diagram is shown in Fig. 4. It will be noticed that in the expansion stroke (No. 3) the pressure falls a little below the corresponding pressure in the compression stroke (No. 2). This is due to loss of heat to the cylinder walls and to slight leakages past the valves, piston rings, etc. The area included is, however, very small, a larger area being included between the induction and exhaust lines. It should be noted that the pressure scale of Figs. 4 to 10 is considerably more open than in Figs 2, 3 and 11, a thinner steel disc being used in the manograph. The total power corresponding to the areas enclosed in Fig. 4 is 0.27 horse power. This value agrees very well with the additional power expended in driving the engine—namely, 0.28 horse power—indicating that this additional work is simply due to the work done on the air.

In Fig. 5 is shown the result of closing the throttle. Here the pressure on the induction stroke sinks considerably below atmospheric pressure, and the branches 1 and 4 of the curve enclose a considerable area. The indicated horse power is 0.46, while the power required to drive the engine is 1.22 horse power. After deducting the work done against friction we get 0.47 as the additional power required on account of the work done on the air in the cylinder, which, again, agrees very well with the indicated horse power.

In Fig. 6 is shown the indicator diagram obtained when the throttle is open and the compression cocks are half opened. The cocks being half open is equivalent to the interior of the cylinder being in free communication with the external air by means of a hole three-sixteenths of an inch in diameter. The indicated horse power is now 0.70, while the power required to drive the engine is 1.39 horse power, the additional power required on account of the work done on the air being 0.64 horse power. On closing the throttle, keeping the compression cocks half open, the diagram obtained is shown in Fig. 7, and the corresponding powers are given in line 5 of the table.

On opening the compression cocks to their full extent, which corresponds to a hole one-quarter inch in diameter, we obtain Fig. 8 with the throttle open, and Fig. 9 with the throttle closed, the corresponding power being shown in lines 6 and 7 of the table. Here it will be noticed that the indicated horse power has risen to .94, the total power required to drive the engine being 1.69 horse power.

Experiments were not made with larger orifices, since an examination of the diagrams and numbers showed that no appreciable improvement was likely to be produced.

Before proceeding to discuss the results attention may be drawn to Fig. 10. This is the indicator diagram obtained when the exhaust valve is prevented from opening,

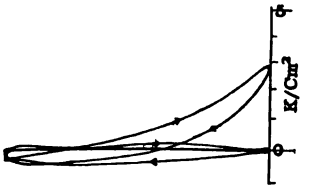


FIG. 7.



FIG. 8.

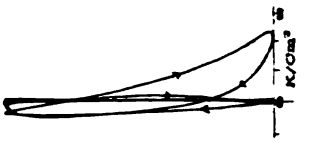


FIG. 9.

so that there is now compression on stroke 4, the pressure at the commencement of stroke 1 falling rapidly, owing to the opening of the inlet valve. There is now a considerable area enclosed between lines 1 and 4, the indicated horse power being 0.85, which corresponds to 1.60 horse power required to drive the engine. This power was not directly measured, since the previous measurements had shown that by adding .75 horse power to the indicated horse power we obtain the total power required to drive the engine.

If it had been possible to alter the phase of the cam which opens the exhaust valve, so that in place of opening in stroke 4 it opened in stroke 3, then the indicator diagram obtained would consist of two loops similar to the loop included between strokes Nos. 1 and 4 of Fig. 10. The indicated horse power would then be 1.65, and the total power required to drive the engine 2.40 horse power. This represents the maximum braking effect which it is possible to obtain with the engine, and we have now to consider what relation these various braking horse powers bear to the horse power the engine develops when working. As has already been mentioned, the engine, when working at 700 revolutions per minute, develops 5.94 i. h. p. This corresponds to 5 i. h. p. at 590 revolutions. What we require, however, is the brake horse power. This may be obtained by measuring the indicated horse power at a load. Since, however, it was found that with no load the diagram was very irregular if both cylinders were allowed to fire, one cylinder was prevented from firing by holding down the corresponding trembler. The diagrams thus obtained are shown in Fig. 11. The speed being 690, the indicated horse power is 1.52. This corresponds to an indicated horse power of 1.30 at 590 revolutions. Since the throttle was almost closed the conditions under which the engine was running resemble those of line 3 of the table, where the power to run the engine was found to be 1.22 horse power.

The agreement is thus seen to be good, and hence we may take the brake horse power as being 3.7 at 590 revolutions.

Hence, collecting the results of the experiments, we have:

	H. P.	Ratio of Brake to Power Per Cent.
Power delivered at clutch by the engine when working.....	3.7	..
Braking effect when throttle is closed.....	1.22	33
Braking effect when throttle closed and compression cocks open...	1.69	46
Braking effect when exhaust valve is prevented from opening.....	1.60	43
Braking effect when exhaust valve is opened on No. 3 stroke.....	2.40	65

Thus the maximum braking effect which can be obtained at the clutch is 65 per cent. of the power the engine is capable of giving at the clutch. If we were to take into account the losses in the transmission gear between the clutch and the road wheels the percentage of braking effect would be considerably increased, since this loss in transmission would decrease the power delivered by the engine and increase the power absorbed when the engine acts as a brake. Thus, if the loss between the clutch and the road wheels amounted to 15 per cent. the maximum braking effect rises to 88 per cent. of the power the engine is capable of exerting, it being supposed, of course, that the same gear is employed in the two cases.

It will be seen from the above that the engine is capable of being used as a powerful brake, and one which possesses this important advantage over the ordinary brake, that the water circulating system will remove the heat generated, and thus prevent the occurrence of burnt brake leathers and such like.

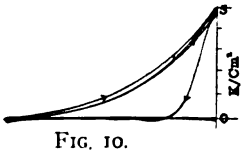


FIG. 10.

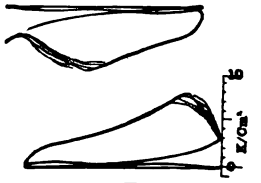


FIG. 11.

THE HORSELESS AGE

...EVERY WEDNESDAY...

Devoted to Motor Interests

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An Automobile Fatality.

In another part of this issue will be found a report of a very deplorable accident which occurred in New York city Friday before last. The coroner's inquest into the cause of the resulting fatality has not yet been held at this writing, and the circumstances of the accident are therefore not yet officially known. According to the account given by the survivors of the accident, the car occupied by them was thrown out of its course by a collision with a large touring car attempting to pass from behind between it and a dirt cart occupying the right side of the road, which caused it to run into a telegraph pole. The touring car alleged to have caused the accident continued on its way without stopping; its number was taken, however, and it developed later that it had been driven to Boston in a fast run the following day.

As stated above, the accident has not yet been probed into officially, and the accounts of the different parties concerned are somewhat at variance. The driver of the big touring car, speaking through his counsel, admits having been in the vicinity at the moment the accident occurred, but denies having had any part in it. This is contradictory to the statements of the surviving occupants of the other car, and this contradiction will have to be cleared up by the coroner. If the statements of those in the injured car should be proved true the position of the accused driver would be a serious one, indeed. It would not be necessary to prove speed excess to insure a conviction, as overtaking the injured car on the wrong side constitutes an infraction of the law, and attempting to pass between the two vehicles at a point where the width of the road would not admit of three vehicles running abreast might also be construed as an infraction of the law. The case against the driver would, of course, be aggravated by his failure to stop after the accident, and might be still further aggravated by the connection of the accident with the law defying record run to Boston the following day. Meanwhile, further comment on the case must be withheld until the finding of the coroner is known.

A word of commendation is due in this connection to the Automobile Club of America for its action in offering a reward for the arrest of the driver responsible for the accident. The accident was a most shocking one, and calculated to strongly impress the public mind, and the circumstances of the accident, as reported in the daily papers, were such as to bring the automobile fraternity into disrepute. The effect is likely to be particularly harmful at the present moment, when more or less oppressive automobile legislation is under consideration in a number of States. By offering the reward the club has put itself on record as seriously opposed to automobile lawlessness.

Against Lawlessness.

We wish to take occasion to again emphasize our opposition to the lawless record runs on public roads between different cities, as inaugurated this season in connection with the Boston Show. These runs are mostly attempted by those who have not sufficient confidence in their vehicles and in themselves to meet their rivals in open competition; they prove absolutely nothing, and are the cause of a great deal of justified public complaint. It has been shown by former performances of this kind that drivers when engaged in such runs will literally stop for nothing that does not imperil their own safety, and minor accidents have been caused by them very frequently. When a driver starts on a trip to establish a speed record between points in a locality where legal speed limits are in force he deliberately sets out to commit a lawless act, and deserves the condemnation of all law respecting citizens. We are perfectly content to

let other publications glorify such acts by leading articles, etc., and shall continue ourselves to ignore them, so far as any mention of details is concerned.

Untaxed Denaturized Alcohol.

The Government Printing Office has just issued a report of hearings on the subject of untaxed denaturized alcohol before the Committee on Ways and Means of the House of Representatives, on February 7-9. The report, which begins with a statement of the Hon. James Wilson, Secretary of Agriculture, contains numerous weighty reasons why the tax should be removed from denaturized alcohol for industrial purposes, and it appears that the chances for favorable legislation on this subject have been materially increased. Although the Secretary of Agriculture declared that he did not intend to either help or hinder legislation, but simply to add his mite to the discussion of the subject which the committee would have to consider, his statements made it clear that the farming community would be very greatly benefited by such legislation, as it would, on the one hand, open up new markets for farm products, and, on the other, help to solve the problems of cheap light, heat and power for agricultural purposes.

The news of any progress in this matter will be welcomed by the motoring fraternity, particularly at the present moment, owing to the fact that an increase in the wholesale price of gasoline at one-half cent per gallon has just been announced, which will probably be followed shortly by an increase of one cent per gallon in the retail price. The increase in the consumption of gasoline will, of course, continue until some suitable substitute is available, and unless one of the several bills on untaxed alcohol now pending is passed in the near future, further advances in the price of gasoline may be looked for.

Among the most interesting testimony presented, from the motorists' standpoint, is that contained in the statements of Prof. Elihu Thomson, of the General Electric Company; Leonard Goebbels, of the Otto Gas Engine Company, and James G. Warnes, of the International Harvester Company, all relating to the use of alcohol in internal combustion engines. Professor Thomson has made some tests on an engine of German manufacture, intended for use in Cuba, where alcohol suitable for use as motor fuel can now be bought at from 12 to 15 cents a gallon, or much less than gasoline. He mentioned that for testing the engine his company imported some of this Cuban alcohol, on which they were obliged to pay a duty of $4 a gallon. As a good deal of fuel is usually required for such testing, this naturally places American manufacturers of such engines at a disadvantage as compared with countries in which denaturized alcohol is tax-free.

The hearing also brought out very strongly the several advantages of alcohol over gasoline, chiefly among which is its relative safety. Whereas a gasoline or kerosene fire cannot be subdued by water, but is, on the contrary, spread over a larger area by a stream of water played on it, owing to the fact that these fuels do not mix but float on water, alcohol mixes with water in all proportions, and is also less easily ignited. There is also another point in connection with the relative safety from fire risks in the use of alcohol, brought out in the statement of Professor Thomson, and which we have never seen mentioned before. The flame of alcohol is non-luminous, and does not radiate heat to nearly the same extent as the luminous yellow flame of gasoline, so that a mass of burning alcohol is not nearly so likely to set fire to surrounding objects as a similar mass of burning gasoline. With the rather frequent garage fires and increasing severity of the restrictions applying to the storage of gasoline, the greater safety of alcohol is a factor of no mean importance.

Considering everything, although the average motorist might not feel inclined to change to alcohol as his motor fuel immediately the tax were removed, placing alcohol on the free list could only benefit the motoring fraternity as well as the industry materially, and improve the relations between motorists and agriculturists. Every motorist and every member of the industry will therefore will be well advised to write to his representative in Congress, urging him to use his influence in favor of such legislation.

Defects of the Pennsylvania Law.

Aside from the automobile legislation now pending in a number of States, a critical examination is invited by laws already in existence which are concededly defective in some of their provisions. The Pennsylvania automobile act, which went into effect January 1, 1906, is a conspicuous example of glaringly defective existing motor vehicle legislation.

In a recent opinion of the Attorney General's Department of Pennsylvania (see In re Automobile Acts, 15 Penn. Dis. Rep. 83), it was held that Section 12 of the automobile act, which provides that the act shall not apply "to any of the motor vehicles which any manufacturer or vendor of automobiles may have in stock for sale, and not for hire or for his private use," is inoperative and futile, for the reason that the provisions of the sections relating to registration and licensing do not apply to the motor vehicle itself, but to the person engaged in operating the machine. This opinion is in accordance with the theory upon which the Pennsylvania act was framed, according to which the operator is the only subject of registration and licensing.

The opinion of the Attorney General's Department suggests a consideration of another provision of the Pennsylvania automobile act which has hitherto escaped notice, in so far as the provision fails to carry out the purpose and theory of the law. We refer to Section 4 of the act, which provides that "every * * * license issued shall contain the name of the licensee under which the said vehicle is licensed, together with the number of book and page in which the same is entered." Manifestly this provision is inoperative and futile, if Section 12 of the act is void, which is held to be the case by the opinion of the Attorney General's Department. It speaks of "the number of the license under which the vehicle is licensed," and according to the Attorney General's opinion and the theory of the whole act the vehicle is not licensed.

The question naturally arises, What is the effect of the invalidity of these provisions on the whole law? Whether or not the invalidity of the requirement as to what shall be contained in the license renders the license itself void, unless there is a compliance with the law as written, may be a question of some difficulty. However, the law provides for one license only, and prescribes the form of that license; and it would seem that if the particular license provided for fails in reference to its legality, the whole act, in so far as it requires the taking out of a license, fails.

There are several other matters of minor importance which upon close reading appear ambiguous. For example, Section 6 provides that "any person using or operating an automobile must display tags," and that "every operator or user of an automobile shall sound a gong or other alarm" under certain conditions. Section 7 provides that "every person licensed must car-

his license with him when using or ating" the automobile.

he particular phraseology to be noted is containing the word user or using. statute not only covers a person driv- or operating a motor vehicle, but spe- ally states that users or persons using automobile must do certain things. it the Legislature meant by this phrase- y is not easy to see, unless it wished to ire persons riding in automobiles to see tags are carried and to make them re- sible for the giving of alarms and r matters which are ordinarily the s of the party actually operating the le.

Spring Overhauling.

may not be amiss to remind motorists this time of the year, when in most icts the roads are entirely unfit for mo- traveling, is a proper time for having car overhauled and painted, if neces- or any changes made that may be de- . At present the repair shops are not rowded with work as they will be in a le of months, when everybody begins ng again, and in consequence the work ely to be done more carefully; besides, a great satisfaction to the owner to his machine in perfect trim when the ng season opens, so he need not miss rides on early pleasant days.

to the parts which should be specially ded to in such an overhauling it is ly possible to lay down any general . The bearings and all wearing parts of course, most likely to need atten- and all such parts should be tested he wear or play that has developed. e is perhaps no part of the car in objectionable play is so likely to oc- as in the steering gear, and all the of this gear should be made the ob- of special scrutiny. In high grade cars oints of the steering gear are generally hardened, and often the wear is even up automatically by cushion springs, his does not apply to the average auto- e, and if it is found that there is so back-lash to the steering wheel that iously affects the control of the car, rorn parts should be determined and d or renewed.

addition to the steering gear, the s deserve a special examination at the ning of the season. It should not only certained that they are so adjusted hey will not drag when released, and firmly when applied, but the state of their wear should be determined, and if they have already been taken up almost to the limit, it is advisable to have them re- lined, or, if no lining is used, to have the bands renewed. There is the more reason for renewing or relining the brakes now, even though they may not yet be completely worn out, because if they reach this stage later in the season when the car is in daily use, there is always a temptation to post- pone the repair, thus courting serious acci- dents.

The repairs and renewals that are most needed will, of course, vary for each in- stance, and if the motorist is not competent himself to decide what is necessary he should place the car in the hands of some responsible firm making a specialty of auto- mobile repair work, instructing them to give it a general overhauling. If he attends to it now there will be fewer interruptions in the use of his car next summer; it may not cost him as much in the end, and he is less likely to miss the enjoyable rides of fine days in the early spring.

Taxing Non-Residents.

Automobilists do not object to a fair tax upon their property, but when the exaction of revenue amounts to oppression, as in the case of E. R. Thomas, the Buffalo manu- facturer, who is temporarily sojourning at Los Angeles, it is time for war. The law in this particular case authorizes a tax on all vehicles, and the assessor determined that all automobiles within the city, whether owned by residents or non-residents tempo- rarily sojourning, were included within the terms of the statute. Accordingly, a tax was levied on the cars of all tourists, and Mr. Thomas was assessed $33.60. He paid it under protest, and commenced proceed- ings to contest the assessor's authority.

This case raises many interesting ques- tions. The ground on which Mr. Thomas objects to the tax is that he already pays taxes on his cars at Buffalo. Undoubtedly the State has authority to tax subjects with- in its jurisdiction, including persons and property, but the doctrine was early estab- lished that the law presumes personal prop- erty to follow the domicile or residence of the owner for the purposes of taxation. Personal property may, however, be taxed in the jurisdiction where it is located, but it must procure a situs in that place, and the question on which the California case will turn will be whether Mr. Thomas' car had obtained a situs in Los Angeles.

The State cannot tax property in the process of transit through its jurisdiction, property employed in interstate commerce. An automobile which starts from New York and travels West to California cannot be taxed as property by the States through which it passes. The California case ulti- mately boils down to a consideration of what constitutes transit. Does the fact that an automobile remains one day in a State deprive it of the character of being in tran- sit? How long must it remain in order to secure a situs for taxation? Is an automo- bile in transit which is temporarily sojourn- ing in a State?

Double taxation is always to be avoided, and the courts will defeat double taxation if possible. In the case under consideration there is double taxation. Mr. Thomas is taxed at both Buffalo and Los Angeles upon the same property.

It would seem that the tax assessor of Los Angeles had no authority to assess au- tomobiles which are merely sojourning in that jurisdiction under the statute in ques- tion, especially considering the fact that the statute does not specifically enumerate auto- mobiles as taxable subjects. In a case de- cided in the District of Columbia it was held that a statute which provided for tax- ing certain vehicles did not include auto- mobiles, because at the time the law was passed automobiles were not known and were not in use. This case may have some bearing upon the authority of the California assessment if the law in question was passed prior to the advent of the automobile. Whatever may be the decision in reference to the California tax it would be well to consider remedial legislation.

Motorists' Troubles in Jamaica.

KINGSTON, Jamaica.—Automobilists visit- ing this island the past winter have entered strong protests against the high price charged here for gasoline, resulting from a duty of 15 cents paid on every gallon im- ported, or nearly 140 per cent on the orig- inal cost. There are also many strict pro- visions regarding the storage and sale of gasoline which cause motorists no end of trouble. On account of the hilly roads a great deal of gasoline is required. In addi- tion to this tax, an import duty must be paid on each car brought to the island, and although the owner can claim a refund of this when he leaves, many visitors are dis- couraged by this red tape from bringing their automobiles here. Residents of Ja- maica believe that it would become a strong rival of Cuba and Florida in attracting mo- tor car owners, if the laws permitted. The Jamaica Motor Union has been formed to prevail upon the Government to change its attitude toward motorists and re' present strict laws.

Automobiling in Cuba.

By Harry B. Haines.

(Concluded.)

The automobile has not found its direct commercial use in Cuba outside of these lines as yet, except as a mode of transportation for wealthy planters to and from their country estates. With the exception of Dr. Ernest Zarra, a wealthy druggist and physician, who does not use the car in his practice, there are no physicians' cars in Havana. A number of famous families, including the Mendozos, Conills, Lenays, Zarras, Cabenas and others, have discarded their horses entirely, and now use automobiles exclusively for pleasure purposes. Horseless vehicles are growing in public favor steadily, and there is a great market for machines. Havana is a Mecca for automobilists, as is all Cuba for that matter, inasmuch as there are practically no speed limits and no obnoxious laws. The police sit and blink wisely when an auto tears up the Prado at 40 miles an hour, despite the fact that the law decrees a speed of 15 miles an hour in the city of Havana.

The other commercial automobile proposition in Havana is that of the Cuba Motor Tally-Ho Company. This concern has three Mack Brothers four cylinder water cooled machines, and in the tourist season discontinues its daily service between the Hotel Pasaje, in Havana, and Guanajay and Mariel; also over the route from the Hotel Pasaje to Guines via Jamaica. C. E. Codd, manager of this company, during the tourist season keeps the rigs busy taking out parties at 10 a. m., 2 p. m. and 4 p. m. to see Havana and the suburbs.

Others leave at 9 a. m. and 2 p. m. to see the Vento Water Works and the famous pineapple fields, while still another route is to the sugar plantations and mills, cars leaving at 8 a. m. and 2 p. m. The charge per passenger for this trip is $3, while $2.50 and $1.50, respectively, are charged for the other two rides. The cars are always full, and the proposition is a paying one. The company's office is on the Prado, and the cars start and end all their trips there. Cars are also rented to private parties in the evenings. Regular trips are made by the rigs nine months in the year in competition with the West Indies Transportation Company's wagons.

The Havana Automobile Company has a small garage at 99 San Lazaro, where a few machines to be hired out to private parties are stored. The Cuban Auto and Machine Company, at 19 Neptuno, have a Knox bus and two touring cars, which are rented out to private parties for sight seeing purposes. These machines are always in demand. Antonio Garcia, a son of the famous Cuban General, is an auto enthusiast, and is preparing to open a fashionable garage and to solicit the trade of the wealthy class of the island. He has not secured a location as yet.

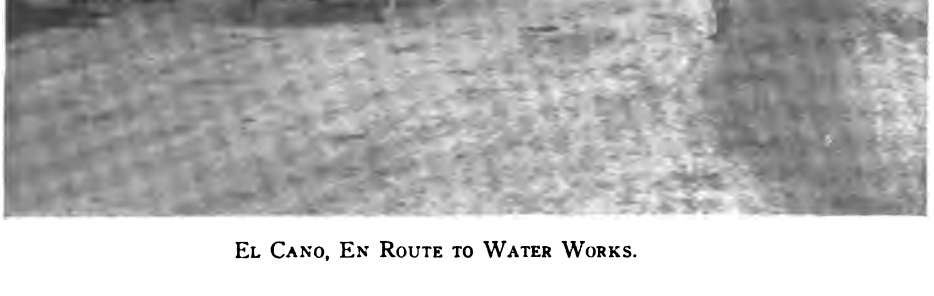
There are a number of other companies planning to enter Havana, and there is no doubt that next winter will see several more sightseeing concerns running cars there. The service between inland towns has also proven profitable and is attractive, and before long the whole island will be intersected with automobile "gauguas," instead of the present mule drawn ones. There is also a large future there for the automobile truck, that phase of the situation being almost entirely undeveloped.

There are in and about Havana fully 400 miles of excellent roads, roads such as Long Island and New Jersey would be proud to boast of, and they are most excellently kept. The supervisors of the highway, hired by the Government, are stationed at intervals of 2 miles along each road, and it is their duty to keep the road cleaned the same as the asphalt streets in large cities are cleaned. They also keep the gutters clean and report any holes that may develop in the road so that they may be repaired at once. Cuban roads are ideal in respect of cleanliness, and they are surely well built and generously wide. The Government keeps a force of road repairers or camineros almost constantly at work on these roads, which lead through a country of tropical richness which, for scenic beauty and general picturesqueness, beggars description. Although there are places in the roads that are rough, fully 90 per cent. of this distance is in such excellent shape that 60 miles an hour would not be at all an impossible speed over them, and it takes pretty good roads to admit of that sort of scorching.

The run from Havana to San Cristobal, which takes the automobilist into the



Starting From Main Office, Prado 9a.



El Cano, En Route to Water Works.

ovince of Pinar del Rio, is the longest ssible ride in Cuba at present. It is 60 les, or about 92 kilometres, and the ads for the entire distance are excel- t. The road terminates abruptly at San istobel and degenerates into a typical ban mud road, which is impassable for thing but the huge, wide wheeled carts. is the intention of the authorities, how- r, to continue this road on to the city Pinar del Rio, a distance of about 100 es from Havana. From this point on it planned to construct a road running theasterly to Bahia Honda. Another d is now under course of construction, h which connection will be made, per- ting the tourist to return to Havana by way of Cabanas and Mariel.

aking the run to San Cristobel from vana, which I had the pleasure of mak- with Mr. Barnhart in his Maxwell car, route from the garage on Calle Zuleuta ut to the Prado, and thence out past Mira Mar Hotel and old Castle Morro El Vedado, the swell residential section Havana. This leads us out over the ous Malecon driveway and past the an asylum, lepers' hospital, Colon cem- y, and so on to the pontoon bridge built the American troops in 1898 across Almendares river. The road itself was built by the Americans for a consid- le distance. Crossing the stream the l leads up a short, steep hill and past Camp Columbia, where the American ps were quartered during the war. A t distance beyond we rushed into the ns of Quemados and Marianao, which close together. Just outside of Mari- the road turns west and winds down ort and steep hill, with a short turn at bottom, and cross an old stone bridge he village of La Lisa. This is about iles from Havana, and the real beauty he country may be appreciated. The road is a wide one, well built and well kept. Every two miles along its route the little house of the Government road caretaker may be seen, and that official is out on the highway cleaning it, much the same as the asphalt streets are cleaned in the large cities, and keeping all rubbish and refuse off it. The gutters are also kept clean and free from vegetation, and as soon as a bad spot develops word is sent to the road commissioner, who comes along with his gang of laborers and repairs the place. This road was built years ago by the Spanish for use as a military highway, and was well constructed. Previous to the destructive war of 1895 the large homes of wealthy planters lined it, but now fire wrecked walls and partially devastated fields tell of its former grandeur. The work of Antonio Maceo and the Spaniards was well done, and none of the great houses have been rebuilt.



ENTRANCE WATER WORKS.

There are, however, still large tobacco plantations, banana groves, pineapple fields and some sugar cane, although this section as a sugar raising one has deteriorated materially.

The famous Vuelta Abajo tobacco leaf is still grown in this section. The country road is lined with the huge but graceful royal palms and other tropical foliage. The natives are picturesque and the scene is ever changing. A man dashes by on horseback, several laborers carrying their machetes saunter past on their way from the fields, a gaugua with its motley load of passengers rolls by, while next a team of oxen yoked together and dragging a huge two wheeled cart come into view; and so it is as one speeds over the fine, hard and smooth white road, a continuous panorama of oddity and ever changing scenes.

Further on along this road the country becomes rolly, and we passed one of the famous Spanish block houses. The natives are uniformly respectful, the drivers of vehicles of all kinds giving way as soon as the horn is sounded, while the horseman takes to the gully and the pedestrian in many instances rushes for the field to get away from the carro del diablo, as the auto is called.

The trouble with the roads is that they are too good. They invite and tempt the autoist to speed and to miss the beauties that are offered at almost every foot of the way. At short intervals we rushed into various small towns, all of which are duplicates and have the inevitable public store, public square, church and a string of one story houses set immediately on the edge of the road, with the open fields behind them. The tavern loafers look up idly and the children hoot and shout the same in Cuba as in every other spot in the world at the auto's approach, or if it stops cro around and try to earn a few pennies



SUGAR PLANTATION ROUTE.

trying to help or running to carry "agua" to cool the engine.

From La Lisa to Guanajay is a 15 mile run over ideal roads leading through Arroyo Arenas, Punta Brava, Hoyo Colorado and El Caimito, all picturesque Cuban villages. In the country a knowledge of Spanish is absolutely essential if the automobilist would ask road directions or get the things to eat and drink that he desires. He will find the charges reasonable and the food and drink clean and wholesome at any of the places along the road that he may care to stop at, but he will not, as an ordinary thing, find anyone who talks any English, after he is 10 miles away from Havana.

Beyond Guanajay the road enters "The Garden Spot of Cuba" around Artemisa. This section is remarkably rich in tropical growth, but further on the country grows slightly poorer and the palmetto takes the place of the palma real. For 35 miles the road runs along with scarcely a perceptible grade.

Guanajay is a sort of a centre and from it roads strike off to Mariel and Cabanas, a distance of 15 miles or so to the northward. There are three ranges of hills to be crossed, but the roads are excellent and the grades easy. There are also two or three other short roads that branch off, but these are not of any great length or importance.

San Cristobel, a sleepy old town, is finally reached, and if the car is a high powered one and too many ox carts are not met with en route the run back to Havana may be made in record time.

In Cuba when a town has side streets it is considered quite a place, and there are few of the villages that aspire to this dignity. In the winter months the thermometer ranges from 80° to 85° in the shade, and the native children run about the streets absolutely naked, never thinking of wearing clothes until they are six or eight years old. A gunny sack is generally enough then to meet their needs.

The roads seem to hold the heat with great intensity and the tourist must needs watch his tires and let the air pressure out of them as conditions demand. It is suicidal to run with tires that are pumped up very hard, as the heat expands the air and "blow outs" follow. Tire troubles are frequent and are most annoying. After a puncture it is useless to repair a tube with a cement patch, as this will invariably melt off and give trouble, the only method being to have the tube vulcanized. Spare tires are the most important essential when touring.

The effect of the heat of the roads on tires was demonstrated to us at Guanajay. We had stopped at the public store there and were enjoying a refreshing native drink, when a large French car dashed down the road, and, as it turned the corner, going at about 25 miles an hour, there was a loud explosion and the rear shoe blew out. The machine proved to be a 50 horse power Panhard, driven by Colonel John Jacob Astor, who was on his way to San Cristobel. It took nearly an hour for his chauffeur to remove the old shoe and replace it with a new one.

Apart from the San Christobel trip there are a number of other runs in and about Havana varying from 10 to 40 miles, and all over good roads. These include trips to Cojimar, to Managua, to Benjucal and to Guines. Each road is picturesque and each has its points of special interest. The Benjucal road runs through Santiago de las Vegas, a small town full of loudly yelping dogs, who do their best to commit suicide under the auto wheels. Near San Antonio de los Banos this road branches off and climbs the hill to the mountain, under which the remains of the famous insurgent Antonio Maceo lie buried.

The Cojimar run is through the suburbs of Havana, where the intrenchments thrown up by the Spanish to guard the city against Maximo Gomez and his troops may still be seen. It runs through the town of Gaunabacoa and so on to Cojimar, where a quaint little village is found nestling on the sea shore, with its typical and picturesque little Spanish fort, with the usual moat, watch tower and dungeons.

The road to Guines is unanimously voted the most beautiful of any near Havana. It is an old road and the trees which line its sides have attained a large growth and spread their limbs in cooling shade. At times their limbs interlacing form a green tunnel that is a bower of beauty. Indian laurel, interspersed with the brilliant royal ponciana and the prettily fringed blossoms of the algarroba, form a combination of floral beauty and attractiveness that cannot be excelled.

Altogether Cuba is a country of lavish tropical beauty. Her roads are well built and well kept and she welcomes Americans. The only drawback is that the Cubans and Spaniards are shrewd business men, and from the hotelkeepers to the smallest shopkeeper they all have the one saying, "Americano mucho dinero," meaning "Americans have much money," and they at once proceed to relieve the tourist of that burden. There are two prices for everything in Cuba, the American price, which is excessive, and the Cuban price, which is fair. If the American dickers he will get the right price, but if he pays what is asked without protest he will be fleeced.

There is no doubting the fact that Cuba is a fine place for automobiling and that in the winters to come many Americans will avail themselves of the opportunity presented to tour in that delightful climate over the almost perfect roads found there. The Cuban Government is not slow to realize the advantage of the automobile and will spend thousands of dollars in laying out and improving new roads for the use of the horseless vehicles. That the motor truck will play an important part in the commercial development of that hustling little island goes without saying.

Practical Demonstration of a Gasoline Truck.

Johnson & Johnson, of New Brunswick, N. J., manufacturers of surgical supplies, were given a demonstration March 8 and 9 of a 3 ton gasoline truck for the transportation of freight between their plant at New Brunswick and their branch at Conshohocken, Pa. On the morning of March 8 the truck was loaded at Conshohocken with a 2 ton load, and left for New Brunswick at 7 o'clock, arriving there at 5 p. m. The next morning the truck carted a load of lumber of about 6,000 pounds from the freight house to the company's box plant in six minutes, thirty minutes being required by the horse trucks to make the same trip. After the lumber was unloaded the machine was brought back to the George street yards, and was loaded with a freight car load of shoes weighing 8,000 pounds. The time consumed in reloading the car, making the trip and delivering the goods, was just one-fourth that taken when the horse power was used. To reach these yards a steep incline must be mounted, which the truck covered without difficulty.

In the afternoon the car was used to transport two carloads of surgical instruments from the plant of the company to the George street yards, each carload being about 15 tons. At 6:30 a. m. the day following the truck, driven by an employee of the automobile company, left New Brunswick with a load of surgical supplies for Conshohocken, 60 miles distant, where it arrived at 4:30 p. m.

During the summer months the Middlesex Transportation Company operate two boats between New Brunswick and New York, which not only carry freight for Johnson & Johnson, but also for other merchants in New Brunswick. For delivering this freight eight horse drawn trucks are used, but if the automobile meets with success it will be adopted to perform this work. In this event a garage will be erected on the grounds of the company at New Brunswick, and one at Conshohocken.

Electric Vehicles for Estate Work.

The Waverley branch of the Pope Motor Car Company some time ago received orders from George L. Carnegie, a nephew of Andrew Carnegie, for seven electric vehicles of their different types, all of special design, so far as the body work is concerned, for use at "Plum Orchard," an island off the Florida coast at Fernandino, which is owned by the Carnegie family and inhabited exclusively by them and their servants. The vehicles include three speed road wagons, a twelve passenger omnibus and eight passenger break, a surrey and a combination truck and passenger car. All of the seven machines are handsomely finished and fitted with all the accessories known to the automobile trade. The truck passenger car is remarkable for the fact that its canopy and seats can be easily removed, being attached

to the floor of the wagon by bolts, as shown in the accompanying illustration. This vehicle is to be used for the transportation of the servants and baggage, using a special body for each purpose. It is finished in Brewster green and presents a quite attractive appearance. The carrying capacity as a truck is 1 ton, and the loading space 12x4 feet. The wheels are of the artillery type, shod with solid rubber tires, the front ones being 32x3 and the rear 36x 3½ inches.



POPE-WAVERLEY ELECTRIC ESTATE WAGON.

New Ideas in Garage Construction.

We show herewith a view of a brick garage recently added to the Locomobile plant at Bridgeport. The building is designed on original lines, and a particularly novel point resides in the doors, of which there are ten on each side. It will be noticed that practically the entire side of the building consists of doors, which when lowered admit plenty of light and which when fully open form an awning. In the photograph four doors are shown in various positions—one had been partly lifted, others are opened wider, and one is open as far as it will go, giving plenty of clearance for any touring car with the top up. The doors are very easily moved, the weight being balanced, and will stay in any position without locking. There are some interesting features about the inside of the garage, one of them being the heating apparatus, which consists of a long pipe running the full length of the room with open ends, hot air taken from around a steam coil being forced into this pipe and out through the various openings. A sort of mezzanine floor is located at one end, with lockers for the use of chauffeurs, and a staircase leading to this floor is hinged so that it may be swung up when out of use, and thus be out of the way. The floor is of concrete, with eight pits. Another feature is an enclosed telephone booth in communication with the offices.



LOCOMOBILE GARAGE DOORS.

French Military Automobile.

The French Minister of War, M. Etienne, recently witnessed some tests of a military automobile built for the Russian Government by the firm of Messrs. Charron, Girardot & Voigt. The car contains a machine gun provided with ammunition for firing 10,000 shots. The turret is so contrived that the machine gun can be utilized in every direction. The artillerymen and the driver, who can start the motor from the interior, are completely protected by the armor plate. The whole of the car, with the machine gun, the ammunition and the necessary supply of petroleum for a very long run, is encased in this armor plate, the only portion of the vehicle unprotected being the pneumatic tires, which are of a special description. Moreover, the car always contains spare wheels for use in case of need. The frame on which this fortress is built is that of an ordinary 40 horse power automobile, provided with extra strong springs. The weight of the machine ready for service, with the artillerymen and driver, is about 3,200 kilograms or 3 tons 2 cwt. It is capable of traveling on a level road at the rate of 40 kilometres, or 28 miles per hour, and can ascend hills of almost all gradients not exceeding 25 per cent. Two steel rails attached to the side of the car are, when required, used to enable vehicles to cross a ditch or trench.

The New Motor Mart, Boston.

The new Motor Mart in Park square, Boston, is practically completed, and is rapidly assuming a businesslike appearance. The building is of substantial concrete construction, and equipped with the most modern appliances known to the trade. It is said of this building that its exhibition rooms, with its repair shops and convenience for showing and handling the cars, is not surpassed by any building of its kind in the country, and when fully occupied its tenants' exhibits will compare quite favorably with some of the smaller automobile shows. Every effort possible is being made to fully occupy the building before the beginning of the coming Boston show. Already a number of dealers have moved in, and among the representatives that are to occupy the mart will be found agents of the Packard Motor Car Company, Cadillac Motor Car Company, Olds Motor Works, Grout Brothers Automobile Company, Waltham Manufacturing Company, etc. Following is a complete list of dealers in Motor Mart: Geo. E. Curtis, Robbins Brothers, Angier Company, A. T. Fuller, A. T. Stone, E. T. Blake & Co., Adams & Sutton Company, N. H. Saunders, E. T. Kimball Company, Abram Hoffecker, Northern Automobile Company, Anderson Spark Company, C. H. Saunders, A. T. Fuller, Morgan & Wright, N. H. Saunders, Crown Motor Company, Pearlstein & Shear.

ELECTRIC IGNITION

Electro-Magnetic Induction.

When a magnet is inserted into or withdrawn from a coil (Fig. 1), an electromotive force is induced in the coil, and if the coil forms a closed circuit, a wave of current is caused to flow through it. The electromotive force lasts only so long as the relative position of the coil and the magnet is changing, and its direction is opposite for approach and recession. By closing the circuit of the coil through a current indicator or galvanometer, the current impulses as the magnet is brought nearer to or removed farther from the coil can be directly observed. The same effect can be secured by substituting for the magnet a coil through which a current from some outside source, such as a battery, is flowing. By placing the two coils with their axes coincident and approaching and separating alternately, current impulses will be generated in the second coil, although this coil has absolutely no connection with the other coil, which receives its current from an outside source. This effect is known as electromagnetic induction, and was discovered by Faraday in 1831.

When a magnet is placed with its axis coinciding with that of a coil, at a slight distance from the coil, some of the lines of force emanating from the poles of the magnet will pass through the coil and return on the outside, thus looping the spires, turns or convolutions of the coil. When the magnet is brought nearer the coil the number of lines of force passing through the coil increases, and when the magnet is moved farther away from the coil the number of

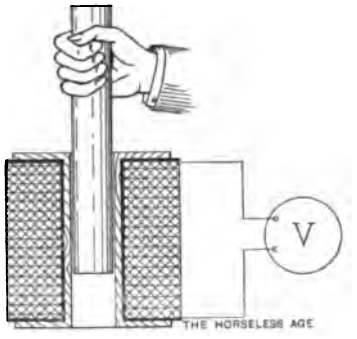


FIG. 1.

lines of force passing through the coil decreases. The total number of lines of force emanating from the north pole and returning to the south pole of the magnet remains the same, but as the magnet approaches closer to the coil, an increased proportion of the lines link the convolutions of the coil, and it is this linking or cutting of magnetic lines of force by electric conductors which is the cause of the phenomenon of electromagnetic induction. Whenever an electric conductor moves in a magnetic field at an angle to the magnetic lines of force, so as to cut these lines, an electromotive force is induced in the conductor, and if the conductor forms a closed circuit, a current is caused to flow in it. The electromotive force induced depends upon the rate at which lines of force are cut. If 100,000,000 are cut per second, the electromotive force is one volt.

SELF INDUCTION.

When a current is flowing through a coil of wire, a magnetic field is set up in the surrounding space, as has already been ex-

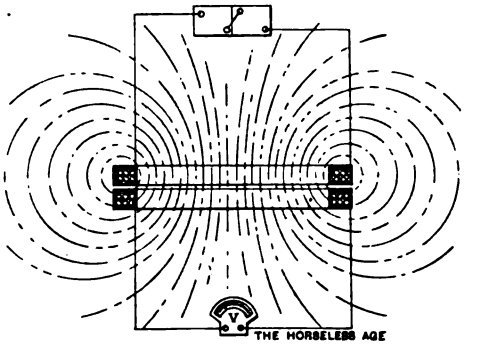


FIG. 2.

plained. If now the current is stopped, the magnetic field will, of course, also cease. Now, the effect upon the coil of the removal of this magnetic field is exactly the same as if the field had been due to an outside magnet; in other words, an electric impulse is induced in the coil by the very dying out of the current in it, and this impulse is in the same direction as the current in the coil. The result is that when the circuit is broken to stop the current, the decrease in the current adds momentarily to the electromotive force active in the circuit, and a visible spark, or even an arc, is generally formed at the break. This phenomenon is known as self induction. Owing to the self induction of a circuit, the current in it, therefore, tends to continue when the circuit is broken; but the self induction also opposes the rise of a current when the circuit is first made. Self induction therefore opposes any variation in the current flowing in a circuit, being similar to the property of inertia of matter, which opposes any variation in the motion of a body.

MUTUAL INDUCTION (FIG. 2).

Now, suppose that two coils are mounted side by side, with their axes coinciding, one being connected to a source of current and the other closed upon itself. If the coils are very large in diameter and relatively flat, approximately the same number of lines pass through both. If now the current in the one coil is stopped, and the magnetic field in consequence ceases, both coils are cut by the same magnetic lines, and the same inductive effect is produced in both. The effect in the coil carrying the current is, as already explained, called self induction, while that produced by this coil on the other coil is called mutual induction. In the latter case there is a transference of electric energy from one coil to the other without there being any conducting connection between the two.

It was stated above that the electromotive force induced in a conductor is proportional to the rate at which lines of force are cut. If the conductor is formed into a coil of many turns and is brought into a magnetic field in which a certain number of lines of force pass through it, every line is cut a number of times equal to the number of turns in the coil. In order, therefore, to produce a high electromotive force by electro-magnetic induction we require, first, a strong magnetic field; second, a coil of many turns; third, means for varying the number of lines of force interlinked with the coil as rapidly as possible.

In such an arrangement of two coils in inductive relation to each other, the one which is connected to the source of current is called the primary coil, and the other one the secondary. The combination is called an induction coil, or a transformer. It is used in practice for varying the electromotive force of a circuit. If the primary coil consists of a few turns of heavy wire and the secondary of numerous turns of fine wire, the electromotive force induced in the secondary upon making or breaking the primary circuit is much greater than the electromotive force of the source of current supplying the primary coil. Of course, not all the lines of force produced by the current in the primary coil pass through the secondary coil, and in order to reduce the leakage as much as possible the coils must be placed close together. To produce the strongest magnetic effect a soft iron core must be placed inside the two coils.

From the foregoing it will be seen that an electric current can be produced by mechanically moving a conductor in a mag-

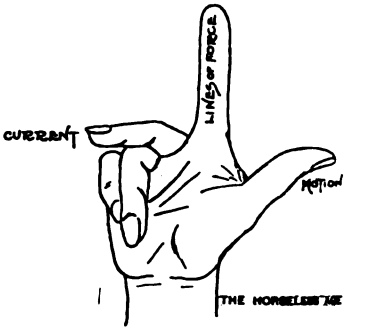


FIG. 3.

netic field in such a direction as to cut the lines of force. When a current is thus produced there is a certain resistance to the motion of the conductor. The direction of an electromotive force thus induced may be found from the following rule:

Extend the thumb, index finger and middle finger in directions at right angles to each other (see Fig. 3). If the index finger indicates the direction of the lines of force and the thumb the direction of motion, then the middle finger will indicate the direction of the induced electromotive force.

MAINTENANCE AND REPAIRS

ıe Things I Found Out by Hard Experience.

By Jesse W. Buckman.

A HOME MADE JACK.

will begin this article by showing how mple and inexpensive device can be e to keep the weight of an automobile he tires when not in use. Any black- n can make it out of old wagon tires

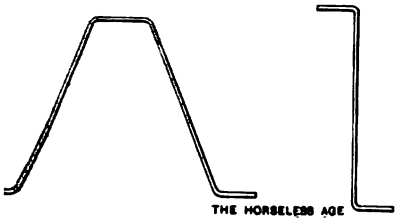


Fig. 1. Fig. 2.

ıitable size for the weight of the car. make a section like Fig. 1, which is ly bent to shape, then another like Fig. nd weld the top of piece 2 to the r side of the central portion of piece 2. e 2 must be made long enough to allow set out from the branches of piece 1 to the whole stability. When the rigging ɔne it looks like a three legged stool . 3). Of course, one must see that it ıde high enough to raise the tires about :h from the floor.

:xt I will explain how I repaired a ing chain sprocket that was broken in :s, the sprocket being 3 inches in diam-

First I made a ring similar to a ıer and drilled through it six ⅛ inch ; at equal distances apart. I clamped ring to the sprocket, marked off the ; on the sprocket, drilled through the :ket and riveted the ring to it. The :ket is now doing as good service as

REJUVENATING DRY CELLS.

ter making some exhaustive tests with batteries, I will give the readers of Horseless Age the benefit of these Dry batteries have a very nasty of giving out on the road when some s 25 or 50 miles from home, and it was ulties of this kind that led the writer ıake the experiments referred to. If batteries give out on the road take screw driver and dig down between

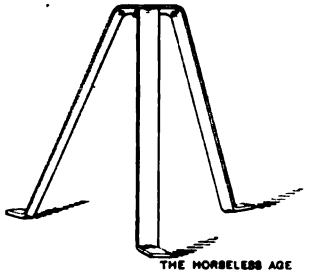


Fig. 3.

the carbon rod and the zinc shell to a depth of 4 or 5 inches, and fill the holes with water, or, still better, if you are near a drug store, with muriatic acid, of which 10 cents' worth may be purchased. The acid must be handled carefully, as it is a poison. If acid is used you will be surprised at the result, for in one half hour you can go on your way rejoicing. I have taken an old cell that had been discarded six months ago, having shown only 3 amperes, and after treating it as described above it tested 20 amperes. By filling the cell with water the amperage may be brought up to 10, and with good cider vinegar to about 15.

TOOL FOR TAKING REAR AXLE APART.

Some time ago I had occasion to put in a new differential gear case in a runabout and not having two pipe wrenches large enough for the purpose, I set about to make a tool to unscrew the outer case, each half of which had a ⅝ inch hole near the outer edge. I made two irons, as shown in the sketch, of 1¼x⅝ inch stock, 3 feet long. The portion A of the iron is the lever arm and B is a curved section so bent as to conform to the outline of the case and the axle. In the latter portion, B, I punched a ⅝ inch hole and welded in a piece of ⅝



Fig. 4.

inch round iron to project about 1 inch. Then I clamped the whole axle in a vise and put the irons on opposite sides, with the pins in place in the holes in the case, and I unscrewed the case without any trouble. After repairing the differential I reversed the irons and screwed the axle together again in the same way.

Refitting Steam Engine Valves.

By Jules Ouvrier.

While it is manifestly not easy to make repairs on a modern four cylinder gasoline touring car, it is as child's play compared to working on the steam car. In fact, there is no mechanic of my acquaintance who would not rather get a "lay-off" than be assigned to make repairs on one of the critters. Therefore, whenever I am given a steamer to work on (which happens quite frequently of late), I am not told that I "stand in with the boss." Of all the beastly jobs I've done, the removal and finally the replacing of the asbestos lagging of the engines stands at the pinnacle. I have found it to be best to leave the stuff off for a few days after making repairs, until one is absolutely certain that there is no more need to dissect the engine, for many a time a trifling alteration necessitates its removal. The particular car of which I am about to speak suffered from leaky valves and a consequent waste of steam, a malady prevalent among steamers, due to high pressure and inefficient lubricating facilities. After removing the jacket and lagging and some fifteen screws, very difficult to remove, the valve chest cover was lifted off. The valve seat had a groove worn in it an eighth of an inch deep, and several others not so deep. To remedy this was a difficult matter; both cylinders, high and low pressure, are cast in one piece, and the opening on the side is the only means of reaching the valve seat. To do this at the factory requires special tools.

After listening to the remarks of brother mechanics, who were unanimous in saying that it would have to be sent to the factory, I started on the job after securing a good, flat file, working by short strokes for fully two hours. Then after a short breathing spell, I thought out a means of finishing the surface absolutely true. I took a piece of one-half inch boiler plate, a little longer and wider than the slide valve, and after turning one side of this by the aid of a surface plate and red lead soon was possessed of a perfectly smooth plate. Now, back to car with plate and red lead. After applying a thin coat of red lead to the plate, it was carefully laid on the valve seat and rubbed back and forth a number of times, thus marking the high spots. These were removed with a flat nose scraper; the plate was again applied and the high spots touched up a bit; this was done a number of times until the entire surface was covered with the read lead. Now, flour of emery was used with the result that the surface shone like that of a lens. The valve was faced off in the lathe, scraped and ground. Thus after nearly ten hours' work the parts were reassembled; after everything was in place, the valve was found to have over three-sixteenths inch play. The low pressure valve also had quite a bit of play, but the owner wanted to use the car, he and the wiseacres holding that the steam pressure would keep them on their seats. I completed my work with the exception of the lagging and jacket. The expected happened; all went well on the level and up hills after once being started, but if stopped on a down grade, on starting great volumes of steam would rush through. Sometimes, by moving the link lever, things would resume their normal conditions.

After a few days of this, the owner consented to run the machine into the shop and use his leather dummies and the street cars for a few days until I could straighten matters out. I concluded to make two collars of brass of sufficient thickness, and shrink and pin them, one on each shoulder of the valve stem. These collars were so made that when in place the valve stem could be easily revolved, but the collars absolutely prevented any motion between the valve and its seat. Now it was of no consequence whether the car was stopped on a down grade or not, the valve remained on its seat. After a trial the owner concluded to have the low pressure valve fixed in the same way. The saving in steam was quite noticeable, and no doubt paid for the job in a few weeks.

NEW VEHICLES AND PARTS.

The Wayne Model F.

The Wayne Automobile Company, of Detroit, Mich., have added to their 1906 models three new cars, known as Models H, K and F, making five models in all. The Model C light tonneau car of last year, with double opposed 5¼x5 inch engine under the body and single chain drive, has been continued practically without change, as has also their four cylinder, 24 horse power Model B.

MODEL F.

The 50 horse power Model F is a four cylinder, 5½x5 inch touring car (Fig. 1). The tread is standard and the wheel base is 117 inches. The change gear is a three speed and reverse sliding gear. The drive is by shaft and bevel gear (as in all the new models). The tonneau is very roomy, having a seat cushion 54 inches in width. On the back of the front seat is an auxiliary seat, which lets down and will accommodate two extra passengers, making the seating capacity of the car seven. The body is upholstered in red enameled leather which is claimed not to crack, is flexible and absolutely impervious to water from either side. The tonneau doors are very wide, hinged at the rear and swung clear of the metal fenders. The entire body—which is slightly squared at the corners, following carriage practice—is of laminated wood, with easy flowing curves. The space under the rear seat may be devoted to luggage, as the tools are carried in a tool box on the running board, long enough to take an ordinary pump. On the right running board is a box for storage batteries. The running boards, as usual, are brass edged and covered with pyramid rubber. The supports, three to each, are steel drop forgings.

The dash is of pressed steel, of graceful design, with covered top, brass edged and colored with baked enamel to match the body. The fenders, which have considerable flare, are set close into the frame on the inside, and are fitted at the outside edge with a splash retaining flange, which prevents the mud from glancing outward and on windy days being blown into the front seats. Each side of the hood is double jointed, folding back on a hinge at the ridge, and can be entirely removed if desired.

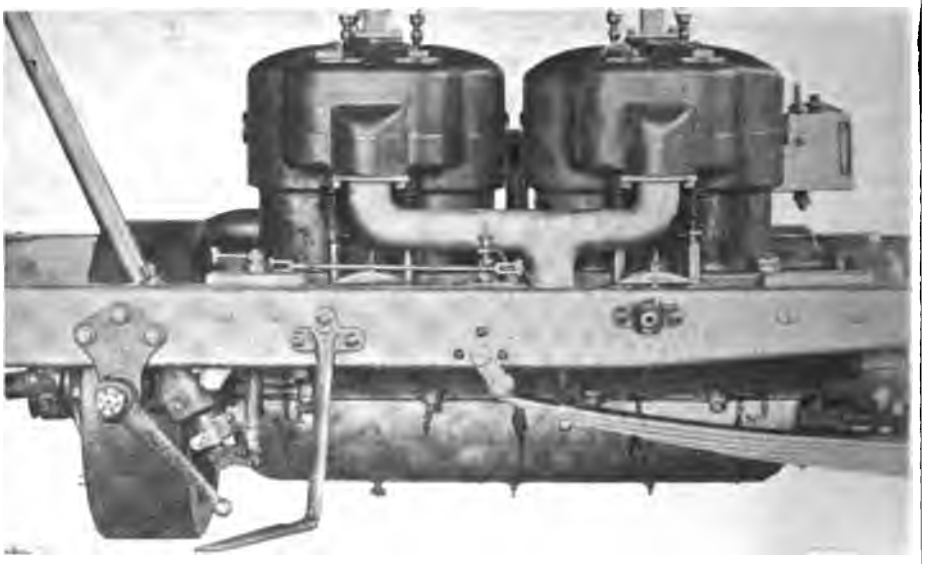


FIG. 2.—RIGHT SIDE VIEW WAYNE FIFTY HORSE POWER.

FRAME.

The frame is of the prevailing type of channel section pressed steel, three-sixteenths inch thick, 4 inches deep at the middle and tapered toward the ends. The side members are not offset or narrowed at the front, and are stiffened by seven-sixteenths inch round section, turnbuckled truss rods with one strut near the middle. There are four cross members, with side gusset plates at the ends—one at the front, another at the rear and two which support the transmission. The engine casing forms the engine support, and no sub-frame is used.

MOTOR CONSTRUCTION.

The cylinders are cast in pairs, with the valves on opposite sides, and the water jackets are integral. They are bored, reamed and ground, and held to the crank case by six studs, with single nuts at the bottom and a nut and lock nut at the top. The water jacket goes between the cylinder bores, and completely surrounds the valves and valve stem guides.

The valves are mechanical and interchangeable, and are made of nickel steel with integral heads. The end of the stem is threaded and slotted to receive a combination cup washer and nut, which screws on and has a pin through its head and the slot in the stem. This device also serves the purpose of adjusting the valve stem length. Bronze screw plugs are screwed into the valve chambers over the valves on copper asbestos gaskets. A special compression relief and priming cup are inserted over the exhaust valves and the ignition plugs over the inlet valves. The valve springs are barrel shaped, being largest at the middle. The short valve lifting rods are of machinery steel, with the usual forked ends flattened on the sides to prevent turning, and carry hardened steel rollers. They slide in bronze guides cut off to receive the roll at the maximum lift. The two adjoining guides are held by a bronze yoke and one nut on a stud, with a nut at the lower end, and are prevented from turning by a dowel pin. All studs projecting from the aluminum case, although threaded into the case, are also provided with a lock nut and steel washer at the under end, to take the wear off the threads. This is a wise precaution, as any stud subjected to alternate tension and compression, and depending for its fastening upon a thread in aluminum, will sooner or later work loose, owing to the fact that the aluminum becomes actually compressed or packed, leaving the thread large.

The pistons, of gray cast iron, are very light in weight; they are rounded at the upper edge, but flat on top, and are about two one-thousandths inch smaller than the bore at the bottom, and tapered above the wrist pin to about seven one-thousandths inch smaller than the bore. They are fitted with four rings, three above the pin and one halfway between the pin and the bottom. These rings are eccentric, being one-quarter inch at the thickest place and one-eighth inch at the thinnest, step jointed and pinned.



FIG. 1.—FIFTY HORSE POWER WAYNE, MODEL F.

e wrist pin is a 1 inch hollow, case ened machinery steel pin. It is a ed fit into a reamed hole, and is fur- retained by a set screw at each end gh the boss and one wall of the pin, abutting against the inside wall. The crews are locked from backing out by g a wire passed through a hole in the of each. The connecting rods are drop forgings of I beam section hav- bronze sleeve, unadjustable bushing ed in at the upper end, giving a bear- f 2¼ inches between the bosses. The bearing is a divided babbitt box d by bronze and flanged at both ends. cap is held by two studs and castel- nuts.

e crank shaft is a drop forging of 40 carbon steel, and runs in three bear- of similar construction to those of the

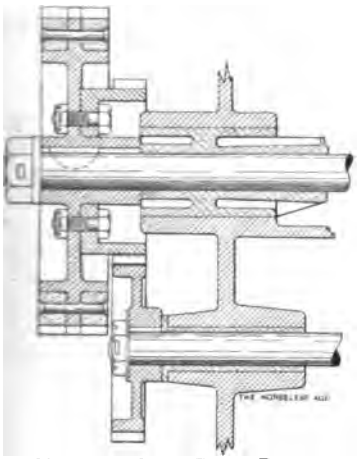


FIG. 3.—CAM GEAR DETAIL.

ecting rod. These bearings are sup- d from the upper half of the case by studs with nuts at both ends. The heel flange is forged integral with the and all the bearings are ground, the lle one being 4 inches long and those ie ends 4½x1⅞ inches diameter. An hole is drilled through the shaft from ear crank web to the end to supply oil the bearing of the cone clutch.

ie crank case is an aluminum casting. lower part, which is simply an oil pan, ovided with a partition at the middle to ent the two middle cylinders throwing much oil into each other. Drain plugs rovided to test the oil level in the case. upper half forms not only the support- arms but also the complete dust pan hield. The forward arms of I section the rear arms are channel, and an in- al web extends between them. These s are formed into a lip at the outer and rest on top of the frame. The cal surface at the end of the arms against a cast steel piece which fits the pressed steel frame and offers a surface. A bolt passes from the inside ie arm through the steel casting and frame. This is clearly illustrated in sectional end view of the engine.

he cam shafts are made of cold rolled k, and are fitted with case hardened s held by straight pins with riveted ends. The shafts run in three bronze sleeve bearings, the diameter of which is large enough so that the entire cam shaft can be withdrawn through the opening. The forward one of these bearings is shown in Fig. 3, which also shows the bronze and fibre cam shaft gear, with the fibre gear bolted to its back, which drives a cast iron gear on the special pump and timer shaft. This shaft runs in bearings fitted into the supporting arms of the crank case on the left side of the engine, and carries near its middle an ordinary bronze circulating gear pump, and at its rear end the timer. The crank shaft gear is of steel, while the cam shaft gear is of bronze and fibre, with 1½ inch face. Fig. 6 shows the arrangement of the gears and how the forward end of the engine case forms the two to one gear case.

CARBURETOR.

The arrangement of the cast iron exhaust pipe can be seen in Fig. 6, and in Fig. 2 are shown the inlet pipes of aluminum and the top of the carburetor, a sectional drawing of which is herewith shown. The float is an annular cork ring, with the nozzle centrally within it, while the inlet into the float chamber is at the bottom. Around the nozzle is an aluminum tube, flared out at the upper end into an inverted cone, the edge of which rests on a circular shelf forming its seat. This aluminum piece is held down by both its weight and the pressure of a light spring, and acts as an auxiliary air inlet valve, as it raises from its seat at high speeds and allows air to enter the mixture without first having passed over the nozzle. The gasoline feeds by gravity from a 28 gallon galvanized iron tank under the front seat. This tank has a reserve compartment holding about 4 gallons, to be used in case of emergency.

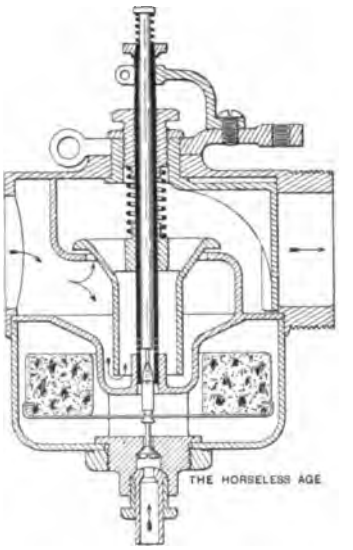


FIG. 4.—CARBURETOR.

The tank has two openings, and can be filled from either front seat.

The muffler is carried lengthwise under the rear of the car. It has a 2 inch pipe leading into it, and is fitted with four interior discs, each having a 1¼ inch hole through the middle and a ring of eight three-eighth inch holes around it. It is very "open," cannot be injured by an explosion, and is yet remarkably quiet.

The oiling is by a McLeod force feed oiler (seen in Fig. 2), which is supported on a bracket from the front crank case arm and driven by a coiled steel wire belt from a pulley on the pump shaft. The four leads from this oiler pass through sight feeds on the dash, and then deliver into the four divisions of the crank case, after which everything is taken care of by splash, suitable pockets and oil grooves being cut

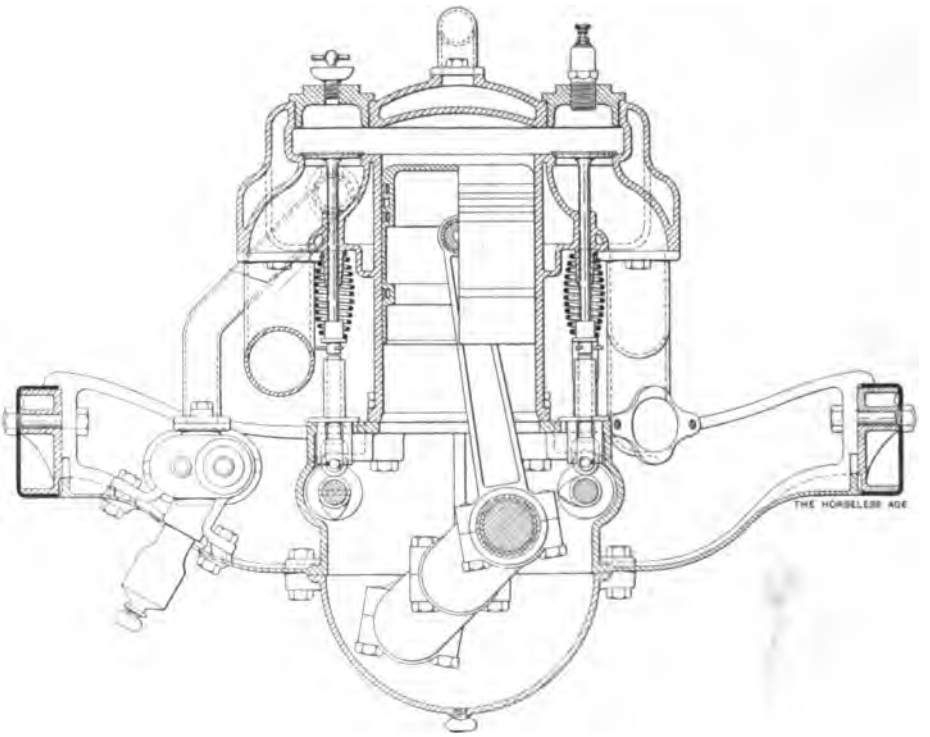


FIG. 5.—CROSS SECTION OF ENGINE.

into the top of the bearings and connecting rod ends.

WATER CIRCULATION.

A cellular radiator and tank, somewhat after the Mercedes in form, fills the front of the hood, and is cooled by a four blade ball bearing aluminum fan supported in brackets on the back of the radiator and driven by a flat belt from a pulley on the exhaust cam shaft. This fan is enclosed in a sheet metal casing soldered to the back of the radiator, to concentrate the draft. The pump forces the water through a Y shaped cast aluminum pipe into the two double water jackets at a point in the valve chambers of the two middle cylinders. Drain cocks are placed at the bottom of each jacket (Fig. 6). The water is led from the top of the cylinders to the radiator through a cast aluminum pipe, which also supports fibre rings through which the secondary wires pass.

The ignition is by jump spark from a storage battery in a box at the front end of the running board, through a quadruple, vibrating, Splitdorf coil on the dash, connected to the plugs over the inlet valves. The timer is of the Lacoste type. The secondary wires are of the French rubber covered style, and all run through an insulating tube supported on the aluminum water pipe on top of the engine. The battery and tool boxes on the running boards are of metal and wood lined, and are guaranteed to be water tight.

CLUTCH.

The 122 pounds flywheel is bolted to its flange by six through bolts and hollowed out to receive the clutch, which is of the inverted leather faced cone type. Fig. 6 shows the section of the clutch which carries inside its spring and a ball thrust bearing, which is in use, however, only when the clutch is released. The shape of the inside of the flywheel is such that castor oil may be poured in and acts as a bath for the leather facing, when oil is necessary. The bearing of the cone clutch is a bronze sleeve on the stub end of the engine shaft; and, as before stated, this is oiled by the crank case splash through a hole in the rear end of the shaft. The clutch is operated by the usual ring of bronze, provided with fibre washers on each side of a grease cup and with two trunnions. These are engaged by two arms rigidly fastened to a transverse shaft, which is supported and rotates in a sleeve or bearing formed by a prolongation of the under side of the transmission case. This shaft is rotated by the usual foot lever.

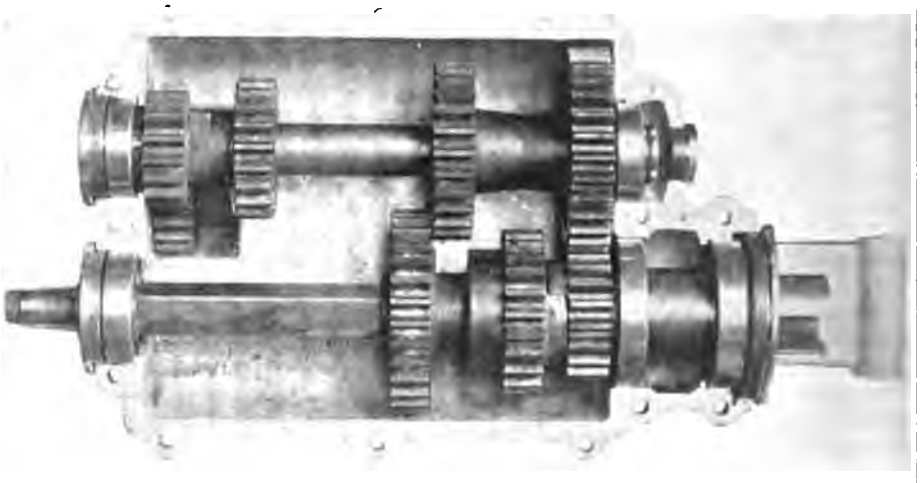


FIG. 7.—WAYNE TRANSMISSION.

TRANSMISSION.

Fig. 7 shows a plan view of the transmission resting in the lower half of its aluminum case, which is supported from the two channel section pressed steel cross members of the frame by four large through bolts. Both shafts, of case hardened machinery steel, run in Hess-Bright bearings, a double bearing being used at the forward end near the universal joint connecting the clutch and transmission. This joint is packed in grease and covered with leather. All the gears are of special treated chrome-nickel steel and run in an oil bath. The photo shows the transmission gears in the direct drive position, in which position the lay shaft is rotating idly. The next engagement, by moving the sliding gear pair on the squared shaft to the left, gives the intermediate speed, and moving it still further to the left gives the low, and to the extreme left through the idler the reverse speed. Dust and oil caps are fitted at the shaft ends to prevent leakage. On top of the case is bolted an aluminum box or guide in which the gear shifting rod slides. This rod has grooves around it for each speed. At the rear end of the guide box is a vertical plug held by a nut at the top. The lower end of this plug acts as a guide to a small coiled spring, which presses downward on a three-eighth inch tool steel ball, which drops into the shifting rod grooves and locks the gears in position, but is yet readily pulled out at any time.

The drive is through a shaft fitted with Spicer universal joints, the forward one being telescoping and provided with a steel drum upon which a belting faced double acting steel band contracts. This brake is

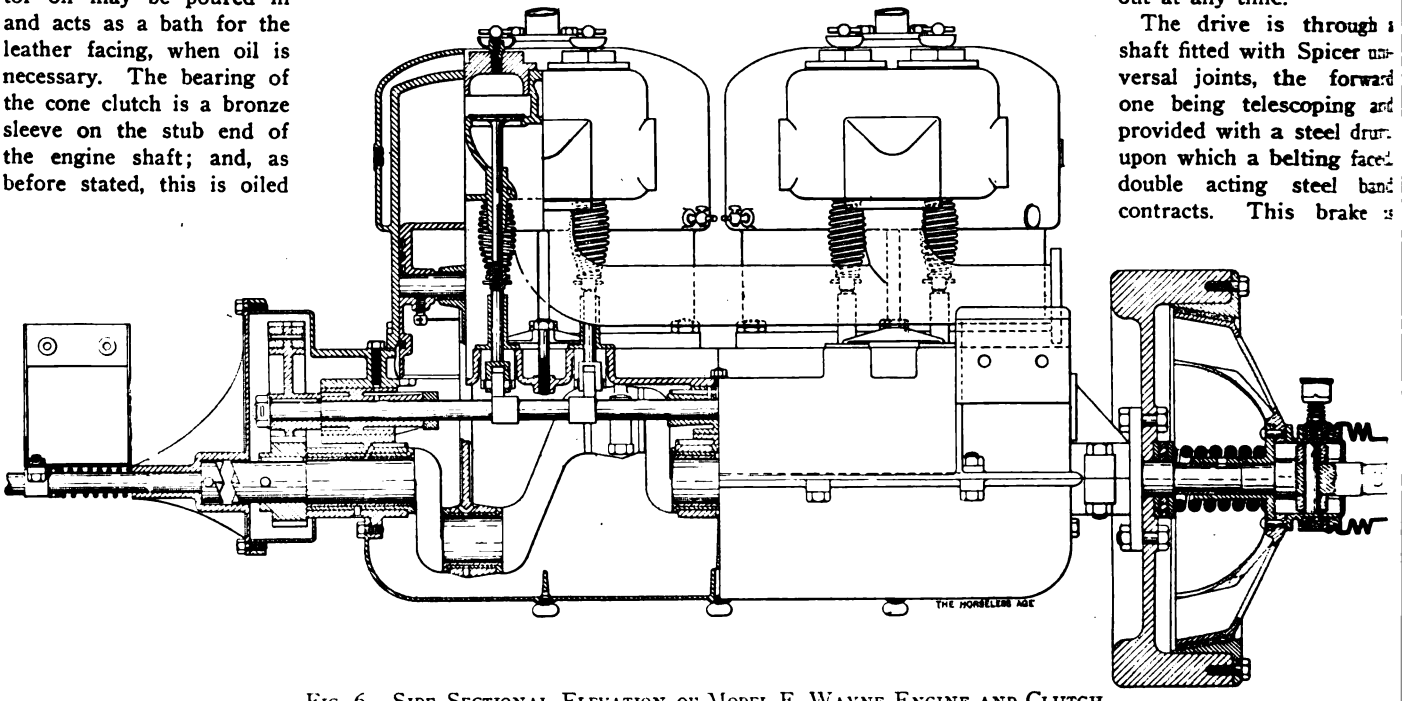


FIG. 6.—SIDE SECTIONAL ELEVATION OF MODEL F WAYNE ENGINE AND CLUTCH.

ted by the right foot pedal and is in-
ident of the clutch, which is operated
ie left foot pedal. Steel drums are
l to the rear wheels, through the
s and hub plates, and are acted
st by an expanding bronze band (Fig.
vhich is held out of contact by springs
not in use. This constitutes the
gency brake, is interconnected with
lutch, and is controlled by the usual
ever.

STEERING COLUMN AND GEAR.

: spark and throttle control levers are
l on a stationary sector on top of the
ng wheel, and operate through the
v column by rod and sleeve through
gears to rotate a small vertical shaft,
g secured to its upper end two arms
cted by rods to the carburetor and

The steering gear is of the nut and
type. Neither member is hardened,
ı order to secure rapid action and the
lock feature, the screw is cut with a
ıple square thread. This gearing is
strongly supported, and connects to
ght steering knuckle of the reversed
t type by the usual drag link, fitted
ball joints and springs to relieve the
shocks on the gearing and take up
notion. The joints are encased in
: bags of leather.

AXLES AND SPRINGS.

: front axle is one of the few nickel
drop forgings of I section made all in
iece. The steering knuckles are also
forgings. The front wheels run on
quarter and five-eighth inch balls, and
rear wheels on seven-eighths and
ı-sixteenths inch balls. The rear axle,
own in Fig. 10, is of the floating type,
all bearing throughout. The floating
drives the wheels by means of dog
ies on the squared ends, which inter-
with lugs on the wheel hubs. The

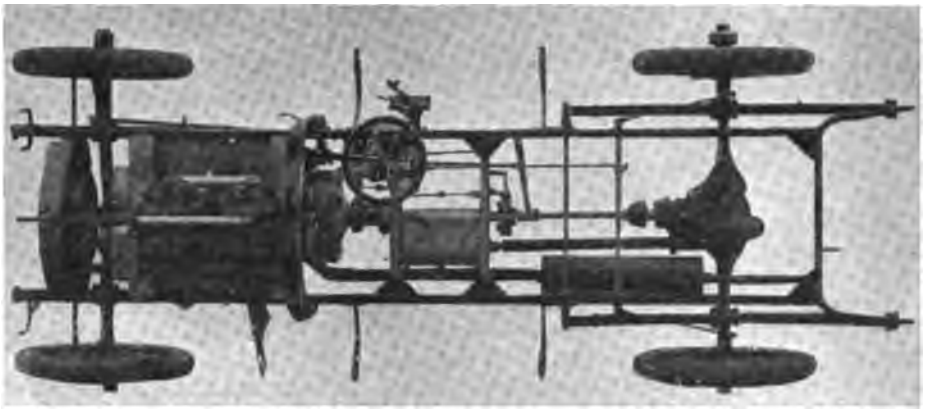


FIG. 9.—PLAN OF WAYNE MODEL F CHASSIS.

casing is of steel tubing, and the differential housing is of cast steel. The axle is well trussed. The short bevel pinion shaft is supported at each end by a ball bearing, and the pinion has 1⅜ inch face and is 5 pitch, which gives a very strong tooth. The differential is of the four bevel gear type. A large torsion rod of steel tubing with solid ends brazed in is fastened to one of the channel steel cross members of the frame on a bolt, between heavy coiled springs.

Both front and rear springs are semi-elliptic and very large. The rear springs are 60 inches long, 2 inches wide, and have eight leaves. They are shackled at the rear end to a Mercedes type of hanger, which is a steel forging. The front springs are 40 inches long, 2 inches wide and have six leaves. They are under the frame, and the axle is fastened to them 2 inches forward of the centre. Four leaves of each spring are clipped together. The long, flat rear spring makes the car very easy riding.

I. M. C. Change Speed Gear.

The Inventors Manufacturing Company, of Boston, have lately placed upon the market a three speed and reverse change speed gear of the sliding key type, applicable to shaft driven cars up to 20 horse power. The entire device is enclosed in an oil tight bronze case, the upper half of which is readily removable to allow for inspection. The engine shaft, carrying the fixed gears, is above, and the shaft carrying the free gears is below, thus allowing the use of a propeller shaft only slightly inclined from the horizontal. All gears are of machine steel, of 8 pitch, and the shaft bearings are of bearing bronze. The special novelty of the device consists in the method adopted for locking, at will, to the shaft, the gears on the lower shaft, which, unless locked thereto, run idly upon it in constant mesh with their mates on the engine shaft. The hardened steel sliding key, which is moved by a lever at the side of the operator, slides in a keyway cut in the side of the solid tool steel gear shaft. A single recess with curved approaches is cut in the face of this key. To the face of the hub of each of the gears on this shaft is affixed a square faced dog or pawl, so pivoted that its engaging end is capable of a movement toward or from the shaft. A spring presses the pawl against the shaft.

So long as the sliding key is in such a position that the recess in it does not coincide with one of these pawls, all gears turn idly upon the shaft, and no power is transmitted to the propeller shaft. When, however, the recess in the key is so placed that it coincides in position with one of the pawls, the latter drops into it and, engaging its flat head against the straight side wall of the recess in the key, makes the particular gear to which it is attached fast to the shaft, which is thus driven, while the

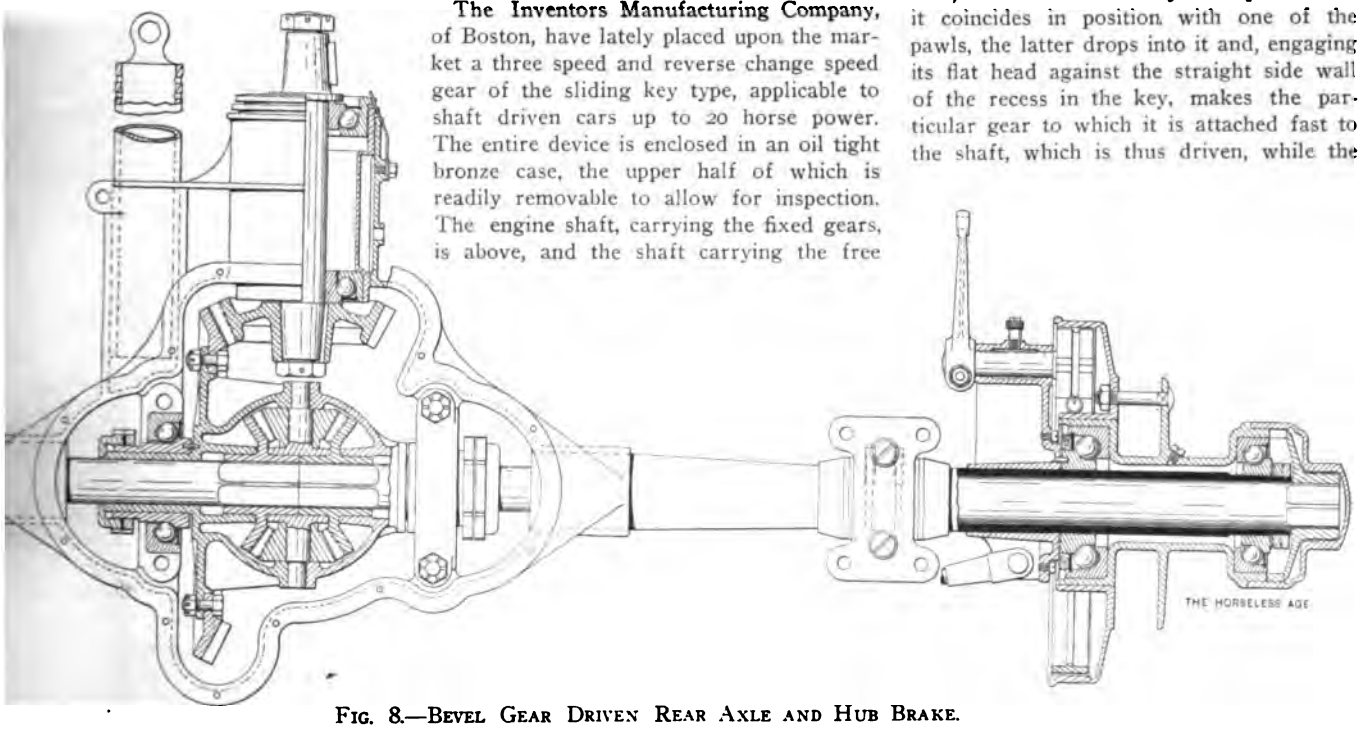


FIG. 8.—BEVEL GEAR DRIVEN REAR AXLE AND HUB BRAKE.

other gears on the driven shaft remain idle. The curved approach end surfaces of the recess allow the pawl to be pushed out of engagement by a motion in either direction upon the part of the sliding key. In this gear there is no sliding of gear faces into mesh, and thus no likelihood of the deformation or chipping of the teeth.

This company also makes a two speed and reverse gear, of the planetary type, for light runabouts, in which the pawl and recess idea is substituted for the locking clutch, which is generally required for securing the direct drive. Two bands, acting upon the casing, throw in, respectively, the reverse and the low speed.



LEAVITT'S SIREN HORN.

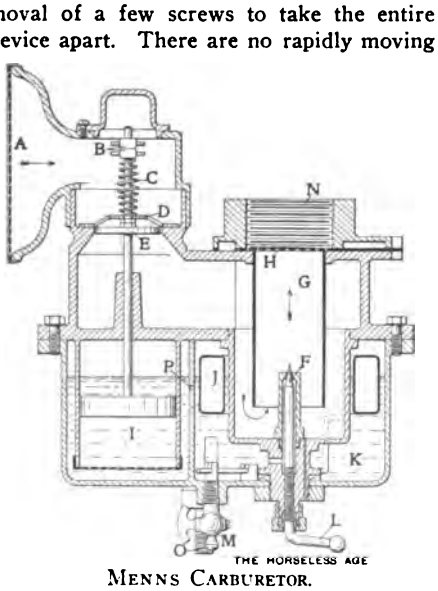
The Leavitt Siren Horn.

The Uncas Specialty Company, of Norwich, Conn., makers of the Leavitt ignition specialties, have recently brought out a line of manually driven and power operated siren horns adapted for automobile and boat signals. Reference to the illustration will make clear the principle of the device. The small end of the finely spun brass horn is fitted into a stationary cylindrical aluminum shell, the cylindrical surface of which is perforated at regular intervals with rectangular orifices. Within this aluminum shell runs on adjustable ball bearings a closely fitting fanlike element, with vanes so arranged as to act as a centrifugal suction fan drawing air through the horn. The revolving element carries perforations which register with those in the stationary shell. When the former is in rotation the effect is to draw a current of air through the horn, which is allowed to escape whenever the holes in the two parts register, thus producing a series of sharp puffs, and is suddenly cut off when the holes in the moving part pass under the closed portions of the stationary cylinder. As the speed of rotation is gradually increased a tone of low definite pitch is soon produced which, as the speed increases, rises to a shriek of very characteristic quality and of very great volume, owing to the energetic character of the air disturbance produced. The horn acts as a resonator and directs the propagation of the sound waves, which are exceedingly penetrating and far reaching. As no reed or other delicate device, capable of being dampened by accumulated dust, is employed, the device should prove very reliable. When operated by a hand crank the siren is mounted upon a frame, which may be clamped in any desired position. Upon this frame is carried the double spur gearing, which gives an exceedingly large speed multiplying effect. A fibre intermediate gear is used to eliminate any mechanical noise.

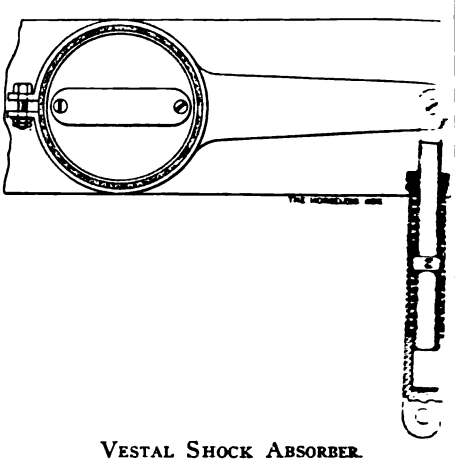
As designed for use upon gasoline automobiles, the siren is operated by a flexible shaft and friction pulley, which is brought into contact with the engine flywheel by means of a pedal. The siren and horn may be placed in any desired position upon the car. Any sound from a low horn to an ear piercing shriek, audible for miles, can be produced at will by a more or less forcible and continued pressure of the pedal.

The Menns Carburetor.

Among the novelties exhibited at the Boston Show is the new Menns carburetor, manufactured by the Boston Mechanical Company, of Boston, Mass. This carburetor is made of brass and aluminum, and has throttle connections with either vertical or horizontal inlet. It is controlled with a single lever and is said to be so constructed that at all engine speeds it supplies automatically the exact quantity and quality of mixture of air and gasoline required. The automatic air feed valve is connected with a piston in a dashpot containing gasoline, which prevents jerking of the valve and thus avoids all unnecessary noise. The spray nozzle is placed in the centre of the mixing chamber and the air is filtered once and the gasoline twice before reaching the mixing chamber. This mixing chamber is drained automatically and provision is made for draining each tank. The carburetor is simple in its construction and it requires only the removal of a few screws to take the entire device apart. There are no rapidly moving



MENNS CARBURETOR.



VESTAL SHOCK ABSORBER.

parts and it is claimed that it is almost impossible for the various parts to get out of order.

Referring to the illustration, N shows the connection for the intake pipe of the motor and O is the gasoline inlet from the tank, the gasoline passing through the spraying nozzle F. A is the air chamber, the air passing through the compensating air valve E into the opening between the two chambers P, then into the mixing chamber G. B, C and D show the air valve adjusting nuts, air valve spring and air valve spring support, respectively. H is the throttle, I the dash pot, K the float chamber, and J are the floats. L is the needle valve and the chambers are drained by the drain cock M.

The Vestal Friction Band Shock Absorber.

This device, made by the Vestal Shock Absorber Company, of 5917 Baum street, Pittsburg, consists of a drum secured to the side member of the frame by two bolts. On the outside of and encircling the drum is a split ring, and between the face of the drum and the face or inside of the ring is a friction lining of leather. The tension on the friction surfaces is maintained by means of a bolt which holds the ends of the friction ring together. Adjustment can be made instantly. The friction arm is connected to the spring clip by a link, in which are placed two balancing springs. This allows a movement of 2 inches between the spring and frame before the friction sets in to check the compression or rebound. This entirely overcomes the "deadening" of the springs under light load or when passing over small obstacles. When surmounting an obstacle the spring of the vehicle starts upward, and instead of acting on the friction immediately, compresses the lower balance spring upward against the collar of the plunger. When this spring has been compressed its full limit the bottom of the plunger strikes a cushion at the bottom, and the friction begins to check the upward movement. When the spring starts on the rebound, the upper balance spring is compressed downward against the top of the collar until it is

ompressed; then the friction sets in. ıooth roads the friction serves as a e checking force, becoming active hen the movement between the axle ame goes beyond a predetermined

ssell Tire and Packing Case.

Russell tire and packing case is a placed on the market by H. J. Rus- orcester, Mass. It is made of wood, back and front; top and sides one ece, the outside painted to match the nside the tire in the case is a round e packing box for clothing lined with covered with leatherette and finished rass trimmings. This box is 24 inch- and 22 inches in diameter. In case es not wish to carry a clothing case a ized iron box of the same size is fur- for ice and refreshments. This is ed with a drip tube to the ground. riangular spaces under the tire give or tools, oil, overalls, etc.

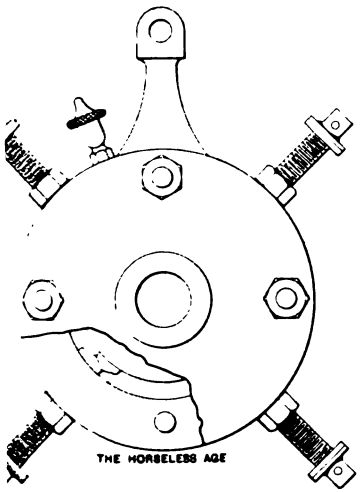
The "Invincible" Timer.

ew timer, of which a cut is shown th, is being marketed by C. F. Ful- 15 Sycamore street, Plainfield, N. J. ısulating material used is hard rub- ıd the contacts are of the snap-off ıd made of tool steel. The device is tely enclosed, and special importance ed upon the long double bearings, are said to make wabbling, due to entirely impossible. The timer is for engines with any number of rs up to six.

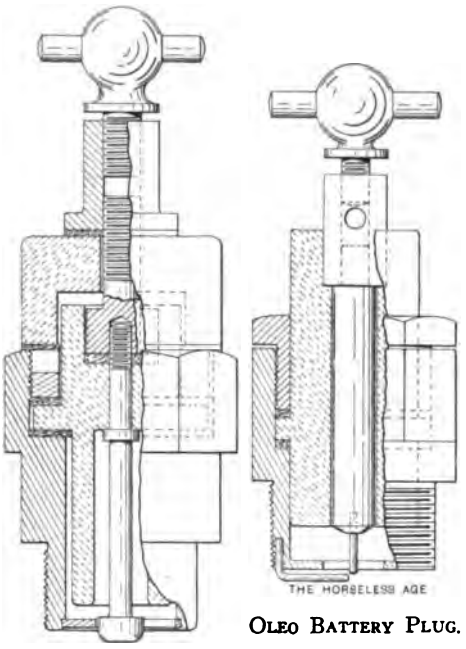
The Oleo Spark Plugs.

Oleo spark plugs, manufactured in , are now being placed upon the an market by the Viqueot Company, d 217 West Forty-eighth street, New ity. They are made in two types dif- somewhat in size, the smaller one intended for battery and the larger gneto ignition. As will be seen from the cuts, the two types are of rather different construction. The battery plug consists of a nickeled steel outer shell into which a single porcelain insulator is clamped by means of a brass screw bushing, with the usual asbestos gaskets. The central terminal is cemented into procelain. The spark terminals are formed by wires pressed into the outer shell and the central terminal respectively.

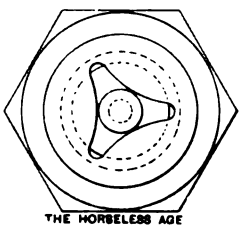
The magneto spark plug consists of a brass shell into which the inner porcelain insulator is clamped in the usual manner. The outer end of this porcelain is protected against sudden temperature changes by a second, cup shaped porcelain, which is held in the manner shown in the cut. The inner end of the central terminal is formed with a head, which is surrounded by a sheet metal disc, with a triangular opening forming a triple spark gap. The disc is riveted into a recess in the end of the outer shell. The binding terminals are of unusual design.



THE INVINCIBLE TIMER.



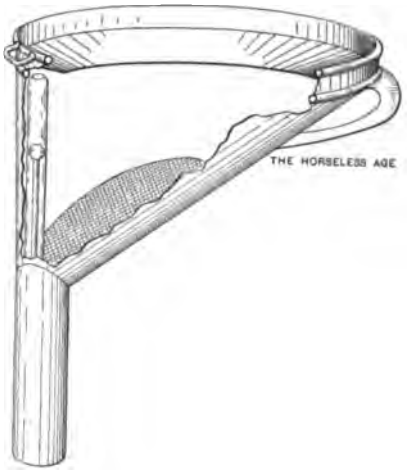
OLEO BATTERY PLUG.



OLEO MAGNETO PLUG.

The Index Funnel.

W. T. Taliaferro, of 258 Broadway, New York city, has invented a new funnel which shows automatically with certainty when a gasoline tank, etc., on which it is used, is full. It is made of sheet copper, thus preventing corrosion, and the construction is very simple and durable. The shape is odd but convenient, as the funnel will adjust itself for any opening, no matter where located. A splash guard near the top prevents any slopping over, should the gasoline be poured in too quickly, and the sieve just above the neck prevents any foreign matter entering the tank. In a long glass tube on the front, visible from the outside, is a metallic float, which is raised as the liquid in the filled tank enters the tube, thus giving warning that the tank is nearing its overflow point. The funnels may be had in different sizes suitable for various purposes.



THE INDEX FUNNEL.

Trade Literature Received.

Lavalette & Co., Paris.—Two booklets containing instructions for the proper working of the Eisemann high tension magneto; also a description of this magneto.

H. H. Franklin Manufacturing Company, Syracuse, N. Y.—Booklet, "Six Cylinders," describing their six cylinder touring car, Type H.

Pearl Manufacturing Company, Buffalo, N. Y.—Booklet and two folders describing the Dietz high pressure automatic lubricator.

Dow Portable Electric Company, Braintree, Mass.—Catalogue of the Dow ignition equipments, 63 pages.

Acme Motor Car Company, Reading, Pa.—Folder showing Acme 1906 models, Types XIV and XV.

Welch Motor Car Company, Detroit and Pontiac, Mich.—Booklet entitled "Reasons," describing their 1906 models.

H. J. Russell, Worcester, Mass.—Circular describing the Russell tire and packing case.

De La Vergne Machine Company, foot of East Thirteenth street, New York City.—Booklet describing the Koerting two cycle, double acting gas engine.

Baldwin Chain and Manufacturing Company, Worcester, Mass.—Booklet describing the Baldwin spring recoil check.

Oil Tempering Spring Company, Chicopee Falls, Mass.—Booklet describing the "Napoleon" counteracting auto spring.

John Sinnott, 234 South Front street, Philadelphia, Pa.—Circular describing the Sinnott shock absorbing spring wheel.

National Brake and Clutch Company, Boston, Mass.—Booklet describing the Autocar Company's clutch used with cork inserts.

Edward S. Clark, 272 Freeport street, Boston, Mass.—Booklet descriptive of the Clark steam car.

Kilgore Automobile Air Cushion Company.—Illustrated circular of the Kilgore air cushion.

The A. W. Harris Oil Company, Providence, R. I.—Booklet describing their petroleum lubricating oils.

The Melrose Automobile Company, Melrose, Mass.—"The National Kerosene Burner for Automobiles," booklet setting forth the advantages of using kerosene instead of gasoline.

H. H. Franklin Manufacturing Company, Syracuse, N. Y.—Booklet describing the Franklin auxiliary exhaust.

COMMUNICATIONS

To Prevent Rusting of Rims.

Editor HORSELESS AGE:

Regarding "Enquirer's" desire for information concerning rust preventives for rims, I should like to tell of my experience with red lead. A year ago, when I laid up our car, I found that the rims had become badly rusted. I had never heard of what is the proper treatment for such cases, so determined to experiment "on my own hook." I mixed the red lead with enough boiled linseed oil to give it body, and then thinned with turpentine. After having carefully sandpapered the rims smooth, I applied the lead with a soft brush and allowed it to become thoroughly hard. Then I gave them a second coat.

The other day, when changing a shoe, I had occasion to examine the condition of the rim, and I was agreeably surprised to find it in splendid shape. Neither was it rusty, nor had a particle of lead stuck to the shoe or tube. Now, I don't know how this works on Fisk rims, but I consider it a good wrinkle for clinchers.

NAT S. SEELEY.

Reply to "Kicker."

Editor HORSELESS AGE:

My letter in your last issue was not really expected to convince "Kicker" of the error of his position. People afflicted as he is are born so, and generally incurable.

In his first article "Kicker" used some very strong language against the steam car. I took up his points separately and discussed them fairly and openly. Instead of meeting me in the same manner and giving his reasons for his position he contents himself with the statement that his crowd is bigger than mine anyway, with the addition of a few undoubtedly brilliant personalities, spit out in a lapdog sort of a manner.

"Kicker" reminds me of a locomotive claiming and probably possessing the ability to do things, yet blowing off steam to no purpose. If he knows the construction of the perfect car in which one has "nothing to do but ride" the columns of THE HORSELESS AGE would be an excellent medium through which to give the information to the world. I feel certain that a detailed description of his "perfect car" would be of very general interest.

Let him "screw down his pop valve" and turn his energy to some useful purpose.

H. W. BEACH.

Flash Boilers.

Editor HORSELESS AGE:

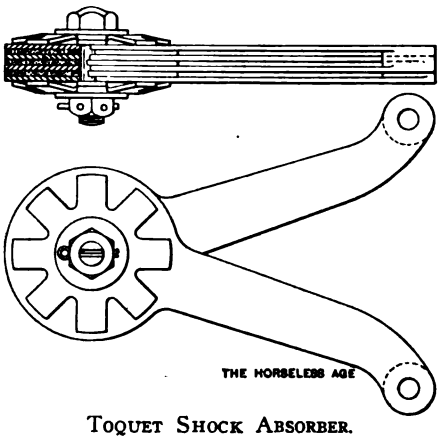
How many linear feet of one-eighth of an inch pipe are necessary to produce 1 horse power when arranged in the form of a flash boiler? Also what number of linear feet of one-quarter inch pipe would give 1 horse power? Kindly give information as to kind and size of pipe used for such purposes. I have been watching your paper for a number of years for some data of this kind for the manufacture of flash boilers. A SUBSCRIBER.

[The semi-flash boilers, now most commonly used for automobiles, are made of seamless steel tubing of about one-half inch diameter, and we understand that it requires about 5 square feet of heating surface to give 1 horse power. It is obvious, however, that the heating surface required varies with the arrangement of the coils and the burner used. The above mentioned heating surface, 5 square feet, corresponds to about 40 feet in length of pipe one-half inch in diameter.—ED.]

Frictional Spring Retarding Devices.

Editor HORSELESS AGE:

In your issue of March 7 I notice a letter from S. F. Edge, of the Napier Company, referring to a simple form of spring check illustrated in THE HORSELESS AGE of January 31, and would say that I am certainly



TOQUET SHOCK ABSORBER.

interested to learn that Mr. Edge has tried a device almost identical with this and found it so satisfactory.

Unless I am mistaken, Mr. Edge is in England, but he reads THE HORSELESS AGE, and is probably aware that spring check matters are lively over here.

Something over a year ago a device for this purpose was strenuously advertised in the trade and daily papers. It required constant adjustment, was sold at a high price, and retarded both ways, which, in the writer's opinion, was wrong in theory. The writer accordingly tried to improve it somewhat by increasing the wearing surfaces, providing automatic means for taking up the wear, and at the same time reducing the cost about 80 per cent. He made the model illustrated herewith, and submitted it to the makers early in 1905, but it failed to interest them at that time. I note, however, that their 1906 device is practically identical with this model. The multiple disc construction is used, wear is taken up by a spider shaped spring, and the friction plates are made of sheet metal.

It looks as if there might be good ground for suing the suer. B. LOUIS TOQUET.

The Patent Situation Regarding Frictional Spring Retarding Devices.

Editor HORSELESS AGE:

In the letter of F. W. Dunn, which appears in your issue of March 7, reference is made to the omission in my article on "Frictional Retarding Devices" of reference to the Truffault re-issue patent, No. 12,437, of January 16, 1906, filed June 1905. I am frank to admit that this issue had escaped my notice, possibly because at the time my examination was made a copy of the patent had not been placed in the usual files at the Patent Office. The first claim of the re-issue patent reads as follows:

"1. In a vehicle, the combination with a supporting spring between the parts of the vehicle movable relatively to each other, of rotating frictional means between the parts which provides a yielding resistance to movement, said means producing a retarding effect on the reaction of the spring substantially as described."

The change in the form of the claim cannot, however, alter the fact that the earlier patent to Stubbs, No. 664,444, December 25, 1900, discloses features which may be judicially determined anticipatory of the broad idea of a friction retarding device. The claims in a re-issue patent cannot be interpreted as broader than those of the original patent. In my article I sought to show the patent situation from an unbiased standpoint for the benefit of your readers. This involved a statement of facts which should give offense to none, while proving helpful to those having interests at stake.

In my letter on "'Shock Absorber' as a trademark I expressed the surprise I felt that these descriptive words should be put forward as trademark property, but I still fail to conceive what possible "important considerations" can transform "shock absorber" into a trademark within the meaning of the law.

Since Mr. Dunn has impugned my publicly expressed opinion, it seems to me proper that he should lay before the public some reason why he believes the words "shock absorber" should not be regarded as purely descriptive of the goods.

F. W. BARKER.

The Farmer's Automobile—Against Standardization.

Editor HORSELESS AGE:

I was very much pleased with Mr. Cunningham's article in your issue of February 28, as it expresses my own opinions about farm autos. Automobiles are just the vehicles for country people, and a godsend to the farm horse. A farmer's road travel is usually long and tedious, and if he is not able to afford a special team for the purpose of driving, his going must be slow, or his tired and clumsy work horses must be overtaxed. But if he has a car his travels will be a diversion and a pleasure, and his

gs will love him as he goes from the side of the pasture fence.

again, the farmer's car has a benefi- fluence upon the public roads. The highway engineer never learns what minable road feels like until he butts with his own car. I believe it pay the State to present every high- mmissioner with an automobile.

e the way Mr. Cunningham handled ject of the three motive powers. To eads infinitely better than "Kicker's" tirade in the "Communications" col- of the same issue of your magazine. certainly are these three distinct mo- wers—electric, steam and explosion good for its purpose, and in com- all treading upon each other's heels. say, like "Kicker," that all are ," idiotic and contemptible, except rticular type that he may be more r with, seems to me to be running ry opinionism clear into the ground. r" also inveighs a sneer at all per- ho have a preferential taste for either e by him proscribed motors or meth- I must confess I don't know much air cooled motors. A great many are nd used, and liked, no doubt. There I often see, a four cylinder car, be- g to a country doctor, who uses it and summer on the rounds of his practice. No horse vehicle can com- ith it for swiftness and certainty, and could call this machine a "freak."

steam autos I have had a little ex- e. Being a steam engineer and ma- . I naturally lean toward them. I ith interest about their progress, and hat, in spite of their not being the fashionable, all leading makes hold own with explosion cars in practical titive tests. The steam motor will lown"; it cannot be exterminated; it taries and friends today, and it will retain them, for the reason that it is natured and polite, "flexible" far be- the possibilities of explosion actuated s, bundles of cog wheels, delicate rs and "timers," and also because it is pendent for its life upon one particu- d fast disappearing fuel. Steam can de with any kind of fire, and a steam n be made without a cog wheel in its ny.

cker" also howls for "standardizing" ito. At the present stage the auto- is no more ready for that than the race is ripe for Paradise. Wonder- ides in perfecting the machine are be- ade, but there is nothing to warrant assuming that the limit of progress is

We fear our neighbor, "Kicker," has sked his last battery in undertaking to hat the present four cylinder water l motor, with its piracies from our 's horse power and mowing machine, climax of all that is to be desired for er vehicle. Say, friends, what if Noah standardized" the ox cart? The bicycle een "standardized," and where is it? manufacturers are obliged to all make one kind of machine, wherein can they compete? Only in hidden cheapness of production, and this means ruin! "Standardize" the auto, and you will bury the automobile industry.

MAURICE R. WILLIAMS.

The Funny (?) Side of Winter Motoring.

Editor HORSELESS AGE:

An automobile breakdown when the thermometer is at zero or below is something that will sprout gray hairs, and such breakdowns will always be liable to occur, because no machine will ever be built that will not get out of order some time. The coming auto will be simplified and improved to a point where it will be nearly perfect, and then it will be reasonably safe to venture out in cold weather.

When the weather is pleasant and we are not in any hurry it is a pleasure to locate the trouble and fix it. We feel proud of the feat and tell our friends how we conquered the rubber tired son of a machine shop. If the battle was along lines that could not by any possibility occur to any other machine or any other driver we write a detailed account of the affair to our favorite magazine. I have about 999 of these hard luck stories filed away in the rear end of my brain to help me out if the same thing ever happens to me, but I either forget the other story or the lightning never strikes, for it never turns out the same as in the story.

Mark Twain might make a funny story out of mending a punctured tire upon a bare ridge where the northwest wind froze his eyelids together. Bill Nye might see the humorous side of mending a broken wire with his fingers frozen stiff, but none of these things, not even a busted water jacket, ever reached my funny bone.

The most dignified, self conceited, independent thing on earth is a "bum" automobile on a cold day. It will stand there and never bat an eye while you skin your knuckles. Great gasoline! how it hurts to knock off a quarter section of hide when your hands are so cold the blood won't flow. It will let you sweat icicles and swear. You can call it all the vile names not in the dictionary, but you can't ruffle its dignity a bit. It only switches its flywheel, snorts out a smoky charge of gasoline and says, "Well, what are you going to do about it?" But the worm will turn; every tyrant meets his doom sooner or later. Down-trodden man rises in his might and deposes the monster. We auto do it now.

W. P. HARTFORD.

The Legislative Problem.

Editor HORSELESS AGE:

The old weather almanacs frequently say "About this time look out for squalls." The same may with certainty be predicted of the legislative calendar for this portion of the automobile year. The squalls vary from gentle zephyrs to howling blasts, and one of the latter has recently struck us in New Jersey, letting loose on the heads of our Senators floods of oratory, both for and against the automobile. At this writing the issue of the fight is uncertain, and it is to be hoped that some sane measure will result from it, but the very existence of such a determined struggle gives food for earnest thought, and should impress the leaders of auto clubs with the necessity of working for legislation, which will effectually prevent or reduce to a minimum the abuses complained of.

These abuses are certainly great, and much more serious than is usually admitted by auto enthusiasts. Although the horse is rapidly becoming accustomed to the automobile, probably still the majority are more or less frightened, and many wives and children of farmers, who formerly used the roads without fear, are deprived of their ancient freedom. This is only a passing phase of the situation, and will disappear with the rapid increase in the number of machines and the growth of a new generation of horses, but at present it is a decided factor, even when the automobilist uses great care.

In New Jersey, on account of the splendid development of our system of good roads, our situation between two of the largest cities in the country, and our wonderful string of seaside resorts, we are accustomed to see great numbers of tourists from other States. Many of these are possessors of high powered cars, capable of great speed, and they use them recklessly and without any regard for the rights of other users of the highways. This is occurring every day in all parts of the State, and the effect has been to produce in the minds of the whole rural population a deep seated dislike of the automobile, which cannot fail to result in harshly oppressive legislation unless the automobilists themselves initiate measures which will be truly effective in abolishing the evils.

Up to the present time the club leaders, and those who have represented us before the legislative bodies, have seemed more interested in shielding the malefactor from arrest than in making it easy to enforce the law. Take, for instance, the subject of arrest without warrant. This has raised a perfect howl among many automobilists. It has been spoken of by them as if it were the greatest possible outrage, and violated the fundamental rights of citizenship. Yet to my mind nothing is more reasonable. An officer sees a machine scorching toward him. By our present law all he can do is to note his number, write to Trenton for the name and address corresponding to it, and then if the offender be a resident of another State suit must be brought there, and all the witnesses taken over there, or cumbersome extradition processes taken. All this surrounds punishment with so much red tape that its practical effect is to leave the law unenforced. Now this would all be cured by the power to arrest with a warrant, and such a provision would no terror for the law abiding automob

Another provision of our present law which aids the law breaker is that no one can be convicted on the unsupported testimony of a police officer. This also makes conviction very difficult.

Our present law is ideal in most respects, but mainly on account of these provisions it is practically unenforceable. Hence the loud demand for its repeal.

The Jackson bill, which has the support of the farmers' organizations, contains as its cardinal feature the provision that no machine shall be permitted on the roads whose speed can be made to exceed 20 miles per hour. As it stands this requirement would absolutely kill all rational and satisfactory automobiling, but I believe it contains the germ of a truth which must be recognized in future legislation. Our manufacturers are each year turning out larger, speedier and more powerful machines, and certainly the time has come when some limit must be set beyond which they cannot go. Our highways are used by women taking produce to the towns, by children going to school, elderly men and various persons not strong enough to cope with a badly frightened horse. This use of the highways is entirely proper, and it is not right to subject these persons to the risks of meeting powerful engines, driven at railroad speed, by drivers who too often have little sense of responsibility. If a man has put several thousand dollars into a car that is guaranteed to do a mile a minute he certainly has no ordinary human nature in him if he will not use that speed when he has a chance. Laws, policemen, magistrates are of no account. The only sure remedy is to bar such a machine from the road.

The question then is, At what point shall we set our limit? If you grant that 20 miles an hour is a safe ordinary speed it would be preposterous to require that the machine should be so geared that at the utmost speeding of the engine that rate could not be exceeded. Under such a law to maintain 20 miles an hour would be ruinous to the engine, and would reduce the practical speed to 12 or 15 miles an hour. Now, my proposition is to require that at normal engine speed the vehicle should maintain a speed of 20 miles per hour. This would probably mean a capability of 35 miles per hour under the most favorable conditions. In other words, if the law provided that machines capable of exceeding 35 miles per hour be barred from the roads I believe a solution would be found which would be satisfactory to the general public and to all of the automobiling fraternity except the manufacturers and users of high powered machines.

I hear the objection raised that such a law would destroy the sport. To my mind the sooner it is destroyed as a pure sport the better for everybody concerned. The limit suggested is fast enough for both business and rational pleasure, and if a few wealthy racers are put out of business the mass of automobilists, as well as the general public, will be benefited. I have been an enthusiastic user of the automobile for five years, and am longing for the day when our manufacturers will spend less energy in producing large, speedy cars for the wealthy, and more in putting out reliable, medium cars, adapted to the needs and purses of those of more moderate means.

It will probably be difficult to induce those who represent our interests before the legislative bodies to agree to this plan of control, for too many of them are the owners of the high powered cars; but if they do not bring forward some such rational plan of solving the problem, and rely simply on insisting on their "rights" and opposing all measures introduced, they will find that soon an aroused public opinion, which is practically universal, will express itself in legislation, and they will be hampered by all sorts of absurd measures.

If automobilists were as much concerned about their duties on the road as about their rights we would have little trouble.

JOSEPH STOKES.

A Canadian Doctor's Winter Experience.

Editor HORSELESS AGE:

In my recent communication I referred to the advantages of the auto as I found them. They might be put under three headings:

1. It is always ready; there is no delay in starting.

2. Three hours' traveling can be done in one, thus giving one more time in the office and more sleep with night calls.

3. There is less suffering from cold; my longest run is about 9 miles, which I make in from twenty to twenty-five minutes—not long enough to get chilled through.

Now, as to the expense. I bought my car in October and sold my last horse in March. I don't want to own another. My gasoline, oil and repair account for the twelve months was $68.11. I did a good deal of repairing myself, and the tire cost was nil. The next twelve months were different, however, as I stripped my transmission, broke a crank shaft, wore out a "bum" differential, bought a chain or two and a few tires. These items, with gasoline, mounted up to $180.01. I keep strict accounts and my use of the car included a good many pleasure trips, some of them 300 miles in length, and I might also add that my boy burned many a gallon of gasoline giving the girls a spin when I was not looking.

Well, my first accident happened early. It was a few weeks after I got the car that I had to go to see a patient at the end of Point Pelee—the piece of land that sticks south into Lake Erie 15 miles, nearly opposite Sandusky, Ohio. It was Christmas and I asked a friend to go with me to leave at 9 and be back for dinner. It was fairly warm, though the ground was covered with snow, and this made enough water to splash and eventually find its way into the cylinders; at least, I was told this was the cause the rings stuck and piston set solid at the end of our desolate though picturesque run. I fixed up a poor old hermit, and then my friend, who was a steam engineer in his day, dismantled the machine in the snow and, after trying every other known device, got the piston loosened, reassembled and the car running, and we got home to dinner—not a noon one, but a six o'clock one.

A few weeks later I found my car stalling 4 miles from home, at 11 p. m., with a wind velocity of 35 to 40 miles, and the thermometer at 6° above. My boy, a lad of fourteen, was with me, and he soon discovered (he thought) that we had an empty gasoline tank. We walked to a neighbor's and borrowed a rig, saw my patient and drove home for gasoline, which we procured, and then returned. This was not enough to persuade the car to move on a cold night, so we towed it home, and the next morning we found a broken commutator spring. Did you ever try, on a cold, dark, windy night, to see how much gasoline you have? If not, do so and let me know.

I broke my crank shaft once, and had to be towed home. This was the only time I had to hire a hay motor and sit up behind and steer and be laughed at. Probably my closest call was occasioned by careless telegraph construction. With a friend I approached an open level railway crossing, and, seeing no danger, I only slowed enough to avoid a bump. A cry of warning from my friend led me to throw out the clutch, reverse and brake quicker than I ever did before or since, and it was well I did, or a bunch of new wires hanging at all heights, and some as big as No. 6, would have pulled us out of the car by the chins, and left the car to go on to the city. No, sir, no kidnapping for me; I always slow for the railway and have great respect for the wires. They burnt us good as it was. I have often heard it said "if anything happens, wire me." Well, I know what it means now.

P. H. HUGHES, M. D.

Causes of Knocking.

Editor HORSELESS AGE:

I am writing to you for the theoretical cause of a "gasoline knock" in explosive engines. The case in hand is a four cycle two cylinder opposed motor. I have recently had it thoroughly gone over, all bearings tightened, etc. On the level it ran all right but in climbing hills it knocked and hammered in the most frightful manner; in fact, it sounded as though it were falling apart. By simply giving it more gasoline in the mixture the knock was entirely removed and it now takes all sorts of grades without the slightest knock. All the bearings are the same as before; they have not been touched.

As I understand it, there is always a slight amount of lost motion even in the

ost carefully adjusted bearing, and it is ıe slight movement in these which causes a ıock when the pressure on the bearing is ːversed. In my case the bearings were ıe same with both mixtures, but with the ːtter one, which supposedly gives a ronger explosion, the knock disappeared.

JOHN R. THOMAS.

[The explanation of the disappearance f the knocking upon admitting additional ıasoline is that a rich mixture burns ıther slowly, and the pressure in the cyl-ıder, instead of rising almost instantly to ıe maximum, as with a perfect mixture, ıses gradually, attaining a maximum only t, say, one-third or one-half stroke, and ıis maximum is, of course, much smaller. 'here is therefore much less of a hammer-ıg effect.—ED.]

ıistorical Development of Lens Mirror Searchlights.

ːditor HORSELESS AGE:

It has come to our notice that some man-ıfacturers of automobile projector lamps ıre claiming that they buy their lens mir-ors from us, or that their lens mirrors ınd ours are made by the same concern. \s such statements are wholly untrue, and ıre calculated to injure us in the minds ɔf buyers unacquainted with recent lamp ıistory, we hope to have your indulgence ior the following brief statement:

Eighteen years ago we began to make marine electric searchlights of the then lately patented type, combining a parabolic reflector with hemispherical cup and bull's-eye lens. They enjoyed a fair sale till it was found that no amount of polishing could maintain their efficiency. They then became unsalable at any price, and we looked about for a searchlight design that should meet every test. We found it twelve years ago, in our present type with Mangin or aplanatic lens mirror.

We began developing grinding processes, aiming always at the deepest possible bowl and shortest focus, and at the same time reducing the cost. The present United States Navy focal-length specifications are largely an outgrowth of our work at that time.

Presently, as we improved our process, we found our lens making capacity to be in excess of the absorbing power of all the navies of the world. We cast about for an outlet.

First came the acetylene locomotive headlight, now used on many American and foreign railways. Then, six years ago, we entered the automobile field, in which at that time only the most inferior reflector lamps were used. For a year or two we merely felt our way, as the still considerable cost of the high grade glass and of grinding the lenses was against us. Then we found means to reduce the cost still further, and almost at once the lens mirror type of lamp sprung into immense popularity. The sudden demand stimulated other lamp makers, and presently imitations by the dozen were in the market. They all had lens mirrors, but none of them had the depth of bowl and shortness of focus of the original, for the simple reason that the cost of grinding the latter was prohibitive to the small manufacturer. At one time we sold a part of our lens output to other lamp makers, but soon stopped this, as we found that they simply traded on our name and filled the bulk of their orders with inferior lenses. At present we do not buy or sell a single lens, and we will give $1,000 to anyone who can show that we have ever, at any time, bought a single lens mirror for use in an automobile light.

We think that this statement should dispose effectually of the claims of other dealers that their lenses and ours have a common origin.

RUSHMORE DYNAMO WORKS.

Double Cylinder Ignition by Single Coil.

Editor HORSELESS AGE:

We thank you for your prompt answers to our queries of recent date. We desire to carry you a little further and will ask yon to reconcile your statement with the following facts: We are now using a four volt storage battery with a single coil to spark two cylinders, and never have a miss when the plugs are clean and the mixture is right. The primary contacts are on no longer than when one coil is used for each cylinder. Only a short time ago the second spark gap was advocated to intensify the spark. It may not be generally known that when one coil is used to spark two cylinders, you can detach one secondary wire from one plug, hold it high in the air without any contact whatever, and the other plug will spark. You speak of two cylinders being put out if the coil ceases to act in the single coil practice. How does the single cylinder man get along? When his coil ceases to act he sets about to adjust it. The same the single coil, two cylinder man. When one cylinder in a four cylinder, four coil motor ceases to act, how quickly will the novice detect it and stop to remedy the same. We see in some instances an extra coil carried with a four coil combination, for fear a coil will break down. Why not carry an extra coil with a two coil combination? We do not believe that the coil is more likely to break down than some other part of the machine. Why not take along an extra crank shaft, connecting rod, spring, wheel and axle, in fact, a whole automobile, for fear some one of these parts will give out? The object of the writer is to do away with useless parts and simplify construction.

Apropos of this subject, we would like to have a serious consideration of the exhaust pressure oiler, the pressure being regulated by a stop cock or globe valve. This would abolish the extra mechanism of a mechanical oiler and simplify things.

The writer desires to say a hearty amen to all the statements of the gentleman who signs himself "Kicker," except that relating to transmissions. Two writers in a previous issue denounced the clash or sliding gear transmission, as being wholly unmechanical. The planetary transmission is all that seems to be needed for light or middle weight cars; it is extremely easy to handle and the reverse can be used to act as a brake, thereby doing away with one brake. A clutch in the flywheel of four cylinder cars is a convenience. We would like to hear Mr. Kicker's objections to this ssytem, instead of his outright condemnation.

P. M. C.

[We have had no personal experience with ignition of two or more cylinder engines with two jump spark plugs in series on a single coil, and know no serious theoretical objections to it, but simply quoted the opinions of a few of our contributors and correspondents experienced in this line. If our correspondents have had more satisfactory experience with this system we are glad to learn it.—ED.]

A New Western Car.

We have received from the manager of the Western Motor Truck and Vehicle Works, of Chicago, the following advance information of their new types, which we print verbatim, except as to the prices of the cars, which we do not usually mention in our reading columns:

"The new type BEEBE machines of the Western Motor Truck & Vehicle Wks, Chicago, are a welcome diversion in many respects. The designs are graceful and have a very racy appearance. The simplified construction and improved mechanical features are a treat to the lovers of power machines and which are flooding the makers with orders. Model E road machine is a side entrance roomy tonneau, 30 H. P; 100 in, wheel base; Giant friction torqueless transmission; Wats two stroke cycle three port engine fitted with our new tubular carburetor; etc. * * * * at * * * Issue No. 3 is a daper runabout with 80 in, wheel base, with same features as Model E and is put out at $——. This runabout has 14 H. P. and is a hill climber right. The principle mechanical features consist of,—A friction transmission which does away with torque and excessive thrust; An entirely new carburetor of tubular construction which generates a very light vapor of thorough mixture and from a point of efficiency is remarkable; A crankless automatic valve engine starter operated from the seat. The WATS two stroke cycle three port engine is a distant relative of the /05 and /04 models. Its advanced construction embraces invaluable features which increase power and efficiency 50%. The fine results from this new mechanism will be welcomed may many as its goods are without its like today. Lubrication is by force feed and is positive." * * *

LEGISLATIVE and LEGAL

The Committee Substitute for Frelinghuysen Bill Passes Senate.

TRENTON, N. J.—The committee substitute for Senator Frelinghuysen's automobile bill passed the Senate, March 12, by a vote of 17 to 2. Several minor amendments were incorporated, Senator Frelinghuysen recommending the substitution of the phrase "Passengers for business or pleasure" for the word "passengers." It was claimed that the wording of the substitute would have exempted every one of the 14,000 autoists of the State from its provisions, as according to the New Jersey law the word "passenger" is defined as a person who is carried for hire. The bill contains practically all of the drastic provisions of Senator Frelinghuysen's original bill, but the automobilists are confident that they will defeat it in the House.

The provisions for arrest without warrant and for arrest within three months after filing complaint are retained. The speed limits remain practically unchanged, that is, a mile in seven minutes, through built up portions of a city, and a mile in three minutes in the open country. The provision requiring that speed be reduced when within 200 feet of any horse, or other beast of burden, is retained, but instead of a mile in seven minutes, the reduced speed is made a mile in five minutes, and 20 miles an hour is made legal to pass a vehicle going in the same direction. After passing speed must be reduced.

An annual registration fee of $1 is imposed on all drivers of cars not exceeding 30 horse power, and $2 on owners of cars exceeding that horse power. The annual license fee for carriages themselves is $3 for those not exceeding 30 horse power, $5 for those exceeding that limit of power. The same rates apply to residents and non-residents alike.

New York Road Improvement Convention.

ALBANY, N. Y.—The annual meeting of delegates from all the counties of the State to consider road improvement has been called by the standing committee for April 3 and 4 in Albany. According to Section 15 of the Higby-Armstrong act the State Engineer is required to hold annual meetings in each county of the State for this purpose, but the large number of meetings necessitated a change if the State Engineer was to be present; and it was, therefore, decided to hold a joint convention of delegates from each county. The first of these conventions occurred in Albany in 1900, and they have taken place here ever since.

This general convention has been found to possess several advantages over the old method of separate county conventions. By it the various counties have been able to exchange information, co-operate as is necessary with adjacent counties, and discuss questions of general interest, such as road construction, methods, materials and cost.

The chief question to be considered this year is work on the roads, under the $50,000,000 State bond act for road improvement. The following are some of the recommendations made by the standing committee this year: That the legislation for the distribution of the money be made in one act, so that the Comptroller may sell the bonds at any time; that the State maintain the roads according to the plan used in Massachusetts (which would not necessarily conflict with Examiner Lyon's plan for a patrol system); that the State designate the roads to be built in each county, so that the money be divided justly; that county conventions be held to discuss highway improvement; that prison labor be employed on road construction.

Severe Penalties Proposed.

ALBANY.—Senator Grady, of New York city, has introduced a bill which so amends the present law in regard to automobiles as to make fast driving a misdemeanor punishable by a fine of $100 or 30 days in jail. If any person is injured, the fine shall not be less than $1,000 or more than $2,000, or two years in jail, and the causing of a death shall be manslaughter in the second degree. It is also provided that any driver who does not stop when requested to do so by a policeman shall have an added penalty of 30 days in jail, and if he does not stop after causing an injury to any person, the offense shall constitute an assault in the third degree. Civil suits can be brought for injury or death.

Sims Bill Passes House.

WASHINGTON, D. C.—The Sims bill to regulate the use of automobiles in the District of Columbia passed the House of Representatives March 12. It provides a speed limit of 8 miles per hour in crossing streets where there are no steam or street railway cars. It contains a provision for imprisonment at the discretion of the court for the second and third offenses against the speed regulations. The bill is opposed by local automobilists, who will try to prevent its passing the Senate.

A Bill All Agree On.

BOSTON.—The bill presented to the Legislative Committee on Roads and Bridges by Judge Prescott Keyes, of Concord, is unique in that both automobilists and their opponents agree that it is a measure of much merit. It prohibits unreasonable speed, and makes speed greater than 20, 12 and 8 miles an hour prima facie evidence of unreasonable speed.

Under the present laws speed and speed alone is the sole element to be considered by the court, whereas under this bill other things are to be taken into consideration, e. g., time of the day or night; width, grade and condition of the road; use of the road by horses, vehicles, foot passengers and other machines; condition and load of the machine; attention and experience of the driver, etc.; speed being still left, however, as the chief element. This bill would allow a fine to be imposed for unreasonable speed, even though it were less than 20, 12 or 8 miles an hour.

California Taxes Tourists' Autos.

LOS ANGELES, Cal.—Automobilists visiting this city are protesting against the action of the city assessor in collecting from them the State tax on automobiles. E. R. Thomas, the Buffalo manufacturer, paid $33.60 under protest, and will fight the case to the California Supreme Court if necessary. He contends that he pays taxes on all his cars at Buffalo, and does not believe his personal property can be assessed in two States.

NEW YORK CITY.—Coroner Harburger announced recently that chauffeurs who run over and kill persons will hereafter be held in at least $5,000 bail when arraigned before him.

ST. PAUL, Minn.—The Minnesota State boiler inspectors will have no authority over licensing automobiles in the future. By the new code this business is given to city and municipal clerks.

CHICAGO.—An ordinance has been submitted to the board of aldermen providing that no garage shall be erected in any block in which two-thirds of the buildings on both sides of the street are used for residential purposes, without a written consent of a majority of the property owners on both sides of the street.

CLEVELAND, Ohio.—The Cleveland Automobile Club will ask the Ohio Legislature to provide for employing State prisoners on the public highways. Ohio farmers are also said to favor the project, and it is thought that labor organizations will endorse such a law as preventing the competition of prison laborers.

TRENTON, N. J.—The New Jersey Court of Errors and Appeals has modified a decision handed down by Vice Chancellor Garrison in Chancery Chambers, Jersey City, limiting the amount of gasoline in automobiles about to enter garages to one-half pint. The upper court provides in its modified order that autos may enter garages with whatever gasoline may happen to be in their tanks.

CHICAGO.—William A. Stewart, son of Dr. Wellington T. Stewart, of this city, has brought suit for $10,000 damages against the Chicago Coliseum Company and General Manager S. A. Miles, of the N. A. A. M., the lessee for the Chicago Show, because he was accused of being a ticket speculator while waiting for his mother and some friends at the entrance to the building. He was taken to the manager's

office, searched, his tickets taken away, and was ordered to leave the place.

REIDSVILLE, N. C.—The Superior Court of Rockingham County, this State, has ruled that "no law can be passed that prohibits the use of motor cycles on the public streets and highways." This was in the test case of David L. Carroll, who violated a Reidsville ordinance by riding his motor cycle on the streets of that town and was fined. By the advice of the American Federation of Motor Cyclists he appealed to the Superior Court.

HOHOKUS, N. J.—Ramsey's Grange of this town has passed the following resolution against macadamizing the Franklin turnpike in this township: "We condemn the spending of one of the hard earned dollars of our citizens for the building of said road, and we regard any township committeemen voting for the same as an enemy to the common good." The sum which the town would have to pay would be small, because of State appropriations and offers of contributions from automobilists living along the roadway.

Fatal Accident in New York City.

A fatal automobile accident occurred in New York city the afternoon of Friday, March 9, when Mrs. Jane Craig, wife of Police Sergeant Robert Craig, of 6 West 102d street, met her death at 172d street and Jerome avenue in the Bronx.

Theo. F. Schulz, the proprietor of a garage at Broadway and 110th street, had invited Sergeant Craig and his family to take a ride in a 20 horse power touring car that afternoon. He sent around the machine in charge of Alexander Cummings, of 132 West 109th street, as chauffeur. Sergeant Craig, his wife and three children were the members of the party. At the scene of the accident the machine swerved from its course and struck an iron trolley pole, throwing out all members of the party. Mrs. Craig landed squarely against the pole, fracturing her skull. She died soon after in the Fordham Hospital. The sergeant was thrown about 10 feet in front of the machine and was quite seriously injured. The chauffeur and the children landed in such a manner that they were practically uninjured.

Accounts differ as to the way the accident happened. Sergeant Craig told a representative of THE HORSELESS AGE that his car was passing a dirt cart, which occupied the right side of the road, when a big green touring car cut in between his car and the dirt cart in a space entirely too narrow for passing, and hit the front wheel of the car in which his family were riding. This threw his car out of its course, causing it to collide with the trolley pole.

He said that it was entirely against the rules of the road to try to pass between his car and the dirt cart in that manner, and that the street was so narrow at that point that there was not room on the left where they should have passed; under the circumstances he believed no attempt at passing should have been made.

On the following day, which was Saturday, the Automobile Club of America offered a reward of $500 for the arrest and conviction of the driver of the machine which ran into that in which Mrs. Craig was riding.

On Sunday evening Fred S. Welch, secretary of the Welch Motor Car Company, of Detroit and Pontiac, Mich., called on Coroner Robert S. McDonald with his counsel, John E. Brodsky, of 49 Chambers street, informing the coroner that he had passed the corner of 172d street and Jerome avenue in his car on the afternoon in question when an accident had occurred. He was arraigned in the Tremont Police Station on a charge of homicide and released by the coroner in the custody of his counsel.

Lawyer Brodsky told THE HORSELESS AGE representative that Mr. Welch's car did not collide with that in which Sergeant Craig's family was riding, but had been ahead of it all of the time. The people in Mr. Welch's car, who were out for a pleasure drive, he said, believed that the auto in their rear had accidentally run into the pole, but they were some distance away when it occurred, and did not believe that it was anything serious.

The car which Mr. Welch was riding in at the time was the 50 horse power touring car which made a run from New York to Boston the next day; they thought it was pretty good proof that they had not been in any accident, as their car had no scratch or mark of any kind and suffered no injury whatever.

The coroner's inquest to determine the cause of the fatality will be held March 21.

The English Lamp, Speedometer and Tire Trials.

These trials, promoted by the British Automobile Club, have met with scant support from the trade, and the reasons are quite apparent. Originally a purely tire trial, the other parts of the scheme were tacked on as an after-thought to ease off the high cost to the tire people. The entry fee for each set of tires is $500 if five or less sets are entered, with a sliding scale varying down to $250 per set if twenty-five sets are entered. To these figures have to be added wages of driver and mechanic for a month, cost of hire of a car for same period to which the tires can be fitted, and all the numberless incidental expenses which mount up enormously in affairs of this nature. One tire firm estimated that to carry the thing through properly each set of tires would involve an expense of at least $1,500, and the result might be a matter of luck owing to possible heavy loss of marks through bad luck with punctures. Moreover, the trade were not consulted as to whether the trials were needed, and they are obtaining all the orders they want, as cars must be fitted with pneumatic tires of some sort, and there is practically no competition with respect to price.

When the entries closed it was found that only three sets of pneumatic tires had been entered by one firm, one set of patent solid block tires fitted to a thirty-four seated omnibus, nine speedometers, three kerosene tail lamps, one pair kerosene head lamps, one pair of acetylene head lamps, and one car for the reliability trial. Notwithstanding the paucity of entries the club determined to proceed, and the trials were duly commenced on March 1. As it was impossible to fit nine speedometers on three cars and one bus, the trials of these have been cut down to 2,000 miles each, and the bus will also only go the same distance, starting on March 10. The following were the starters: 20 horse power Dennis, entered for reliability trial and carrying a set of Collier tires, Vulcan speedometer, Worsnop head lamps and Worsnop tail lamp; Daimler car, 28 horse power, carrying set of Collier tires, Gratze speedometer, Eclipse head lamps and Eclipse tail lamp; Rolls-Royce 20 horse power car carrying Collier tires and Cowey speedometer. On the first day the roads were of the worst possible description, and heavy rain fell at intervals. The distance for the tire and car trials is 4,000 miles.

Philadelphia Club Withdraws from the A. A. A.

The Automobile Club of Philadelphia has withdrawn its membership from the A. A. A., and it is probable that the Pittsburg Automobile Club will take similar action. This is due to the opinion of the members of these clubs that they can accomplish their purposes much more effectively by combining all Pennsylvania clubs in the Pennsylvania Motor Federation than by working through the A. A. A. The enactment of just laws is the object of this federation, and the Pennsylvania motorists believe that their federation will have greater influence with their State Legislature than a national organization.

The Philadelphia Club last week elected the following members of the board of governors to serve for two years: J. Maxwell Bullock, John R. Wiggins, Henry H. Roelofs. The committee that had in charge posting the roads to Atlantic City reported that permission had been secured, but after the Jersey main roads had been posted work would begin on the Pennsylvania highways.

Price of Gasoline Advanced.

The Standard Oil Company has advanced the price of gasoline one-half cent per gallon. This will probably result in an increase of 1 cent per gallon by the retailers. Secretary Butler, of the Automobile Club of America, says that a special committee is to be appointed shortly to test the possibilities of alcohol for use by automobiles. The principal obstacle now is the high internal revenue tax, but automobilists hope to see the bill now before Congress removing the tax from the denaturized product passed this session.

Commercial Vehicle Notes.

A Winton car, Model K, is in use carrying visitors to and from the Baldwin locomotive plant in Philadelphia.

An automobile stage line is planned between Truckee, Cal, and Donner Lake; also between Truckee and Lake Tahoe.

An automobile stage service is planned for between Flint, Mich., and Long Lake the coming summer. Several cars may be purchased.

The practicability of an automobile stage line across a desert in southern California, from Mojave to Owen's River, is being investigated.

Chief Cheswell, of the Boston fire department, has a new automobile for answering fire alarms. It is provided with a big gong and a fire extinguisher.

Captain J. F. O. Comstock, of the Underwriters' fire patrol, San Francisco, Cal., is using an Autocar runabout in answering fire alarms.

Theodore Wirth, superintendent of Minneapolis parks, has been supplied by the park board with a 22 horse power Buick car to facilitate his work.

The Southwestern Transit Company has been given permission to operate its automobile stages in the State of Texas, and at the present time has a line in operation out of San Angelo, Tex.

Fire Marshal John Campion, of Chicago, has asked the Finance Committee of the Chicago Court of Common Council for an automobile to replace his horse and buggy in responding to fire alarms.

It is reported that the Barnum & Bailey circus managers are negotiating with a Western automobile manufacturing concern for the manufacture of trucks which will be adaptable to the needs of the show.

The Niagara, Lockport and Ontario Power Company has lately purchased two large automobiles with which to patrol and inspect its entire power and transmission line as far as it has been completed.

Harry Hardy, of Big Rapids, Mich., will start an automobile stage line to Chippewa Lake, Clear Lake, Rogers' dam and fish hatchery May 1. He has bought a Reo omnibus carrying twelve passengers.

Sullivan County (N. Y.) boarding housekeepers have determined to promote automobile stage lines between Monticello and Liberty, and Monticello and Sheldrake, to connect with the Ontario and Western and Erie railroads.

C. W. Gray will start his automobile omnibus line at Watertown, N. Y., about April 15. Two Packard cars have arrived, the first to hold between fourteen and eighteen passengers, with seats along the sides, and the second to hold twenty-four passengers. They will be run on streets not served by trolley cars.

The Tenth Ward Improvement Society, Jersey City, N. J., at a meeting on March 8 suggested that an automobile stage line from the Bergen County line to Bergen Point would be much more desirable than a trolley line on the Hudson Boulevard, which latter scheme, they said, would ruin the only territory in the county that had any scenic value. They thought such a stage line, with a 10 cent fare, could be established.

The Winchendon Auto Transit Company, of Winchendon, Mass., proposes to start an automobile passenger line between the villages of Winchendon, Waterville and Winchendon Springs about April 15. D. C. Woodruff, of Fitchburg, is trying to have one of the cars that have been used between Fitchburg and Townsend brought to Winchendon.

Several automobile firms are at work on designs for an automobile for the Pittsburg morgue. This is the suggestion of Coroner Joseph G. Armstrong, of that city, who believes that trips can be made to distant parts of the city in half the time now required. The designers are instructed to avoid ornamentation and to provide large carrying space.

The Chelsea (England) Borough Council at its meeting on January 31 last decided to purchase ten additional steam trucks for municipal service (sprinkling and garbage disposal), at a cost of $27,000. Chelsea was one of the first communities in England to take up the municipal automobile in earnest, and when the new trucks are delivered it will have nearly twenty machines in use.

The Catalana Omnibus Company (animal traction), of Barcelona, Spain, has made successful trials with a motor bus, and the *French Bulletin* adds that it is hoped that its entire service will soon be carried on with these vehicles. As soon as its charter has been revised the motor buses of this company will probably run from Barcelona to Garcia, to Sans, to San Gervasio, and to San Andrés.

The Loudonville Autobus line, operating between Albany and Latham's Corners, N. Y., began business March 12. The distance is 8 miles, the suburbs of Loudonville and Newtonville being on the way. An eighteen passenger Knox omnibus makes the trip in thirty minutes, including eight stops. It is equipped with Firestone solid rubber tires, 36x3½ inches, and is capable of making 25 miles per hour on a level road. David Jeram is the owner and driver, and makes six trips daily.

Police Commissioner Theo. A. Bingham, of New York city, has asked for $16,000 to purchase three automobiles for himself and deputies, to facilitate their work of visiting the police stations of greater New York. The petition was referred to the Finance Committee of the Board of Aldermen, which has ascertained that the machines desired by Commissioner Bingham can be purchased for $8,200. The aldermen will wait for the commissioner to revise his figures.

The Auto Car Equipment Company, of Buffalo, N. Y., are having several terraced cars built for local sight seeing and passenger service, which they expect to put into commission May 1. A new 25 horse power, four cylinder upright, eighteen passenger car is now being completed for regular service between Buffalo and Niagara Falls. This car will be fitted with sliding gear transmission and solid rubber tires. Three additional electric cars, with a capacity of twenty to twenty-four passengers each, will be installed for sight seeing service in the city.

Operating Cost of Motor Police Patrol.

A 16 horse power automobile with air cooled motor and solid tires has been in use as a police patrol at Springfield, Mass., for more than a year. According to official figures for the year ending November 30, 1905, it appears that 1,190 day runs and 990 night runs, aggregating 5,178 miles, were made, the cost of gasoline and oil amounting to $146.25. Adding the entire repair bill ($168.35), a total maintenance cost of $314.60 is shown, representing 6.07 cents per mile and 14.33 cents per run. Strictly speaking, $75 of the repairs account was not normal expenditure, having been necessitated by an accident to the main shaft through skidding, before the tire chains were applied to the rear wheels. In addition, the night driver now makes ordinary small repairs.

Rural Mail Carrier's Auto.

A. D. Bolton, the rural mail carrier between Abilene and Detroit, Dickinson County, Kan., has driven an automobile over his 28 mile route every week day since December 1 last. He is able to do this between 9 and 12 o'clock in the morning, and has the afternoon to himself. Seven hours would be required to make the drive with a good team. He reports that the cost of repairs has been trifling. Without doubt the warm, dry weather of the past winter has been especially favorable to this kind of a vehicle, and other rural mail carriers are preparing to follow his example.

Garford Plant Acquired by Studebakers.

We learn that the Studebaker Automobile Company, of South Bend, Ind., have purchased the plant of the Garford Manufacturing Company, makers of automobile chassis and parts, at Elyria, Ohio. The consideration is reported to have been more than a quarter of a million dollars. The facilities of the plant will be increased to meet the demand for its products. From another source we hear that the way the deal was put through was that the capital stock of the Garford Company was increased, and the additional stock was taken by individual members of the Studebaker Automobile Company. From the reports it seems that the Garford Works, which are now turning out the parts for quite a line of touring cars under different names, including the Studebaker, Cleveland, Rainier and Ardsley, will after the present season engage in the manufacture of complete cars.

MINOR MENTION

lans are being drawn for a new factory the Wolverine Motor Company at lgeport, Conn.

he new factory of the Woods Motor iicle Company, Chicago, will be in oper-n early in April.

r. W. G. E. Flanders, of Burlington, is making arrangements for the manu-ure of glumatic tire filler.

. Tarkington has built a 20 horse power at Maryville, Ohio, and is now trying ıterest capital to manufacture it.

ıe Ithaca (N. Y.) Motor Club have :d rooms which they will occupy April Sixty-two members have already been lled.

ıe collapse of a wall at the plant of the k Brothers Motor Car Company, Al-)wn, Pa., damaged the machinery ıo.

ıe Bennett Manufacturing Company, ers of steel auto mud guards, Nunda, ., are to remove their business to Al-N. Y.

ıe season of fortnightly exhibitions of models at the Long Island Automo-Club, 360 Cumberland street, Brook-will end on March 30.

ıe Decauville Automobile Company, of York, are negotiating with the Paw-t (R. I.) Business Men's Association gard to the location of their proposed ty in that city.

titions are being circulated in Long d asking the board of supervisors of au County to grant the privilege for the lerbilt Cup race over the same course last fall again this year.

factory has been started at Spokane, ., to manufacture an automobile in-:d by Levi Rhodes, of that city, who ıs his machine can be successfully ıted by crude petroleum.

e Diamond Chain and Manufacturing pany, Indianapolis, have recently ex-:d their plant for the production of Diamond I beam front axle and special nobile parts to customers' drawings.

e Rossler Manufacturing Company, wagon builders, 507 Ellicott street, llo, N. Y., are completing a light 10 power gasoline runabout of the le opposed piston type. W. A. Schaum designer.

e Electric Vehicle Company paste a ed sheet containing complete oiling in-tions on the under side of the forward of all their vehicles, and then shellac er. These instructions are thus always for reference, and are more generally

e consular reports say that Austrian s invite estimates for three benzine r buses to hold eighteen to twenty ns in two compartments, with roof suitable for carrying baggage. Address Karl & Emanuel Tauber, Czernowitz, capital of Bukowina, Austria.

The Alameda (Cal.) County Automobile Club have decided to erect a clubhouse.

The Toronto Automobile Show is scheduled for the week of March 31 to April 2.

Geo. A. Snell, Attleboro, Mass., is planning to manufacture Cape tops for automobiles.

The Burlington Railroad Company are manufacturing 100 cars specially designed for shipping automobiles.

The Automobile Club of Washington will build a $3,000 clubhouse on the Villa Flora property on Brightwood avenue.

The Berkshire Automobile Company, of Pittsfield, Mass., are soon to open a store in the Motor Mart, Boston, with George Hewes Berg as manager.

The New York Automobile Trade Association has decided to hold the proposed open air automobile show at the Empire Track May 24, 25 and 26.

The directors of the New York Motor Club will hold a meeting at the club rooms in the Hotel Cumberland March 22. A smoker will be given March 23.

The ceremony of laying the corner stone of the new clubhouse and garage of the Automobile Club of America, Fifty-fourth street, west of Broadway, New York city, will be held Wednesday afternoon, March 21, at 4:30.

The Blair County Automobile Club, which will be affiliated with the Pennsylvania Motor Federation, was organized at Altoona, March 12, with twenty-five charter members. R. H. Fay is president and W. H. Wolfe secretary.

The Monroe Body Company, Jackson, Mich., has absorbed the Jackson Body Company and Monroe Body Company, of Pontiac. The Jackson plant will be enlarged, and the entire facilities of both factories will be devoted to making automobile bodies.

The new plant of the Matheson Company at Wilkesbarre, Pa., has just started work with about 150 employees. Work closed at their former plant at Holyoke, Mass., March 3, after which 20 carloads of machinery were shipped to Wilkesbarre. Fifty employees and their families moved from Holyoke to Wilkesbarre.

The Syracuse Storage Battery Company, Syracuse, N. Y., has begun the manufacture of batteries, and has opened a garage for the care of electric vehicles at 410 South Warren street. One of the pieces of equipment is a mercury arc rectifier, which takes the alternating current from the wires and transforms it into a direct current.

Boston automobile dealers resent the action of the N. A. A. M. in their decision to sanction only the New York and Chicago automobile shows next year. The Boston Show has been the most successful of any outside the two largest cities, and the dealers there are planning to hold a larger show than ever next year. They hint that should the Selden patent litigation remain unsettled or go against the licensed manufacturers, an attempt would be made to hold a show of the non-licensed factories at Boston next year.

The Chas. Holmes Machine Company, whose friction driven automobiles we described in our Boston Show report in our last issue, are located at Boston, Mass.

The Fashion Automobile Station, 4612 Cottage Grove avenue, Chicago, was damaged by fire March 7, and fourteen automobiles, valued at $10,000, were destroyed.

The Rochester (N. Y.) Motor Cycle Club has been organized with the following officers: President, A. D. Fisk; vice president, F. L. Hunt; secretary, Thomas Drainsfield, Jr.; treasurer, H. B. Brown.

Theodore A. Cook, a reputed "mechanical genius," is said to be building three automobiles at Callicoon, Sullivan County, N. Y., for the use of the Cook expedition which will go in search of the South Pole in the summer of 1907.

Roger B. McMullen, general manager of the A. M. M. A., has tendered his resignation from that position to take effect April 15. He has become interested in the A. O. Smith Company, of Milwaukee, and will have charge of their commercial business, with offices in Chicago.

The Monarch Automobile Company, North Aurora, Ill., are planning to reopen their factory after having gone through bankruptcy proceedings. The new officers will be: President, E. B. Overshiner; vice president, D. W. Simpson; treasurer, Wm. George; secretary, F. Doussang; mechanical engineer, J. Goldberg.

A. H. Kirkland, superintendent for suppressing the gypsy and browntail moths in Massachusetts, maintains that the automobile is an important factor in distributing the first named moth, claiming that places where the automobilists are accustomed to stop for meals or supplies are most generally affected by the gypsy moth.

Jefferson DeMont Thompson, the new chairman of the racing board of the A. A. A., announces that the Vanderbilt Cup commission will be enlarged by official representatives from the automobile clubs of Italy, England and Germany, and perhaps from other countries, provided they enter cars for the contest. Hitherto France has been the only European country represented on the commission.

Walter G. Morse, president of the Second National Bank of Springfield, Mass., now in liquidation, will be treasurer and general manager of the Knox Motor Truck Company after April 1. Mr. Morse succeeds to the treasurership of the company through the resignation of Clarence J. Wetzel, but the office of general business manager is a new one. Mr. Wetzel will continue a large stockholder in the business. There will be an increase in the paid up capital of the company from

$250,000, the taking up of most of the increase being provided for by Mr. Morse.

Clarence B. Brokaw will lecture at the Automobile Club of America, March 27, at 8:30, on "Various Methods of Ignition; Dry and Storage Batteries; Dynamos; High and Low Tension Magnetos." Supper will be served at 10:30.

The Association Patents Company, an offshoot of the A. L. A. M., have acquired from Edward D. Wheeler the Canfield & Mueller spark plug patents. These patents are considered by the owners to cover primarily all spark plugs with the annular air gap.

The Lozier Motor Company of New York has been admitted to membership in the A. L. A. M., and granted a license to manufacture gasoline automobiles under the Selden patent, after having paid back royalties and $2,500 initiation fee. This makes the total membership of the A. L. A. M. thirty-eight companies.

The Geo. N. Pierce Company expect to break ground within a week or two preparatory to the erection of their new plant at Buffalo, N. Y., on the site of the old Pan-American grounds. The new plant is to be ready for occupancy by fall. It will be a one story structure, covering the entire 5 acre tract at Elmwood avenue and the Belt line railroad tracks, which the company purchased recently.

Garage Notes.

Swart & Bailey, Washington, Pa., are building a new garage.

Frank Fairchild will erect a garage at Sherburne, N. Y., this spring.

Leedom Brothers will erect a garage at San Bernardino, Cal., this spring.

The Peoria Automobile Company, Peoria, Ill., are erecting a new $15,000 garage.

Allen Laing, Plainfield, N. J., is going to erect a garage on West Second street.

The H. J. Willard Company, of Portland, Me., are planning to build a new garage.

J. Zimmer will open a garage at 127 North Third street, La Crosse, Wis., April 1.

The Corning Automobile Company has opened a garage on Tioga avenue, Corning, N. Y.

The Valley Automobile Company, Warren, Ohio, have opened a garage and repair shop.

The Fitchburg Auto Transit Company, Fitchburg, Mass., will open a garage this spring.

A. P. Heyer is opening a garage in Valley road, Montclair, N. J. He handles the Haynes cars.

The garage of the Reading Automobile Company, Reading, Pa., is being considerably enlarged.

The South End Automobile Company, Newark, N. J., has opened a garage at 7 Wright street.

A. J. Picard, manager of the Philadelphia agency of the Rainier Company, has established temporary headquarters at the Hotel Walton.

The Auto Rapid Transit Company, La Crosse, Wis., is remodeling its garage in the Trane building.

The Kirchdorfer Automobile Company, Louisville, Ky., will erect a garage and repair shop this spring.

The Newark Repair and Garage Company have opened business at 213 Clinton avenue, Newark, N. J.

The new Cadillac branch at 1001 Bedford avenue, Brooklyn, opened last week, with J. D. Rourk as manager.

The Greene Motor Car Company has opened a garage and repair shop at 88 Washington street, Newark, N. J.

Lucas & Weaver, Oil City, Pa., have opened a garage at 255 Elm street. They handle the Thomas and Oldsmobile cars.

Apperson Brothers are occupying their new Philadelphia quarters on the west side of Broad street just below Callowhill street.

The Anderson Auto Company, Aurora, Ill., have opened a garage at 41 Downer place, where they will handle the Rambler and White cars.

The Auto Electric Company, of which H. A. Brown and John Benson will be the proprietors, will erect a three story garage at Attleboro, Mass.

The new salesrooms of the Welch Motor Car Company, of Detroit and Pontiac, Mich., will be formally opened at 1867 Broadway, New York city, March 31.

The Nashville Motor Car Company, Nashville, Tenn., has added 500 square feet of floor space to its garage. They will handle the Ford cars, in place of J. C. Symmes.

The new garage of the Atlas Auto Company, Pittsburg, Pa., will be opened May 1. It will accommodate 500 cars. They will handle the Maxwell and Premier cars.

Erskine & Hall, agents for the Rambler car in the Oranges, N. J., are to double their capacity within the next month. A complete electric charging plant will be installed.

The F. E. Boland Motor Company has opened a garage at 239 Halsey street, Newark, and represents the National, Wayne and Hotchkiss cars. F. E. Boland and William H. Weldon, Jr., are members of the company.

Charles Morgan has returned from a trip to Mexico and the West Indies, and will take the management of the New Amsterdam Motor Company, 152 West Fifty-sixth street, New York city, which has the agency for the Crawford cars.

New Agencies.

Columbus, Ohio.—Chas. E. Bell, Wayne cars.

Marietta, Ohio.—W. W. Wood, Maxwell cars.

Saginaw, Mich.—Beck & Fisher, Maxwell cars.

Neenah, Wis.—C. H. Bergstrom, Pope-Waverley cars.

Van Wert, Ohio.—D. L. McDonald, Maxwell cars.

Wheeling, W. Va.—House & Hermann, Maxwell cars.

Akron, Ohio.—Central Motor Car Company, Maxwell cars.

Cohoes, N. Y.—Clute Brothers, Pope-Waverley cars.

Port Huron, Mich.—William L. Wilson, Maxwell cars.

Danville, Ill.—J. B. Chambers & Son, Pope-Waverley cars.

Bucyrus, Ohio.—Bucyrus Cycle and Auto Company, Maxwell cars.

Tiffin, Ohio.—Tiffin Cycle and Auto Company, Pope-Waverley cars.

Birmingham, Ala.—Birmingham Auto Garage Company, Maxwell cars.

Aurora, Ill. (for Kane and Kendall Counties)—W. J. Reed, Buick cars.

Cleveland, Ohio.—McGeorge Manufacturing Company, Maxwell cars.

New Incorporations.

Milford Automobile Machine Company, Milford, Mass.—Capital, $10,000. Directors, W. H. Baker, S. Fred Howard and William Hadley.

Meridian Auto and Cycle Company, Meridian, Miss.—Capital stock, $10,000. Incorporators, Theo. Sturges, R. J. Mynton and others.

Monarch Motor Car Company, Chicago.—Capital, $150,000. Manufacturing automobiles. Incorporators, T. A. Quinlan, Jr., A. B. McCord and J. J. Boucher.

The General Motor Car Company, San Francisco, Cal.—Capital stock, $25,000. Incorporators, H. L. Edell, W. J. Young, E. W. Choynski and William Jacobs.

Apex Motor Company, Bergen, N. Y.—Capital, $15,000; to make automobile motors, etc. Incorporators, A. A. Sands, G. E. Parish, Bergen, F. O. Bullis, Rochester.

Mora Car Company, Newark, N. Y.—Capital, $150,000. Directors, Samuel H. Mora and William N. Freeman, of Rochester, and William H. Birdsell, of Newark.

The Mutual Auto Accessories Company of America, New York City.—Capital, $10,000. Incorporators, T. R. Nesbit, S. A. Houch, F. J. Willard, all of New York city.

Webb & Pine Automobile Company, Chicago.—Capital stock, $2,500; to manufacture automobiles and accessories. Incorporators, William Friedman, Harry A. Riley and Morris Friedman.

American Racycle, Novelty and Manufacturing Company of the Pacific Coast, San Francisco, Cal.—Capital stock, $30,000. Incorporators, H. O. Coughlan, J. R. Turner and D. S. Mantz.

Waller Motor Company, Ames Avenue, Rutherford, N. J.—To manufacture motor cars, automobiles, etc. Capital, $50,000. Incorporators, William E. and Elwood E. Waller and John M. Bell.

The Wyoming Valley Motor Car Company, Wilkesbarre, Pa.—Capital, $50,000; to deal in automobiles. Incorporators, Ambrose West, of Plymouth; James Cool and Laning Harvey, of Wilkesbarre, Pa.

The Bridgeport Vehicle Company, Bridgeport, Conn.—To manufacture automobile parts. President and treasurer, Henry H. Miller, 20 shares; vice president, H. F. Brandes, 10 shares; G. G. Miller, 10 shares.

The Nielson Motor Car Company, Detroit, Mich.—Capital stock, $150,000. To manufacture 3½ ton motor trucks, runabouts and delivery wagons. Incorporators, W. J. Newtown, E. E. Webb and Charles J. Woodall.

The Camden and Atlantic Automobile Company, Camden, N. J.—Capital stock, $25,000; to carry passengers and freight from Camden to Atlantic City. Incorporators, I. Dare Ginehart, Charles D. Wesley and M. Leon Berry.

The Muffler and Timer Company, Utica, N. Y.—Capital stock, $51,000; to deal in mufflers, timers and cut-out valves for automobiles and engines. Incorporators, William S. Foster, William B. Foster, John J. Radell and G. A. Bowman, of Utica, and Herbert S. Powell, of Clinton.

Fort Pitt Automobile Company, Pittsburg, Pa.—Capital stock, $25,000. President, John H. Stubbe; secretary and treasurer, Thomas McGovern. Board of directors, A. I. Cook, James E. Gill, Thomas McGovern and John H. Stubbe. To handle commercial and tourists' vehicles.

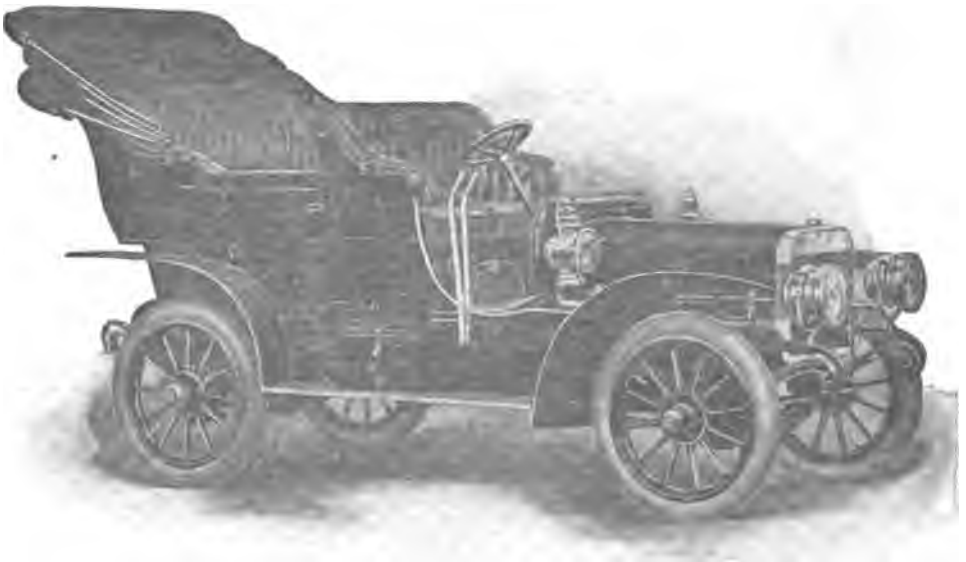
...THE...

Horseless Age

VOLUME 17 MARCH 28, 1906 NUMBER 13

WINTON MODEL-K

BEST FOR HEAVY WORK



Mr. Alfred W. Bowen, of San Francisco, is vice-president and general manager of the Ocean Shore Railway Co. and has charge of the company's construction work.

Mr. Bowen writes:

"I purchased my Winton Model K after much serious consideration because, as you realize, during the present course of construction of the Ocean Shore Railway, I must have a machine upon which I can rely absolutely to take me over an extremely rough country and with as much speed as possible.

"To say that the Winton Model K has fulfilled my expectations is putting it mildly, for I had grave doubts that a machine could be found which would stand up under the trips I am obliged to make. Any machine which will climb the hills back of Colma with mud anywhere from six inches to a foot deep, and will also climb the California Street hills, is good enough for me, and I doubt if there can be found in the market to-day a four-cylinder machine which will give as good service for heavy work as the Winton Model K."

Compare the $2,500 Winton Model K with any car on the market selling at $3,500 or higher.

Full information can be obtained at Winton Branches in New York, Pittsburg, Boston, Philadelphia, Chicago or London, at Winton Sales Agencies in all important places, or by writing for "The Motor Car Dissected" to

The WINTON MOTOR CARRIAGE CO.

Licensed under Selden Patent.

CLEVELAND, OHIO, U. S. A.

Mention HORSELESS AGE.

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All Things Being Equal

YOU will naturally be favorably inclined toward the simplest engine. But suppose that, instead of being merely equal, the engine with the fewest parts actually develops most power and costs least to maintain. ***There's a combination worth considering, isn't it?***

That's precisely where the **ELMORE TWO-CYCLE** engine stands—eighteen to twenty parts eliminated on every cylinder.

AND THERE'S ENERGY BEHIND EVERY PISTON STROKE

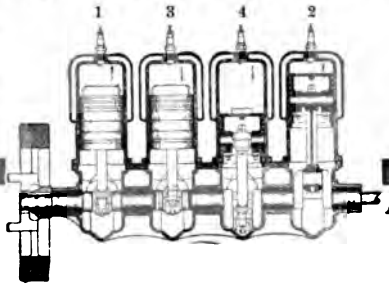
You know, don't you, that only every other stroke of a four-cycle engine carries power with it. Just consider what four Elmore cylinders, with four impulses at every revolution, really means.

THEY START FROM THE SEAT

Let us send you, right now, a full description of this epoch-making car. The prices are:

Model 15.	Four-Cylinder, Two-Cycle Elmore	$2,500
Model 14.	Three-Cylinder, Two-Cycle Elmore	1,500

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of Carburetors, Mufflers, Coils and Plugs is without a peer. The catalog we want to send you will tell you why. A postal from you, and we send it.



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WINTER EXPERIENCES.

Winter Motoring in Indian Territory.

By Amos Avery, M. D.

For the past two years I have owned and run a small buckboard and have kept it in commission the year round. I ran it when I was living in Connecticut, where the winters were much more severe than they are here (Indian Territory). The motor being air cooled, I have had no trouble with freezing of cooling mixtures. I consider this to be the greatest argument in favor of air cooling, more important than the elimination of the complication of a water cooled system.

I kept my machine in a sort of open shed, and on a very cold morning it would sometimes start a little slowly, but by injecting a few drops of gasoline into the cylinder through the relief cock it would start very readily, even in the coldest weather, and sometimes the mercury was 10° below zero. The lubricating oil would be a little stiff, and at times it became an advantage to warm the lubricator and oil pipes with a little hot water before starting out. After the engine had been running a few moments the oil would flow freely. If there happened to be any adjustments or repairs necessary it was rather cold, and I would say that it would be an advantage for various reasons to have a storage room that was kept at least above the freezing point, but I am glad to have had the above experience, as it gave me a knowledge of the working of the machine under all conditions, and it is my experience that we perfect our methods.

When on the road I found that the runabout worked as well in very cold weather as it did in warmer weather, with this exception, viz., if I happened to be running the machine on the road during a heavy snow squall there would be a small quantity of snow flakes drawn in with the air into the carburetor, and this would cause a slight precipitation of moisture that would cause skipping in the ignition. The motor was stopped a few times from this cause. I soon found for this trouble a simple but effective remedy, as follows: From a piece of roofing tin I formed a tube about the size of the intake to the carburetor, and connected it so that it came up past the cylinder at one end. At this end I cut an oblong opening in the tube on the side next to the cylinder, at the upper, warmer portion of the cylinder, thus taking in warmer air and from a position protected from the snow flakes. I had this tube arranged so it could be adjusted to any distance from the cylinder, so that it allows of obtaining air of any desired temperature. I found this tube an advantage in another way. When the streets were wet and moist, with the original position of the intake, a few drops of water would sometimes be drawn in when riding through a small pool, but the added tube I could so arrange that it was away from the direction of the water.

I used my machine when there was at least 2 feet of snow on the ground—that is, after the roads and paths had become somewhat beaten down—and found much satisfaction in it. Sometimes it became necessary to wind the rear tires with rope to get the necessary traction. The town where I was located at that time was a small country town and the roads were not always broken out as well as one might wish, but the little buckboard always brought me home on its own power.

The climate in this locality is so mild that one can run an automobile all the time with no winter troubles. The only difficulty is after or during a rain. The soil is such that it is very muddy on the dirt roads and the mud is very slippery and sticky. As soon as we get Statehood and can raise some taxes to put in bridges and fix up the roads, this will be an ideal country to motor in. We have no cold, disagreeable winter weather, and even in the extreme hot weather of summer there is something in the radiating properties of the air that facilitates the cooling of the motor, according to my experience.



Out in the Auto on Christmas Day.

Two Years of Autoing.

By William Martin, M.D.

Life is made up of little things, and one might say the same of autoing, for it requires only a very slight thing to make an autoist miserable for a short time, at least. My experience is that one must first learn these various little things in order to be successful in the larger. After two years of the use of an auto in my professional work, I feel that many little discouraging things have happened, but that enthusiasm that helps one to soar far above such has kept me an enthusiastic autoist, and each added experience has just that much better fitted me for continuing. This past winter having been so mild, it has been easy to use the auto through the season, and even the many snows and cold of the winter before did little to prevent its use. During the early part of each deep snow I did not attempt to run, but just as soon as a track was broken I was in the auto as usual. The water problem was a trying one until I used the wood alcohol, glycerine and water combination, and since this was used little or no trouble was found.

To my knowledge there has been no damage done to the rubber hose, and, of course, the metal parts could not become damaged from any of the ingredients. The only fault is that of evaporation of the wood alcohol, which necessitates its renewal from time to time.

Tire troubles are, to my mind, the most troublesome, and offer a large outlet to the elusive dollar. Punctures and blowouts, if not always with you, certainly are frequent enough to merit a considerable thought in the line of prevention. The only way that at present suggests is the use of cushion or solid tires, and here again we who run the light autos are "up against" it. I am not quite convinced that what the makers of one kind of solid tires promise you is quite to be accepted as just what applies to one's own case. I hesitate to use such on my runabout because of the necessary jarring to the engine, as the street crossings and trolley tracks offer many opportunities for a considerable shaking up. I have had no experience with the filling to make tires puncture proof, so cannot testify to the usefulness of it, and I do feel that the solution of the tire problem does not lie in that direction. It seems to me that the suspension of the engine in such a way as to absorb the jars ought to allow of the use of solid or semi-solid tires on

any auto, light or heavy, thus doing away with this great annoyance and expense.

Ignition troubles may be frequent and annoying to anyone careless about watching the wiring and connections, and at the beginning of the auto career are often the most frequent of the causes of stoppage, and at times a little thing will cause a long delay. One soon learns, however, to watch the battery connections, the spark plug and the vibrator of the coil. These and the commutator are the vital points, and where trouble is often found.

An unusual accident, that of the entire breaking off of the ground wire, happened to me some time ago, and I was some time locating the trouble, not suspecting it there. The loosening of a screw, and even the loss of one from the commutator, may not occur often; but such did occur recently, and at a least expected time, for that morning I had just cleaned and replaced it, as I thought, securely. A cotter pin did duty for the screw, and the lost time was soon made up.

Carburetor troubles are not infrequent, although the proper adjustment once had is easily held. A too rich mixture or too poor will give trouble, but either one can soon be remedied. I recently had the coil of the tubing leading to the carburetor from the tank to break and give considerable trouble, until it could be properly mended. This occurring far from home, and no rubber tubing being available, would place one in a very unfortunate position.

Starting the engine in the morning of a cold winter day, after standing all night, is not always the easiest thing to accomplish, yet a little priming of gasoline in the spark plug hole will generally save lots of muscle and reputation. I invariably do this each winter morning without trying to start in any other way, and it has saved many sore muscles and perhaps my conscience, and I can recommend it to all who have not tried to. The cold oil not flowing, and the lubrication necessarily suffering because of it, prior to the warming up of the engine can be obviated by the addition of a small quantity of kerosene oil—just enough to thin it for the purpose. I have done this for two winters, and feel that it gives good results, and allows of using your stock of oil and saves the engine from damage from lack of lubrication. Oil should always be strained before being placed in the receptacle, as some foreign matter may easily clog the outlet and thus allow of little or no lubrication. If you hear an unusual pounding, it will be well to look to the flow of oil, as damage can be quickly done to your cylinder.

Experience is the best teacher, and in two years one can have plenty of experience, and one must be unusually dense if he does not profit by these various experiences. The exhilaration of autoing is one of the points in favor of it for a physician, and the change of thought gives the mind a little rest between the visits, enabling him to do better work, which is to the benefit of those whose lives are practically in his hands. I am fully persuaded that the auto offers the ideal mode of conveyance to the town physician especially—in fact, to anyone, if he has the little mechanical knowledge or inclination sufficient for the proper care of one.

A Doctor's Car in Winter.

By Dr. C. F. Howe.

In almost every issue of The Horseless Age are printed wise suggestions from the medical profession to builders of automobiles, advising them how to construct satisfactory cars that would meet their approval, and induce them to give up their money. The builders may or may not be influenced by these suggestions, but in the meantime the doctors without automobiles are losing valuable time, and the builders are pushed to their utmost supplying the demand for the present style of car. The facts are that so many good, satisfactory cars are made that any of them or all of them would suit me. It's only a question of price; I would own a dozen good cars if I could. My car has served me so well that I am perfectly satisfied with it individually, but there are so many better and more expensive cars made I would like an assortment. The motor in my car is a two cycle type, and certainly is a wonderful piece of mechanism. I have used it continually in my practice for now over ten months, including the present winter, and never has it failed to go when wanted. For reliability, flexibility and economy, certainly no gasoline motor can excel the two cycle.

My entire expense for the ten months has been less than $60, or a fraction over one cent per mile. I have used 270 gallons of gasoline, at a cost of $32.40, also $8 worth of dry battery, $5 worth of lubricating oil, and $2 worth of wood alcohol for anti-freezing fluid. Other items of expense are: Calcium carbide, $1.50; repair of radiator, $4 (it froze before the wood alcohol was used); $5 for a broken pump shaft and adjustment of chain and brakes; $1.80 tire expense. Total expense for ten months, $59.70, or $5.97 per month, with an estimated mileage of over 5,000 miles, estimated on the basis of gasoline consumption, my car easily averaging 20 miles on one gallon of gasoline, according to my own measuring, while the makers claim 25 miles per gallon.

While these figures may seem impossible to some with automobile experience, yet they are correct. My experience with two former cars was vastly different, however, in the matter of repair expense. I attribute my small expense with this my present car to three important features, viz., two cycle motor; light but well made vehicle; very heavy 3½ inch tires. It costs less to haul a light load than a heavy one. My tire expense has been almost nothing, and I have had no trouble. A heavy tire on a light car is a matter of economy. The motor expense has been absolutely nothing, and the motor has been always in order and ready to go. Some say a motor should be overhauled and inspected at least once a year, while others seem to think once a week or once a month is not too often, but my car will only get an overhauling when it refuses to go satisfactorily. Of this I am certain, after ten months' constant use it runs seemingly as well as ever. I have a horse, but he has not been harnessed the entire winter. When the weather was very disagreeable I used the street cars, but at no time would it have been impossible to use the automobile. Of course it is understood this has been an exceedingly mild winter, and the automobile has served every purpose, and served it well. My only objection to automobiles is that I cannot own more of them, at least an extra big fine one for extra occasions. Live well while you live, and own a big automobile, should be the motto of every progressive physician.

Three Winters' Use.

By W. N. Fowler.

This is the third winter I have owned a two cylinder runabout of 6 horse power, which weighs a little less than 1,000 pounds. Except for a general overhauling and repainting each winter, my machine has never been out of commission more than one day at a time. Among the most serious accidents I have ever had were the following: One intake valve stem broke, which was temporarily repaired in thirty minutes; another time one push rod bushing loosened and, turning quarter way round, sheared a key in the cam shaft; once a lug bolt holding the radiator in place broke. This includes all my roadside accidents. I have also kept close account of my expenses, and though they were high for the first six months, the average has been satisfactory. My low tire expense for the three years I attribute to the fact that I have always kept my tires as tight as possible and never have ridden a tire when it was even leaking a little. I have always carried an extra tire, even in my country practice, and have been a careful driver, though my average is 15 miles an hour over country roads, which is quite satisfactory for me. I find that my average expense per mile, including overhauling the machine, varnishing once and painting and varnishing once, carrying two passengers practically all the time, and sometimes four, has been a fraction over 1½ cents per mile or three-quarters of a cent per passenger. This includes oil, gasoline and electricity, as well as expenses mentioned above. If you include deterioration of value, it would be a little more. My winter precautions are limited to the provision of a pair of tire chains.

Charles E. S. Burch, of Minneapolis, has built an "ice locomotive," which is propelled by means of four large steel spirals in place of wheels, those on opposite sides being of opposite pitch.

gislative Situation Considered—Measures Suggested.

By Xenophon P. Huddy, LL.B.

low that the legislatures of many of States are considering new automobile isures, it is a particularly appropriate e to look over the existing statutory ctments for the purpose of ascertaining r merits and defects. Presumably if new ctments are passed, which undoubtedly be the case in many jurisdictions, the ctment of new or amendatory legislation be for the purpose of improving upon existing laws, either by curing defects, plying omissions or repealing unneces- provisions; that is, if the legislation is mpted by a desire to honestly and fairly t the present conditions and necessities he times. Of course, legislation which roposed not in good faith and not for purpose of fairly dealing with condi-, but for the purpose of spite or any ve other than that of honestly ishing a bona fide remedy for the safe-ding of the public (of which it must not rgotten automobilists constitute a great) cannot be expected to be of great e. On the contrary, hasty and prejudi- legislation is apt to be not only unwise unconstitutional. What satisfaction can be in passing such legislation is easy to see, for the chances are that it be immediately overthrown, involving nse to the State in defending the con- This legislation is not the kind which re intended to be discussed, but it is legislation passed in an honest effort to it the public which will be considered. legislate wisely on any given subject nportance is a more or less difficult according to the nature and position e matter sought to be regulated; espe- is this true in a country like the d States, where the Government is sed to be in the hands of the people, exists for the purpose of benefiting the e as a whole.

e who takes upon himself the official ity of representing the people in the ng of laws should be a man of intelli- and education; one with qualifications ch a nature as to fit him for the re- ible position assumed. A lawmaker d possess education and wisdom con- ng the matter he seeks to regulate by If he desires to frame a bill concern- railroads or their operation, or one ning to insurance, or marriage and ce, he should thoroughly understand subjects. So it is in the case of auto- e legislation. One who attempts to laws to govern the operation of motor es on the public highways should do a result of a study of the subject and peration of existing laws; he should the necessities of the situation, under- the form of remedial legislation need- d be able to frame the kind of meas- hat will accomplish a successful solu- of the problem.

empting to handle the motor vehicle legislative situation and to suggest measures which might be acceptable to all concerned is treading upon delicate ground. However, nothing ventured, nothing gained, and the writer begs the indulgence of his professional brethren and the expert motor car operator and machinist in the following reflections.

Many of the State automobile enactments need remodeling, both as to form and substance, and this should be done only from a careful study of conditions and the operation of existing laws. That which needs to be remedied should first be considered. The situation should be understood, and the matter requiring control or regulation is then in order for consideration.

Should we regulate automobiles and their operation? This is the first question to be answered. The necessity for the enactment of laws is always the first consideration in any proposed legislation.

There are those who can see no reason why motor vehicles should come under legislative supervision, and be compelled to carry tags and conform to certain rules when other vehicles are allowed to be operated free from these burdens. They claim that there should be no distinction made between animal drawn carriages and carriages propelled by motors. Very true, there should be no distinction if there is no marked difference between the classes of vehicles and the effect of their operation. We must deal fairly with the subject, eliminating all bias for or against the automobile. It is the only way to get at the truth.

That the automobile is more powerful and is capable of more speed than the horse drawn vehicle, no one will deny. These characteristics constitute the motor vehicle a radically different mode of transportation from the old means of conveyance. We have in the horseless carriage great speed capacity and power that is not subject to fatigue, but no matter how powerful and fast the automobile may be, it is not for those reasons a dangerous machine per se. Its unconfined sphere of action, quick response to guidance and immediate ability to stop are superior characteristics of the motor car.

The personal part played in motoring is the only subject for serious consideration by the State. Put the powerful automobile in the hands of a reckless operator and there may be danger. This danger requires regulation in the form of legislation. It is the man plus the inherently inoffensive power—the automobile—which necessitates the enactment of laws. Because the motor vehicle is liable to become dangerous in the hands of a careless driver, we need laws governing the situation. This is getting down to rock bottom.

There being liability of danger in the operation of automobiles, due to the personal element of motoring, the State legislatures undoubtedly have the power to enact laws to protect the public on the highways. This the State may do under its police power, which authorizes it to enact laws for the protection of the public safety, health and welfare. There can be no question of the State's power to pass proper regulations controlling the operation of automobiles on the public ways. The liability to danger constitutes the constitutional basis of such legislation. It authorizes the State to act in the matter. To deny this power is a waste of effort. There is a right and a wrong side of this legal matter, and it is believed that all motorists desire to take the correct position at the outset, which accords to the State the power to regulate to a certain extent motoring on the public avenues of travel.

We have seen that there is a necessity for legislation concerning the automobile, and that the State possesses the power to legislate. These having been established, we will now consider the kind of legislation needed.

First, and above all, we want fair legislation—fair to all concerned. Such legislation is the only kind that can stand for any length of time; it is the only satisfying legislation avoiding conflict and contention.

Second, the legislation must be simple and understandable. The statutory provisions must not be too complicated. The requirements must be plain; the duties of automobile operators to be performed while driving must be prescribed in such a way that there can be no question as to what must be done.

Third, the legislation must be effective. It must accomplish its purpose, and its purpose must be to eliminate that which authorizes the legislation, which is the danger caused by the imprudent and careless driver.

Fourth, the careful operator should be given the greatest liberty of the road consistent with the safety of the public.

From the foregoing discussion, it will be seen that any proposed legislation must be directed against the careless and imprudent operator. The machine needs no consideration, except in an incidental way. The declared dangerous element of motoring is, as has been stated, due only to the act of the reckless operator. He must be exterminated by law—for the sake of the public and the safe motorist. He should be the prime and only object of automobile laws. Some of the States have attempted to carry out this theory, notably Massachusetts and Pennsylvania.

To eliminate reckless motoring should be the aim of all legislative action, and a motor vehicle law should be so framed that every section, sub-division, paragraph, sentence and word should point toward the one great object—recklessness.

To accomplish its legitimate object the law should provide for registration and identification of operators, and operators only. There is no need of registering the machine, and there is no necessity of requiring manufacturers and dealers to become registered, except when they assume the capacity of operators.

There should be a carefully fr-

vision in reference to driving on the public ways. This should be the main and most important regulation. For example, it should be provided that to operate an automobile on the public highways at a speed or in a manner which is dangerous, having regard to all facts and circumstances at the time, constitutes an offense. Incidental to this main provision there should be other separate provisions defining or stating that which amounts to dangerous operation; but in order to protect the careful driver and to give him greater liberty of the road, the violation of the law should in the first instance, at least, constitute only a prima facie offense. There should be a provision enacting that if a driver operates at a speed over the given limit, he is, prima facie, driving at a dangerous speed; or if he operates in a certain manner, swaying from side to side of the road, for example, he is prima facie driving in a dangerous manner. There should also be a provision in reference to the carrying of lamps and proper appliances, which should provide that if between certain hours lamps are not carried the driver is prima facie operating in a dangerous manner; likewise if the automobile is operated without brakes, there may be a provision that the machine is, in such a case, prima facie deemed to have been driven in a dangerous manner.

It will be noticed that a non-compliance with the suggested provisions constitutes only a prima facie case of dangerous driving, or in other words, a prima facie violation of the law. This gives the automobilist the opportunity to prove or show that, under the particular circumstances of the case as they existed at the time, he was not causing danger, and therefore he committed no offense. By enabling the motorist to refute a charge of dangerous driving under the provisions as above suggested, he is given a greater liberty of the road; while on the other hand the reckless driver is controlled.



SCANDINAVIAN LEATHER COAT, PARISIAN MODEL.

Courtesy of Scandinavian Fur and Leather Co.

Spring and Summer Garb for Motorists.

Spring and summer garments for automobilists are now occupying the attention of specialists in this kind of apparel. In the shop windows along Fifth avenue and Broadway the new modes are now on view, and have already made their appearance among the fashionables. Although the past winter has not been of the variety known as "old fashioned,"



SPRING MODEL, LADIES' MOTOR COAT.

Courtesy of Saks & Co.

dealers have done a thriving business in fur garments for motorists, but with the approach of the warmer days of spring new problems are presented. The raiment demanded must be dust and rain proof, as well as of much lighter material. A distinction is also to be made between garments for spring and fall wear and those for the warmest weather of summer.

According to a prominent Broadway dealer, khaki is going to be an extremely popular material the coming season for all but the warmest weather. Although it has not yet been used to any great extent in this country, English motorists have been very fond of it for more than a year. It is inexpensive, and meets the requirements of motorists exceptionally well, after it has been treated to the rain-proofing process.

Of course, pongee, linen, leather and all kinds of rubbered silks and satins will be worn, and the Empire styles that were so much in vogue last summer will still hold the lead. Loose, full garments have become an acknowledged necessity with motorists.

Those who can afford it affect leather to a great extent. The garments made from the soft, pliable Danish and Scandinavian leathers are comfortable as well as beautiful, but those made from the domestic leathers are far from satisfactory. We illustrate on this page one of the fancy Scandinavian leather coats after a Parisian model. To chauffeurs especially leather has a practical value, which will probably always give it a certain degree of popularity with them. Notwithstanding this fact, one sees them wearing cloth Norfolk jackets with knee breeches more and more, the puttees being the only leather garments.

In this connection the recent action of the Professional Chauffeurs' Club of New York City, in protesting against motor car drivers wearing livery, is especially interesting. American chauffeurs generally appear unwilling to follow the dictates of European flunkeyism, and so we do not see them decked out in gorgeous hussar and semi-military uniforms, as is so common in France and Germany. They believe their calling is above that of a coachman or footman in that they must have mechanical knowledge, and they evidently propose that their employers shall recognize this fact.

Italian, Japanese and Tussor silks in white and black, as well as in lighter and mode shades, and pongee will be the materials used for the warmest weather. Some of the new models are severe in their simplicity and utter lack of ornamentation, while others go to the other extreme of fashion. Indeed, at the recent race meet at the Ormond-Daytona beach some wonderful creations in motor coats were worn, while some of the hats and veils were positively startling as compared with previous fashions in this country.



GENTLEMAN'S MOTOR COAT.

Courtesy of Saks & Co.



SILK HOOD FOR MOTORING.

he present season will show a distinct lency toward the more dressy styles he French in millinery. Hitherto the nest hats possible were thought the st desirable for automobilists, but ie of the new models are very elabte. They are all rather flat in effect, are made up in striking colors, and amed with wings in such a way that y will not take the wind.

Veils especially offer an unusual optunity for novel display to the devos of fashion. Yards of chiffon can be ped upon the head in myriad styles l with striking effect. The popular on Bijou veil is apparently a scarf en one picks it up, but it is instantly nsformed into a hood, with veil athed, by the extremely simple process pulling two strings, which then tie der the chin and fasten it. Fine Orienlaces and the French lace veils with avy borders will be worn by those who sire more expensive materials.

Two of the new spring models in mor coats by Saks & Co., New York, are ustrated on the opposite page. They ay be made of any material (although ongee is used in the models shown), d are provided with Danish leather collars and cuffs. In the ladies' coat the long cape and the fullness of the garment show the tendency of the new style.

The rubbered silks come in a great variety of weaves, some of the most attractive being Scotch plaids. Leather piped and bound, they make unusually stylish garments, and the dealers expect that there will be considerable call for them this spring. One of these new weaves is a black and white shepherd's plaid, cut full length, with new style of cuffs, trimmed with bands of the same material, the plaid effect being carried out even in the buttons.

Another stylish ladies' coat is of fine gray worsted of quiet weave, showing pipings of narrow buff leather, wherever they can be used effectively. The buttons of many sizes, in French gilt, all bear the design of an automobile. Straps of the worsted stuff, buff piped, as are also the pockets and cuffs, add much to the striking effect of the garment.



PONGEE DUST COAT, WITH CAPE.

A light drab worsted rain-proof coat, trimmed with narrow, curved bands of the same material, piped with tan leather, of which the the pockets and cuffs are also made, is one of the coats to which dealers call attention as having been much admired by those who had seen it. Tan buttons with gilt rims give the garment an exquisite finish.

One of the extreme styles is the Louis coat in leather, with skirt to match, and finished with welt cordings of velveteen. It is most effective on a tall, slender woman, and is a style that will naturally be exclusive.

In the matter of color, gray seems to have the preference, with the shades of blue and slate close seconds. Some of the coats are bright red, and are permissible to those who desire an extreme style.

A long coat of gray silk of high sheen cut with a biased seam back, that gives it a smart flare, reaches to the hem of the dress skirt underneath. The double breasted front is fastened with smoke pearl buttons.



SILK HOOD FITTED WITH LARGE GLASS.

Two silk hoods are illustrated on this page, one on the right being fitted with a large glass and adapted to go over any size hat.

A long cravenette combination coat for men is illustrated on this page. This is so arranged that trousers can be made out of a part of the coat, thus affording complete protection against the elements. It takes only a moment to change the long coat into a garment having all the essential features of a blouse and trousers.

Imported leather gloves are usually worn by men; those shown in the illustration are of Scandinavian leather and waterproof. They are adapted to the hardest uses.

In the matter of head gear for men, caps are in the lead. These usually unfold over the back of the head, reaching to the coat collar.

For all of the cuts used in this article, except the two credited to Saks & Co., we are indebted to the Scandinavian Fur and Leather Company, New York.



IBINATION CRAVENETTE COAT AND TROUSERS.



IMPORTED LEATHER GAUNTLETS.

ELECTRIC IGNITION

Electrical Connections.

A galvanic or primary cell made of definite materials always gives a certain electromotive force independent of the size of the cell. The ordinary dry cell, for instance, gives about 1.3 volts, while certain forms of wet cells give as high as 2.5 volts. When it is desired to make use of a higher electromotive force it is necessary to use a number of cells and connect them in series, as shown diagram-

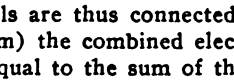


FIG. 1.

matically in Fig. 1. That is, the positive or carbon terminal of one cell is connected by a wire to the negative or zinc terminal of the adjacent cell. It may here be explained that it is customary in electrical literature to represent a primary cell diagrammatically by two parallel lines, one short and heavy, representing the negative pole, and one long and thin, representing the positive pole. When a number of cells are thus connected in series (or tandem) the combined electromotive force is equal to the sum of the electromotive forces of the individual cells. Or, if all the cells are exactly alike, the total electromotive force is equal to the product of the electromotive force of one cell by the number of cells. A number of cells connected together electrically in any manner is called a battery.

When a number of cells are connected in series the total current flows through

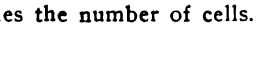


FIG. 2.

each one, and the maximum current obtainable from a battery of cells connected in series is limited by the current capacity of the individual cell. If it is desired to obtain a greater current than is obtainable in this manner the cells are connected in parallel (or multiple), as shown in Fig. 2; that is, all the positive poles are connected together and all the negative poles are connected together. The resultant electromotive force of a battery of cells connected in parallel is no greater than that of a single cell, but as the currents from the individual cells are combined, providing the cells are all exactly alike, the total current is equal to the current furnished by the individual cell times the number of cells.

The two methods of connection may be combined, giving the series-parallel method of connection, as illustrated in Fig. 3. In that case the total electromotive force is equal to the product of the electromotive force of the individual cell by the number of cells in each row or series, and the total current is equal to the current of the individual cell by the number of rows. By this method of connection it is therefore possible to secure both a high electromotive force and a strong current.

The actual current which flows when the terminals of a battery or other source of current is connected through a resistance is always calculated by Ohm's law, as given in a recent instalment, viz.,

$$\text{Current} = \frac{\text{Electromotive Force}}{\text{Resistance}}$$

or

$$\text{Amperes} = \frac{\text{Volts}}{\text{Ohms}}$$

The term resistance in the upper of the two equations includes the whole re-

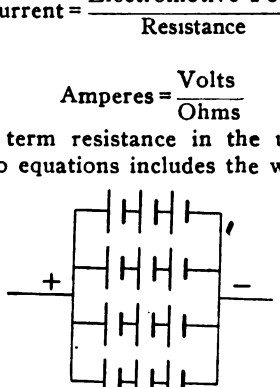


FIG. 3.

sistance of the circuit, the internal resistance of the source of current as well as the resistance of the outside portion of the circuit. These two resistances, being in series, add together. For instance, suppose that a cell of 1.5 volts electromotive force and one ohm internal resistance is closed through a wire of 2 ohms resistance. The total resistance in circuit is evidently 1 + 2 = 3 ohms, and the current $= \frac{1.5}{3} = \frac{1}{2}$ ampere. It is evident that electric conductors, like cells, may be connected in any one of three different ways, viz., in series, in parallel and in series-parallel. When they are connected in series, as shown in Fig. 4, the total resistance is equal to the sum of the individual resistances,

$$R = r_1 + r_2 + r_3 + r_4.$$

When a number of conductors of equal resistance are connected in parallel the resultant resistance between their junctions is equal to the resistance of the individual conductor divided by the number

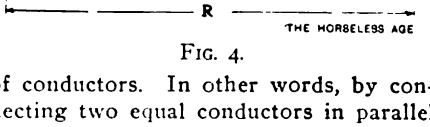


FIG. 4.

of conductors. In other words, by connecting two equal conductors in parallel the resistance is reduced to one-half; by connecting three in parallel, to one-third; four, to one-fourth, etc.

When conductors of unequal resistance are connected in parallel the problem of finding the resultant resistance is somewhat more difficult. The method of proceeding in such a case is as follows: Suppose that three conductors of 1, 2 and 3 ohms resistance respectively are connected in parallel; it is required to find the resultant resistance. When a number

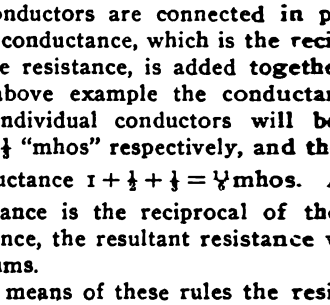


FIG. 5.

of conductors are connected in parallel their conductance, which is the reciprocal of the resistance, is added together. In the above example the conductance of the individual conductors will be 1, $\frac{1}{2}$ and $\frac{1}{3}$ "mhos" respectively, and the total conductance $1 + \frac{1}{2} + \frac{1}{3} = \frac{11}{6}$ mhos. As the resistance is the reciprocal of the conductance, the resultant resistance will be $\frac{6}{11}$ ohms.

By means of these rules the resistance of any network of conductors can be calculated, and the current which a cell or battery of known electromotive force and internal resistance will send through it be found. The maximum current which a cell is capable of delivering is obtained when its two terminals are connected by a short, heavy wire. The cell is then said to be short circuited, and the current flowing in such a case is evidently equal to the electromotive force of the cell divided by its internal resistance.

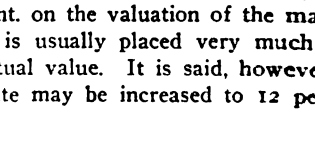


FIG. 6.

Automobiles in Uruguay.

Consul O'Hara, of Montevideo, writes that the automobile is rapidly becoming a popular vehicle in Uruguay as a social and business convenience. Prior to 1905 there were but three machines in Uruguay, and they were of French manufacture, while during the year just passed forty-seven were imported, four of which were American. Two of the American machines are now in use. He criticises American manufacturers for not assisting local agents the same as the French manufacturers do, who now have the greater portion of the automobile trade of Uruguay.

The Uruguayan Government has offered a special inducement to importers of automobiles by reducing the rate of duty to 8 per cent. on the valuation of the machine, which is usually placed very much below the actual value. It is said, however, that this rate may be increased to 12 per cent.

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tered at the New York post office as d-class matter.

Disintegration of the A. A. A.

One of the largest Eastern automobile clubs has recently withdrawn from the American Automobile Association, and several other clubs are reported to be considering the same step. The association is therefore on a downward path, so far as membership is concerned. The dissatisfaction appears to be particularly marked in Pennsylvania, where an independent State federation of automobile clubs has recently been formed.

There need be no surprise at this secession from the ranks of the A. A. A. Every member club is obliged to pay into the treasury of the association an annual contribution of $1 for each active and associate member, and even those well disposed toward the A. A. A. must admit that the clubs have received very little in return for their money. Of the different objects which the association was organized to accomplish it has succeeded in accomplishing only one, that of exercising control over automobile racing. The association has managed to retain undisputed control of racing to this date, and the racing committee has been practically the only one which has developed any activity. Automobile race control gives the association its power and absorbs its energies, and, presumably, its material resources.

Now, the average member of the smaller automobile club is not a sportsman. Aside from a few who may lay claim to this character the membership of these clubs is composed of automobile tradesmen and owners, who are particularly interested in seeing the cause of automobiling advanced by efforts in the direction of fair legislation, roads improvement, touring bureau work, etc. The American Automobile Association during the four years of its existence has done almost nothing along these lines, and it is no wonder that the practical minded members are becoming dissatisfied. The association may not have had sufficient funds at its disposal to undertake very extensive propaganda work, but if the will and ability to accomplish desirable objects had only been plainly shown the necessary funds could readily have been raised.

The dissatisfaction among the membership is reflected by a recent utterance of the newly elected president, that the association should henceforth devote more attention to the practical side of automobiling, or words to that effect. Before the election of Mr. Farson, Western automobilists were inclined to regard the association as dominated by a coterie of wealthy Eastern automobile sportsmen, and it was obviously to discount this impression that the presidency was this year confided to a Western man. This may dispose of the charge of sectionalism, but whether it will have any material effect on the general policy of the association may well be doubted. The main object of the association still remains the control of automobile racing, as was emphasized by the importance attached to the selection of the racing committee, and it is to be questioned whether the association's capacity for work will much exceed that required for this task. Moreover it appears that it is difficult, if not impossible, for one and the same organization to accomplish much for both a sport and a practical object. It's a case of serving two masters. The American Automobile Association has given its preference to the sport, and will probably drift further in that direction as time goes on. The chief incentive for the smaller clubs throughout the country to join a national body would be the possibility of exerting through it a strong in-

fluence in case of threatening, unfavorable local legislation. If this field of activity is neglected the support of the smaller clubs must inevitably be lost.

Legislative and Judicial Prejudice.

The automobile has suffered considerably at the hands of legislative bodies in some jurisdictions, owing to prejudicial influences. Adverse legislation has been expected, and a commendable effort has been made to prevent the passage of unfair laws. If nothing else has been accomplished, the fact that there are two sides to the automobile question has been impressed upon all, and it has become pretty well understood that the motor vehicle is a great and useful invention, possessing rights which must be recognized. It is also conceded that, although there may be stringent legislation for a while, modifications will soon come when conditions change and when the prejudice against the automobile subsides. There is, however, no small amount of judicial prejudice against motoring, and this constitutes one of the most serious dangers at present.

That magistrates and courts are subject to prejudice is a well known fact. Corporations, for example, have experienced judicial prejudice from the time of their inception. Now the automobile seems to be an object of discrimination on the part of some courts and magistrates. Very recently a New Jersey grange adopted resolutions condemning the expenditure of money in improving highways for the benefit of automobilists, and denounced the motor vehicle as a public enemy. This prejudice in New Jersey is matter of common knowledge. It was recently reflected in the remarks of a New York police magistrate when holding to bail a millionaire Wall Street speculator for alleged excessive speeding.

Prejudice in the legislatures may be expected if the people are prejudiced, since the former are representatives of the latter, but to find a judge or court prejudiced is not only contrary to the expectation of the citizen but opposed to his rights. A judge who allows prejudice to operate in deciding a case before him is not fit to occupy his place. No tribunal should be as devoid of prejudicial influences as a court of justice. A magistrate in deciding a case has to consider only the facts pertaining to it which are brought to his attention, and if an automobilist is before him for a violation of the law the magistrate must not be influenced by popular sentiment or any other matter foreign to the case, for if he is so influenced he violates his duty and oath of office.

How can judicial prejudice be met? What is the remedy? Strong influences should be set in motion to keep men from occupying judicial positions who are incapable of impartially determining cases. A record should be kept of those magistrates who have expressed prejudice against the automobile, and efforts should be made to keep them from holding office.

Is the Horse Disappearing?

William H. Shannon, who is said to be an authority on horse trade statistics, has compiled from the reports of the Department of Agriculture a table of the number and value of horses in the United States every year since 1890, from which it is seen that in the intervening period of fifteen years the number of horses in this country has increased from 14,213,837 to 17,057,702, or by about 20 per cent. These figures have been put forward as proving that the advent of the automobile has in nowise affected the breeding of horses.

During the period covered by the statistics not only has the manufacture of automobiles developed from its earliest beginning to its present state, but the trolley car has replaced horse cars in all parts of the country, so that one might well expect the breeding of horses to have suffered materially. If the statistics show an actual increase in the number of horses in the country, it must not be rashly concluded that the introduction of mechanical means of transportation has not affected the horse, for the country has also grown enormously in the past fifteen years.

The population of the United States has increased during this period from about 62,000,000 to about 90,000,000, or by about 45 per cent., and there is no reason why, if there had been no change in the means of transportation employed, the number of horses should not have increased in the same proportion as the population. In that case there would have been a total of about 20,600,000 horses in the country at this date, or 3,500,000 more than there actually are, and this is as large a number as could reasonably be expected to be displaced by the trolley and automobile in so short a period.

If the population of the country did not increase there is little doubt that the number of horses would actually decline, as is found to be the case in Paris since 1900. Again, it must be remembered that the demand for horses depends not only on population, but also on the amount of land under cultivation and on the intensity of cultivation, and these factors have been constantly increasing in the United States, and will continue to do so for quite some years to come. While, therefore, owing to the rapid growth of the country, there is as yet no decrease in the number of horses due to the rise of the automobile, its effect on the increase in the number of horses is already quite noticeable.

Worm Wheel Drive for Commercial Vehicles.

Not the least among the causes of trouble with the earlier types of commercial gasoline motor vehicles was the employment of the direct drive by centre chain from the motor to the rear axle. With this method of transmission it is difficult to get a greater reduction factor than 5 to 1, as it would unreasonably reduce the road clearance under the sprocket on the rear axle, and whatever advantages the direct drive may offer, in the case of a heavy commercial vehicle they are more than wiped out by the accompanying disadvantage of the high speed of which the car is capable and at which it is likely to be frequently driven. The great wear and tear which are inseparable from high speed in heavy cars on solid rubber tires have since become fully recognized, and at present the prevailing practice is to use a double reduction on all heavy commercial vehicles.

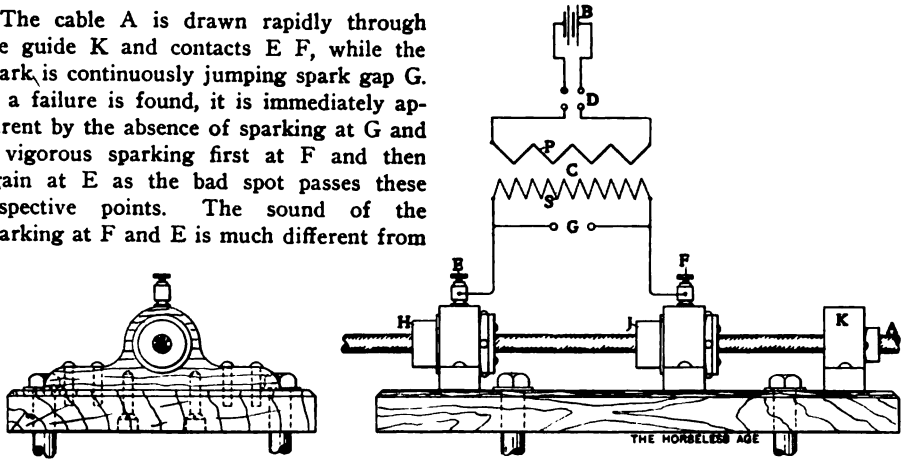
The introduction of a second reducing gear, whether it be sprockets and chain or spur gears, is, of course, accompanied by an appreciable extra loss in the power transmitted, and the question arises how the worm gear, which allows of almost any reduction ratio desired, would compare in efficiency and convenience with the ordinary double reduction gears. A somewhat similar problem has arisen in electric street car practice, where the use of the light and compact high speed motor calls for either a double reduction spur gear or a worm and worm wheel. Some experiments made by a prominent

ign electrical firm have shown that by g multiple thread steel worms, mesh- with phosphor bronze worm wheels nerged in oil, a degree of efficiency btained which is certainly very diffi- to realize with a double spur gear ıction. This suggests the practica- y of the worm wheel drive for com- cial automobiles. The application of orm gear in automobile transmission ld not exactly be a departure, as ı a drive has been used on pleasure by an English manufacturer for a ber of years, and has recently been ied by him to motor omnibuses. It also been used to some extent in ıce, particularly on broughams and of similar construction, in which the position of the shaft with the worm rneath the axle is an advantage. lied to heavy commercial cars, which ld not be run at above 10 miles per , the worm gear drive would admit considerable simplification in con- ction, reduce noise somewhat and ibly even increase the transmission ency, as compared with a double re- ion gear. The chief disadvantage of worm gear drive is probably that a cle equipped with it cannot be pulled ushed, or, at least, only with great ulty, owing to the back lock action e gear. But from the success of this of drive in England it is to be con- d that this drawback is not a very us one. Another consideration d be whether the live axle is really able on heavy vehicles, as at present tendency is evidently toward side ıs. These matters can only be defi- decided by experiment, and we are fore glad to learn that the worm is soon to be tried on a commercial o be built in this country.

Ignition Cable Tester.

A. Wolcott, superintendent of the ard Electric Company, of Warren, has devised a method of testing the ıtion of ignition cables which has adopted by the company. The cable is substantially an induction coil, C, le of producing a 3 inch spark. The ıry coil P is connected through switch a 4 volt storage battery B. Secondary connected to adjustable spark gap G lso to terminals E F, which are metal- connected to contacts H J. The latter spring contacts continually brushing xterior of the cable. K is merely a and, with H and J, is mounted on a wooden base which is firmly bolted support.

The cable A is drawn rapidly through the guide K and contacts E F, while the spark is continuously jumping spark gap G. If a failure is found, it is immediately apparent by the absence of sparking at G and a vigorous sparking first at F and then again at E as the bad spot passes these respective points. The sound of the sparking at F and E is much different from that at G, which affords an additional means of detecting the defect if the operator does not happen to be looking at the tester the instant the sparking occurs. It was the intention to use a solenoid cut-out for breaking the primary circuit and switching a bell on the battery circuit to give a greater alarm; but, owing to the ease with which a poor spot can be detected, this was found to be unnecessary. The above can very easily be arranged, since the primary current changes in value as soon as the resistance of the secondary circuit changes.

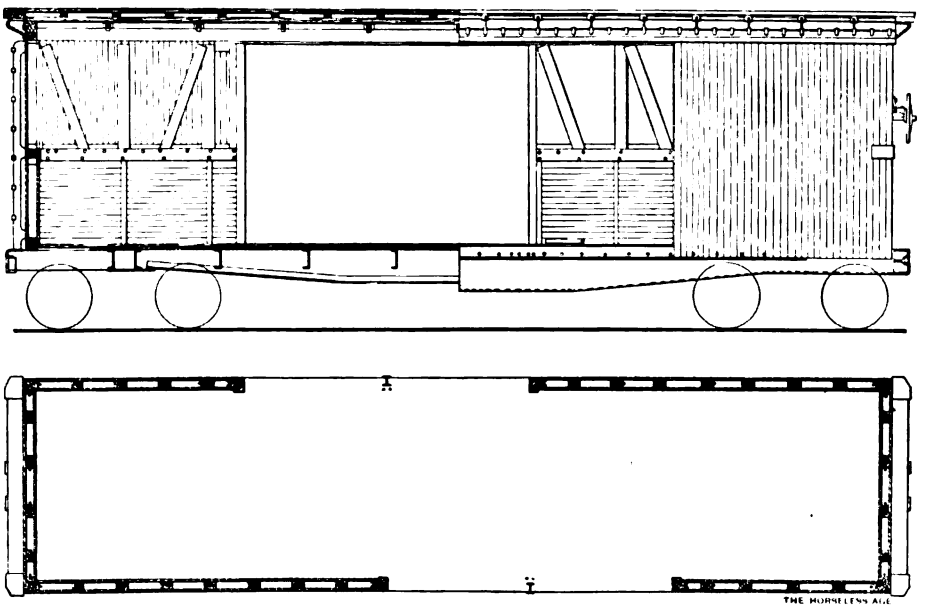


PACKARD CABLE TESTER.

Special Railroad Cars for Automobile Transportation.

With the increase in length of automobiles it has become very difficult to load them into the regular box cars for shipment from the factories, and the construction of specially designed cars has recently been undertaken. The Pennsylvania Railroad Company, notably, has recently begun work on 100 such cars, as recently reported in our columns. Through the courtesy of Theo. N. Ely, chief of motive power, we are enabled to show a plan view and an elevation of these new cars, known as Class Xlc box cars. The special features of these cars are the size and location of the doors in the sides of the car, which make it possible to load the longest and highest machine, and, at the same time, greatly facilitate the loading and unloading of all sizes of machines.

There are two sliding doors in each side of the car, with a removable centre post. For ordinary service only one door with an opening of 6 feet 1 inch wide by 8 feet 4½ inches high is used, but by removing the centre post and opening the other door an opening 12 feet 2 inches wide is obtained. The door opening in the company's regular box car is 6 feet wide by 7 feet 5¼ inches high. The regular doors are in the centre of the sides of the car and the extra doors open toward opposite ends of the car, thus making the openings diagonally opposite to one another. The cars have a total length of 38 feet 6 inches, total width of 9 feet 4½ inches, and total height of 13 feet $4\frac{1}{8}$ inches. The cars are being built at the Altoona shops of the company, and will be completed in time for the spring trade.



ELEVATION AND FLOOR PLAN OF THE PENNSYLVANIA RAILROAD COMPANY'S NEW BOX CAR FOR AUTOMOBILES.

MAINTENANCE AND REPAIRS

[Suitable contributions to this department, accompanied by sketches, are solicited and will be well paid for.]

Taking Care of an Auto Engine.

By "Garage."

Where an automobile is added to a large stable of cars, in charge of a competent mechanic, it is superfluous to give directions concerning its care and management, but many machines do not go to such places. They are sold to men having little or no mechanical knowledge, and men competent to take care of cars frequently do not like the long and late hours, when they can have a good situation in the city, mostly working only nine hours a day, inside, at cleaner and safer work, and having the evenings to themselves for study and amusement. The salary being about equal, machinists are seldom willing to give up the privileges and opportunities of inside employment in garages and machine shops manufacturing gasoline motors. I am firmly convinced that it would pay owners to hire first class chauffeurs and pay them sufficient to prevent dissatisfaction.

There are many men in charge of cars throughout these United States who seem to believe that the only time an engine can be cleaned is during the first week that it is used. They believe that it must of necessity grow more dirty and noisy every week that it is used, until it is absolutely filthy with mud, dust, dregs of oil burnt onto the bright work, pieces of dirty waste, etc.

This is all wrong, for although an engine soon loses some of the freshness it has when first turned out from the shops of a first class engine builder, still it may be kept quiet, clean and bright for years if it is placed in charge of a man who will take care of it. I have seen many engines, both large and small, in filthy condition, but have never found a man in charge of such an engine who did not have a plausible excuse for it. Sometimes such men rehearse these excuses until they really believe them to be valid, and in many cases they spend enough time in telling of them to keep their engines clean and bright. One cause for this is that they are always waiting for the time to come when they can spend two or three days in giving the outfit a thorough cleansing, but that time never comes. Chauffeurs who keep their engines clean are not watching for such chances, but are doing something along that line every day, hence their machines always look neat.

There are many causes for noisy engines, but a great majority of the knocks and pounds that are so much in evidence are due to lost motion in some form. When an engine is new it is not a good policy to adjust the parts to the closest possible fit, as the bearings are comparatively rough, even though they are ground. The rubbing parts touch each other in places only, and are much more liable to heat than after they have been run and used for a few days. For this reason don't drive your car 100 miles the first day or try to take hills on top speed; a full load should not be put on until the wearing parts are perfectly adjusted. This is especially true of the crank pins, for it must be remembered that these bear the strain due to turning all other bearings in the engine and transmission, except the wrist pins. When both boxes and the pin of each crank throw are worn smooth there will be lost motion at this

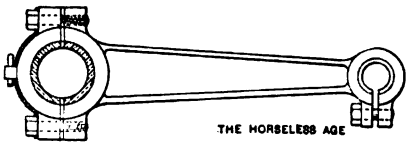


Fig. 1.

point, but it must not be tolerated indefinitely. There are several kinds of connecting rods in use at the present time, consequently there are a variety of ways for taking up lost motion in crank pin boxes which might be described in detail, but only one will be presented in full at this time in order to illustrate the principle involved.

The connecting rod (Fig. 1) is brass bushed at both ends, shims being placed between the rod and cap at the large end. The cap is held on by hexagon head cap screws, and these are locked by a flat steel plate, with hexagon holes over the screw caps, the plate being held on by cotter pins through the lug on the cap.

When it is necessary to adjust the crank

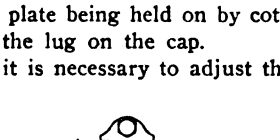


Fig. 2.

pin boxes, after removing the cotter pin and plate, loosen the bolts, screws or nuts, and remove one or more of the thin shims, and replace the nuts or bolts and draw up tight. The point which puzzles the young chauffeur or mechanic and seems to bother some of the older ones is to tell when the cap has been drawn close enough to take up lost motion, and still not enough to cause heating. To illustrate this point Fig. 2 is introduced, which is a side view of the crank and connecting rod.

It will be noticed that the box is not wide enough to fill the whole space between the arms of the crank, although the vacant space is exaggerated in order to make the matter plain. By trying to move the rod first to one side and then to the other, and repeating, taking out more shims if necessary, a perfect adjustment can be obtained. As long as this operation can be repeated freely the box does not bind on the pin. If it is still loose tighten it up some more. An expert can tell when the box begins to bind, but it is not yet held fast, and then it is time to stop. Be sure and put the locking plate on and secure it with new cotter pins, as the old ones may be fractured. More than one accident has resulted from forgetting to do this properly. An occasional engine is found on which the crank pin space is filled by the boxes, and no side space remains, but they are scarce. In such a case if the chauffeur holds a finger partly on one of the boxes and partly on the crank close to the pin, while an assistant moves the flywheel back and forth slightly, he can quickly tell if there is lost motion and the nuts can be tightened up until it is nearly all taken out.

In the case of an old engine the crank pin may not be round, therefore care must be taken to place the pin so that its largest diameter will be parallel to the connecting rod. If the boxes do not bind then they will not at any other part of the revolution. A mechanic will sometimes tighten up on nuts or bolts as far as they will go, then back off enough until he guesses that the boxes do not bind; but this plan is not recommended for general use, and could only be tried on boxes having no shims between. If any reader has tried it and found it satisfactory in his case there is no objection, but the foregoing plan is safer and better in nearly all cases.

The same care should be taken when adjusting the wrist pin, but it is often considered of less importance. If the boxes move sidewise when force is applied, as in the case of the crank pin, there is practically no danger of heating; but if the wrist pin does heat it is less liable to be discovered, because owing to its proximity to the combustion chamber it is always at a high temperature. For this reason babbitt bearings could not be used on the wrist pin.

It seems hardly necessary to say that while an engine is running the bearings should be closely watched in order to prevent excessive heating. If there is any time when more attention should be given to this matter than at others it is immediately after the bearings have been adjusted to take out lost motion. They should be watched constantly until they have run long enough to insure coolness, notwithstanding the above mentioned precautions, to avoid getting them too tight. Failure to do this has caused many stops and breaking of crank shafts costing hundreds of dollars.

Every engine should be equipped with a lubricator that will deliver oil drop by drop into cylinders and bearings, not splash around in it. One or two drops of good cylinder oil are much better than ten of an inferior grade when both are used an equal length of time. The former may cost more than twice as much as

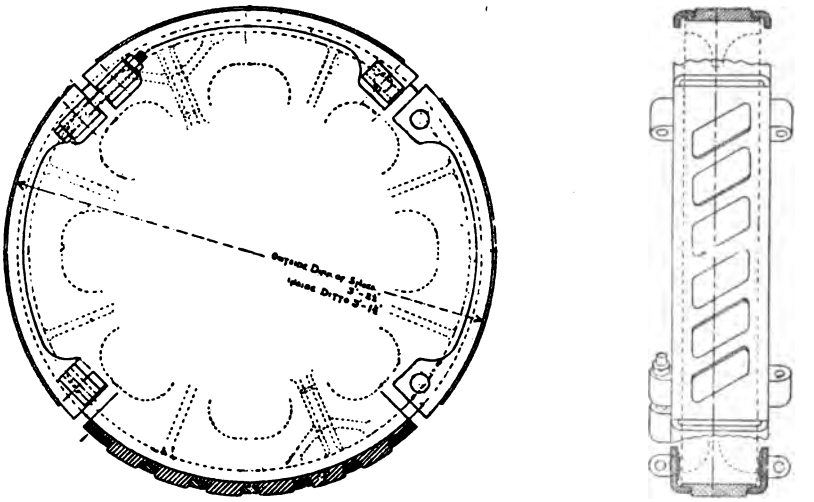
latter when considered by the gallon, is much less expensive by the day. ve made tests to determine the comtive values of two kinds of cylinder and found that two drops per minute ne was equal to nine of the other n used under the same conditions, on an air cooled engine. The oil cleaves to the cylinder walls is what want, as it prevents the cylinders rusting during the idleness of the and also insures a coating of oil on urfaces of the cylinder when the enis started after resting over night or er. The piston should be taken out cleaned occasionally, but the amount rbon sediment resulting from good der oil is insignificant. A poor grade l will choke up ports and coat the n head, and the particles loosening nes short circuit the spark plug, etc. ny unusual noise is heard the chauffshould at once investigate it, and vait for the owner to complain, and cause is not readily discovered it be good policy to shut down, for nore complete examination of the may show a dangerous defect. It ll to be on the safe side.

ow Tires for Motor Trucks.

difficulty which has troubled users of motors is the tendency to skid on rt of the wheels. In snowy weather, en the roads are covered with ice, or steel tires nearly always revolve ut "biting," causing the vehicle to befor the time being, unmanageable. vercome this trouble the Goodwin shoe has been devised, which is manred by T. C. Aveling & Co., Limited, ntral House, New street, Birming-

may be seen from the drawings, the consists of four steel segments, which ydraulically pressed and bedded to heel upon which they are to be em-. The drawings are both to the scale nches to the foot, or one-quarter full nd the wheel shown is 3 feet 1 inch meter. Each of the four segments is ed with six oblique slots, 4½ inches y 2¾ inches wide, through which the of rubber pads project. The pads are timately 1 inch thick, and are prowith an extension all round, forming to prevent their being forced through ots too far when the segments are round the wheel. At the extreme Fig. 2 is seen a section of the shoe, one of the rubber pads in position. re formed at the end of each portion shoe, and these are provided with bored to be a loose fit round clampolts three-quarters of an inch in er.

great advantage of this non-skid de- that it can be adapted to any wheel, to the fact that each wheel forms its attern, the shoe or segment being, as previously, pressed on to the particre upon which it is intended to work.

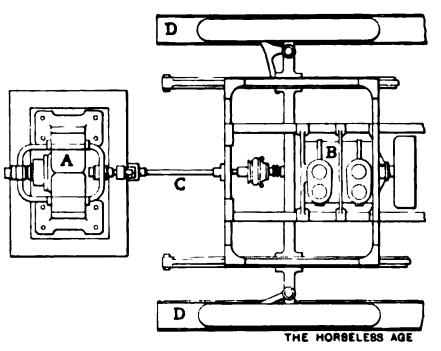


SNOW SHOE FOR MOTOR TRUCK WHEELS.

In this way, old wheels that have been laid on one side owing to the tire widths being too narrow to conform with the heavy motor car order can be turned down on the felloes, new tires put on, and fitted with these shoes, to be used as a stand-by when the roads are covered with snow. An important point not to be forgotten is that wheels fitted with this device are shod with resilient tires, which do away with road hammer and vibration to a large extent, resulting in increased life to the engine and framework, at the same time keeping the repair bill low.—*The Commercial Motor.*

Use of a Gasoline Car for House Lighting Purposes.

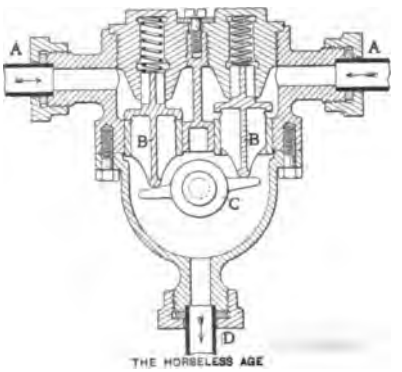
A French firm, Milde & Co., of Paris, have gotten up an arrangement for driving a lighting dynamo from the two cylinder gasoline motor of a motor car. Under ordinary conditions, motor cars of private owners are out of use a considerable portion of the time, and the motors may then be advantageously used as prime movers for stationary work machines. The object of the arrangement referred to is more particularly to allow of electrically lighting country residences which are not connected up to any electric supply station. The motor may, of course, also be used for driving a pump, wood saw or other domestic machine. As shown by the illustration, the starting crank of the motor (which latter is located under a bonnet in front) is made detachable, and a small dynamo A is secured to a foundation at any convenient place in the auto house. Near the dynamo there are two fixed guide rails D of channel steel, on which the front wheels of the automobile may be run, so that when the brakes are applied the car cannot move. The engine B of the vehicle is then connected to the dynamo by a shaft C with two universal joints, which facilitate making the connection.



UTILIZING A MOTOR CAR FOR HOUSE LIGHTING PURPOSES.

Novel Crank Chamber Drainer.

A novel crank case draining valve, illustrated herewith and quaintly described by the engineer supplying the sketch as a cylinder bleeder, provides an efficient substitute for the usual cylinder cock. It has the prime advantage that but one is needed to drain both ends of the crank case. The connections A A with the case ends are made by the two pipes shown at the right and left hand. The outlet to each of these is closed by a valve B, which is closed and also held seated by a spiral spring. The double cam C shown above acts on either of the valve stems as desired. In the illustration the right hand valve is open. The outlet is below at D, as shown by the arrow. The makers of this device are Schneider & Helmecke, Magdeburg, W.—*Autocar.*



CRANK CHAMBER

NEW VEHICLES AND PARTS.

Wayne Models K and H.

WAYNE MODEL K.

This new four cylinder car is one of those in which the engine (with its flywheel at the front), the clutch and the transmission form a unit, and are mounted on a three point support. The cylinders are 4¾x5 inches, and are rated at 30-35 horse power. The car has a multiple disc clutch, three speed and reverse sliding gear transmission and shaft drive, jump spark ignition, large side entrance tonneau to accommodate three, divided front seat, 32 inch wheels with 4 inch tires, standard tread and 102 inch wheel base.

The cylinders are cast in pairs, with integral water jackets extending between the cylinders. The valves are on one side, and all mechanically operated. The plugs over the valves, the valve springs and fastenings, and the method of fastening the cylinders to the case are the same as the model just described. The push rods, however, are of tool steel, hardened and tempered, with a flat disc at the bottom and no roller. The eight cams are of hardened steel, held by straight pins with riveted ends. The pistons are convex on top, but are otherwise similar to those of Model F. The bearings are also similar, except that they are supported by a semicircular partition from the under side. This middle partition is held by cap screws from the outside of the case. The end bearings are 4 inches long, and the flywheel is at the forward end. The aluminum crank case forms two supporting arms at the front, and is provided with two large hand holes in the bottom.

The "two to one" gears are enclosed in an extension of the case at the rear. The small one is of steel and the large one of bronze. In the drawing is shown a section of the engine, clutch and transmission. The crank shaft and connecting rods are practically the same as those of Model F, except for size. The circulating gear pump is mounted on a special shaft and driven by a gear at the front end, which meshes with a gear on the cam shaft.

The clutch is composed of alternate discs of steel, faced with leather, and driven by pins from a plate fast to the engine shaft, and plane steel plates, strung on pins fast to the transmission shaft. The discs dip into a bath of castor oil. The change gear is also the same as that of the large car, except for size and that the lay shaft is below the main shaft, and the bearings are Hyatt rollers instead of ball.

The same pump, timer and carburetor are used as in the other car. This car is also driven by a shaft with Spicer universal joints. The rear axle construction is identical with that of the 50 horse power car except in dimensions. The frame is of five-thirty-seconds inch pressed steel, with straight side rails of 4 inches greatest depth and tapered toward the ends.

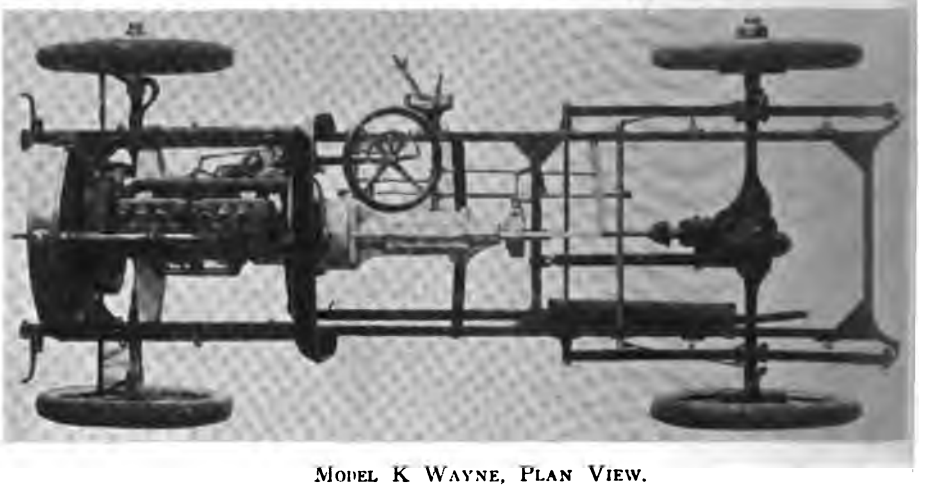
THE 1906 RUNABOUT, MODEL H.

This runabout has a two cylinder opposed motor located transversely under the hood at the front. The cylinders are 4½x4 inches, and rated at 12 horse power. The change speed gear is of the two speed and reverse planetary type, and the drive is by shaft through one universal joint. The tread is 54 inches and the wheel base inches. It is equipped with 28 inch wh and 3 inch tires.

The ignition is by jump spark from



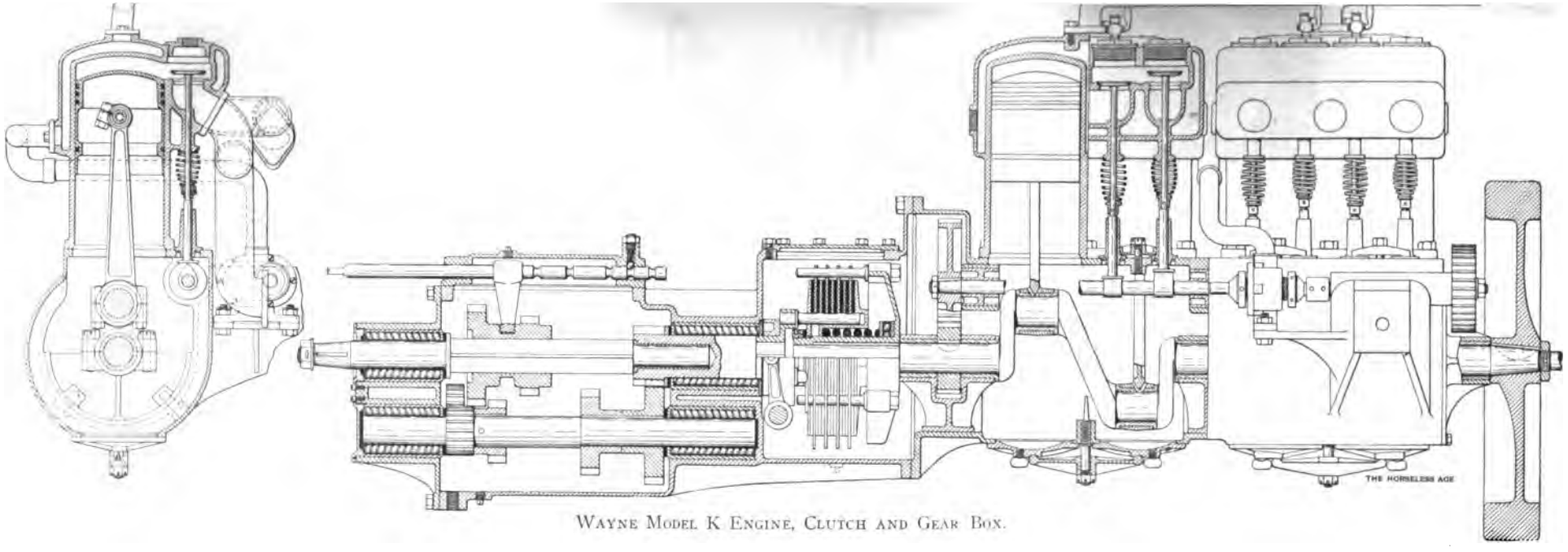
MODEL K WAYNE, 30-35 HORSE POWER.



MODEL K WAYNE, PLAN VIEW.



MODEL H WAYNE, RUNABOUT.



WAYNE MODEL K ENGINE, CLUTCH AND GEAR BOX.

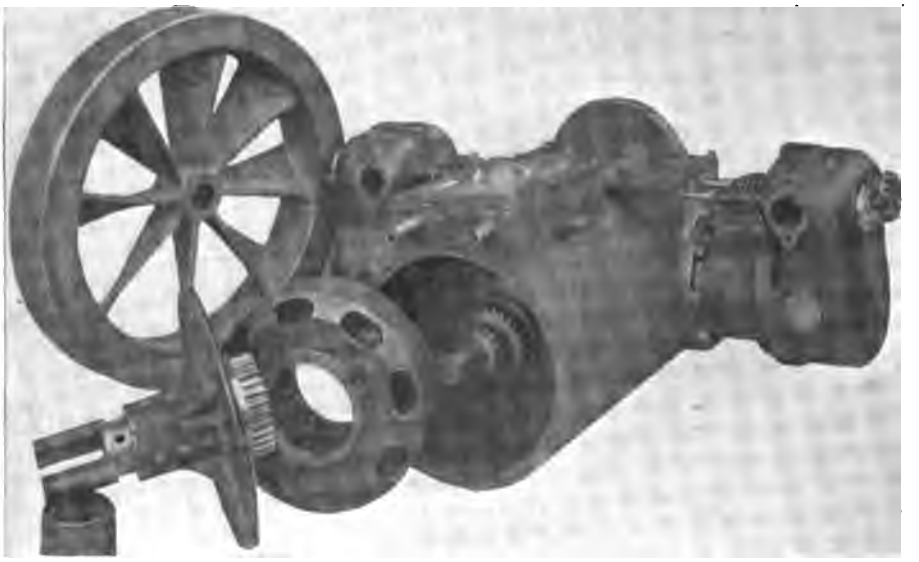
batteries and a double vibrating coil on the dash. The body is very light, and the single seat is undivided. The car has wheel steering, and the rear of the body provides a large carrying space. Full elliptic springs are used both in front and rear. The weight of the machine complete is 1,050 pounds. The accompanying photo gives a general idea of the car's appearance.

Two photos are herewith shown of the engine and transmission. It will be seen that the flywheel, which acts as a fan, is at the front, and that the engine case and transmission gear case are all one casting, and the cylinders are inserted and held by cap screws. The flywheel is held by a nut and set screw on the tapered end of the shaft; the nut also forms the dog for the starting handle. The cylinders have integral jackets, and both valves on the upper side. The valves and springs are the same as in the other engines. The square push rods, with hardened steel rollers working in slots milled into the crank case, are clearly shown in the plan view. The pistons have domed tops and carry three rings, all at the top. The crank shaft is a steel drop forging, and extends through to the rear of the transmission case. The bearing at the front end is a 4 inch babbitt sleeve pressed into the case. The rear end bearing is supported by a ring resting on the bottom of the case and held by cap screws from outside. This construction allows of assembling the transmission on the shaft, then putting the shaft in place, and finally placing the bearing support in position and fastening it. The cam shaft, which runs in bronze sleeve bushings at the top of the crank case, is made of cold rolled steel, with its hardened cams pinned in position. The drop forged H section connecting rods have bronze sleeve bushings at the upper end and divided babbitt bushings at the crank pin case. The 2 to 1 gears are inside of the case; the small one is steel and the large one is cast iron, and is enclosed by a pocket on top of the transmission case cover.

A cylindrical oil tank is supported in front of the dash and under the hood. Six oil leads pass through sight feeds on the dash; of these two run to the top of the cylinders near the bottom of the stroke, two to tubes inside the crank case, which drop the oil directly into the slot formed by the upper side of the H section connecting rods, and the remaining two supply the main bearings. The oil is forced by the crank case pressure. A check valve is fitted into the top of the case, and allows any excess pressure to escape through a one-eighth inch hole. The surplus oil flows down into the transmission case, which requires very little oil, as the drum which carries the gears is provided with a little blade or scoop, which carries oil up from the bottom and pours it over the gears at each revolution.

The change gear is of the triple gear type, no internal gears being used. The gears are all of steel, and two sets are used. The drums are gripped by contracting fibre faced steel bands, which are held out of contact when not in use by stiff coiled springs, which can be seen in the plan view. The two rods which run lengthwise of the case are fitted with wedge shaped pieces, which when the rods are rotated bear against lugs on the ends of the band and force the ends together. The high speed clutch is an expanding band of cast iron, which is in reality a wheel with three spokes and the rim cut open. The hub in its normal condition fits closely over the shaft, but is split open between the spokes to allow it to expand. However, just as soon as it is released it springs back into its normal position, in which case the hub fits the shaft and centres the outside rim so that it does not drag.

The combination engine and transmission case is machined all at one setting on a large horizontal boring mill fitted with a revolving table, and jigs are used for locating all drilled holes, so that the ports must line up correctly. A single universal joint on the rear of the transmission shaft drives the rear axle by means of an encased shaft and bevel gear, which is backed by a ball thrust washer. The shaft and rear axle run in Hyatt bearings, each fitted with grease cups. The Brown-Lipe differential runs on ball bearings. The middle portion of the housing is a steel casting, and the steel tube ends are brazed and pinned in place. The rear wheel brake drums are of stamped steel and bolted through the spokes and hub plates. They are acted upon by cast steel bands faced with special belting material. These brakes are operated by the right foot pedal. No



MODEL H WAYNE ENGINE AND TRANSMISSION.

other brakes are furnished, and the use of the reverse is recommended in steadying the car and slowing down under ordinary circumstances. The other foot lever controls the low speed, while the single side lever operates the reverse and high speeds. The spark and throttle levers are on a small notched quadrant on the front of the steering column just below the wheel. The same Universal carburetor is used as on the other cars. The front axle is made of steel tubing, with the ends brazed on, and the frame is made practically of one piece of angle steel.

Sturtevant Vertical Cylinder Car.

The Sturtevant Mill Company, of Harrison square, Boston, although advocates of the horizontal type of multi-cylinder vehicle engine, have this season produced, in deference to the preferences of the automobile buying public, a type of automatic, leverless controlled car, equipped with a four cylinder vertical motor. The car is a roomy, side entrance tonneau, on a 120 inch wheel base. A pressed steel frame is employed, with side members 2 inches in width and 4½ deep at the middle portion, tapering toward the ends, and well strengthened by gusset plates and cross members. The sub-frame, which carries the engine and gear box, consists of longitudinal members of pressed steel hung from the main members. The springs are half elliptic, 36x2 inches, and of eight leaves in front, and 56x2 inches and ten leaves iin the rear. Thirty-four inch artillery wheels, shod with 4½ tires, are used in front and rear. Steering is effected by means of an inclined column passing through the dash at the right of the engine, and carrying a dustproof and adjustable worm and sector irreversible device. The linkage is massive, and provided with adjustments for wear.

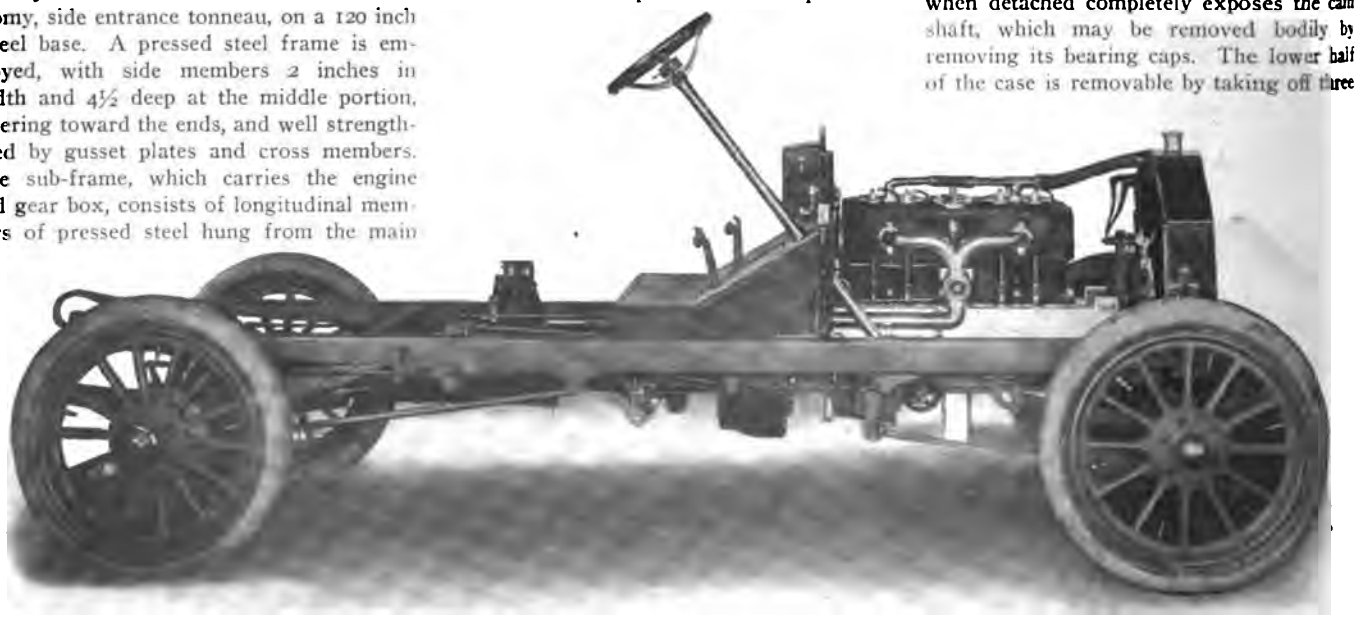
The live, shaft driven, tubular encased rear axle is of the ball bearing "floating" type, relieved of transverse stresses. The driving gears are of four pitch hardened steel, and a bevel differential is employed. A tubular torsion rod, with spring shock absorbing attachment to the cross frame member, provides against the ill effects of severe driving stresses and brake applications. Powerful internally expanding brakes act upon drums attached to the rear wheels, these brakes being actuated by a ratchet retained pedal at the operator's right, through an equalized linkage of great multiplying effect.

The four cylinder, vertical, forwardly located engine is of 5½ inch bore and 5 inch stroke, with its cylinders cast in pairs, and is rated at 50 horse power. It has integral heads and liberal water spaces, so designed that the valves and their stems are well cooled. Inlet and exhaust valves are both mechanically operated, and are interchangeable; they are 2 inches in diameter in the clear, with 40 degree seats.

Valve operation is by push rods from two cam shafts, and the cams and guides are of very liberal design. All valves are removable through the usual caps in the valve pocket tops, upon the removal of the spring retaining keys. Both inlet and exhaust ports are siamesed, which reduces the piping to a minimum and contributes much to the appearance and the accessibility of the motor. The intake manifold is of aluminum, and the exhaust manifold is cast in the Mors form.

A crank shaft of nickel-steel is employed, supported from the upper half of the crank case in three bearings fitted with phosphor bronze bushings. The steel bolts which secure the cylinders to the crank case pass through the bearing caps, thus relieving the crank case of the stresses due to the explosion. The bearing at the flywheel end is 6 inches long and 2¼ inches diameter, and the other two bearings are 4 inches long and 2 inches in diameter. Connecting rods of nickel steel of H section are employed, and the wrist pins are hollow, hardened and ground, 1¼ inch diameter, bronze bushed. The crank pins are 2¼ inches diameter, with bronze bushed bearings 3½ inches long.

The aluminum crank case is of special design, and is constructed with a view to fully enclosing all gears, and at the same time affording perfect accessibility to all parts. A removable plate upon each side when detached completely exposes the cam shaft, which may be removed bodily by removing its bearing caps. The lower half of the case is removable by taking off three



ELEVATION OF STURTEVANT CHASSIS WITH VERTICAL ENGINE.



STURTEVANT POWER BRAKE.

ts, and exposes the crank shaft. A for-rd extension of the crank case complete- houses the two cam shaft gears, the ınk shaft gear and the fibre idlers, which : readily reached by the removal of an ıminum cover. The right hand cam shaft rries a mitre gear which drives a vertical aft, upon the upper end of which are rried the timer and spark governor in a ry accessible position between the two irs of cylinder heads. This cam shaft gear so drives a downwardly projecting shaft thin the crank case, which carries the l pump. The left hand cam shaft drives rough spiral gears the circulating pump, hich is supported by a bracket midway be-reen the two cylinder pairs. Every gear out the car is completely enclosed.

Cooling is effected by means of a radiator vertical finned tubes, assisted by a fan iven from the crank shaft by a flat belt. he pump is of the double delivery vane pe, half of the water passing through mmetrically arranged brass piping to each ylinder pair. A "weak link" in the pump onnection to its driving shaft acts as a afety device in case of foreign matter dging in the pump. It is perfectly accessi-le for repacking and lubrication. The hot ater leaves the cylinders by two pipes onnected to the centre of the head of each ylinder pair.

Engine lubrication is effected as follows: he submerged positive oil pump before re-erred to delivers lubricant to the main rank shaft bearings, from which it flows hrough channels in the crank shaft to each in, thence through channels up each con-necting rod to the hollow wrist pin, from which it is collected into a retaining ring ormed in the inside of each piston, thence assing through and being distributed to the ylinder wall by the lower piston ring. A ingle visual indicator on the dash shows whether oil is being supplied. By this ar-rangement a multiplicity of small oil carry-ing pipes and individual pumps is avoided and simplicity secured. The pump is posi-tive, and the arrangement is such that the oil holes in the crank pins register with those in the hollow connecting rods only while the latter are moving downward, thus making use of the inertia of the lubricant to force it upward to the wrist pins.

Ignition is by means of a quadruple dash-board coil, a Lacoste timer, and plugs screwed into the inlet valve caps. Accumulators are the source of the current.

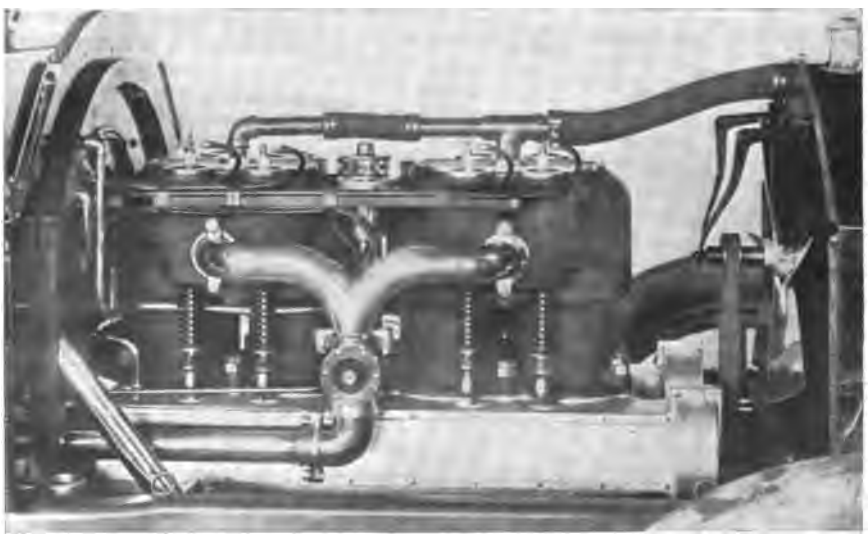
The starting of so large an engine ordinarily requires considerable muscular exertion. In order to obviate this annoyance means are provided for relieving the compression through about two-thirds of the compression stroke. The exhaust cam shaft is slidable longitudinally by means of a spring returned pull rod, which is brought out conveniently at the front of the car. When slid from its normal position the cam shaft brings to bear upon the valve lifters specially formed cams, which effect the desired compression relief. A touch of the pull rod returns the cam shaft to its normal position. In order to avoid the chance of an accidental starting of the car when the engine is cranked, with possible serious results to the person starting it, a very ingenious safety device has been adopted. Within reach of the left foot of the operator is a pedal, by means of which the reverse gears are brought into action. A linkage is so arranged as to prevent the engagement of the ratchet starting device carried by the crank, unless this pedal is in the neutral position. The spark timer is also automatically retarded to a safe starting position, unless the engine control pedal is being pressed.

The starting crank rod has its forward support in a transverse tubular member attached to the extreme forward ends of the spring hangers, and thus the crank is brought clear forward of all parts of the car. If by any mischance a back kick should occur, the operator's arm would not strike anything.

The Sturtevant system of leverless control by means of a single pedal has been fully described in previous issues of THE HORSELESS AGE (March 15, 1905, and February 14, 1906). In the present model the engine control button takes the form of a tilting pedal of comfortable proportions (in reality a movable portion of the floor), upon which the whole right foot of the operator rests, and the movement of which provides for the operations of starting, speed controlling, stopping and braking. The governor of this car, which controls the engine at a speed below that of clutch engagement, is mounted integrally with the timer, and acts through it to keep the speed down to the desired point by retarding the spark, the throttle opening being automatically reduced for free running. The progressive relations of throttle opening and spark position, as the engine control pedal is depressed, have been the subject of special study in the design of this model. The first movement of the pedal advances the spark, the minimum opening of the throttle being maintained, a further movement progressively opens the throttle, and when this process is complete the spark is progressively advanced to the limit of pedal movement.

This car is fitted with three forward speeds and reverse, and the clutches and gears necessary to secure them are housed in a rearward extension of the engine crank case which encloses the flywheel, in which the clutches are located, as well as the gear trains. The whole power plant thus forms an integral structure.

In one particular the present gear is of special interest. In the gear, which has been described in these columns, provision was made for the manual throwing out of action of the high gear when road conditions were met with over which the middle speed would, on the whole, overload the engine less and give a better rate of speed. In the present arrangement this is accomplished automatically by a simple device actuated by the change in driving torque. All gears are run in oil, and special means are provided for oiling the clutches within the flywheel, through an aperture in the aluminum housing, which registers with an oil hole in the flywheel at a certain position of the latter.



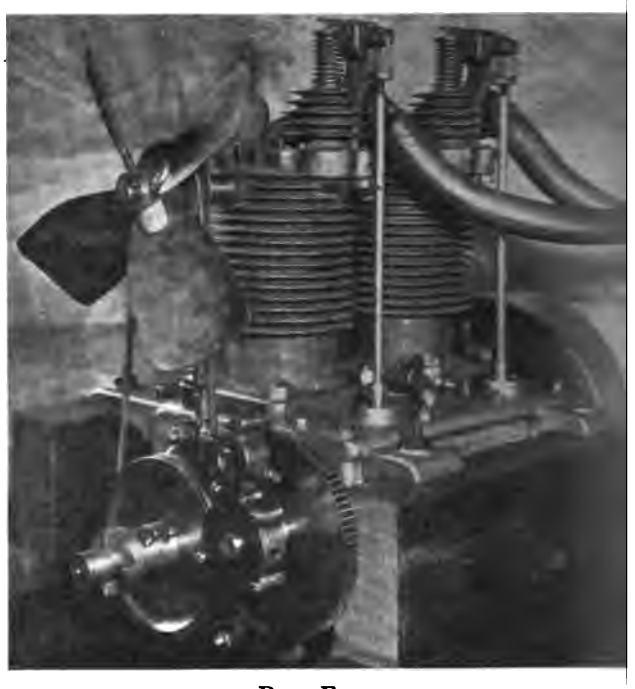
STURTEVANT FOUR CYLINDER VERTICAL ENGINE.

The Page Runabout.

The Page Motor Vehicle Company, of Providence, R. I., have brought out a light runabout propelled by a double cylinder, vertical air cooled motor. The frame is constructed of 2x3x¼ inch angle steel, with front spring hangers integral and rear hangers riveted in position, the side frame members being drawn together at their front ends. Semi-elliptic springs, 36 inches long in front and 40 inches in the rear, are provided. The wheels are 28 inches in diameter, shod with 3 inch clincher tires. A shaft drive is employed with a gear of 3½ to 1 on the high speed. The tubular rear axle is fitted with Hyatt roller bearings and ball thrusts. The wheels are pinned and keyed to the axle shafts. In the construction adopted no struts or torsion members are employed, the propeller shaft casing acting in these capacities. The rear spring hangers are free to revolve upon the axle tube, and a telescopic universal joint is inserted in the forward end of the drive shaft, which latter runs on Hyatt bearings with a ball bearing to resist the thrust of the pinion. Upon each rear wheel hub is a brake drum of 2 inch face and 8 inch diameter, upon which acts a Raymond brake actuated by a pedal.

The front axle is of 2 inch Shelby steel tube, with one-quarter inch wall. It is dropped at the centre and pinned and brazed to the steering forks. An adjustable worm and segment, enclosed steering device with inclined column and large hand wheel is furnished, and the tubular steering linkage is adjustable for wear. Spark and throttle control levers are carried just above the wheel, but do not turn with it. The levers are held in their desired positions by a slight friction, instead of by the use of notched segments.

The engine is forwardly mounted under a sheet metal bonnet, the front of which is closed by a square meshed grating, giving the appearance of a cellular radiator. A 4 inch bore and 4 inch stroke are employed, and the crank throws being on the same side of the shaft, the cylinders fire 360 degrees apart. The cylinders are deeply flanged horizontally, with a few vertical ribs on the heads. Both the automatic inlet valves and the mechanical exhausts open directly into the heads, and the exhaust valve housing is well flanged. Both valves are of 1½ inches clear diameter, with 45 degree cast iron heads on steel stems. These cylinders are not fitted with separate heads, the cylinder casting being produced with the ports in its upper surface and a central hole, through which the boring bar is passed in machining. This hole is afterward plugged and a pet cock inserted in the plug. Side projections are cast on the upper surface of the cylinder, and the inlet and exhaust valve housings bolt down directly over the ports, with a copper gasket to pack the joint. The cylinder bores are



PAGE ENGINE.



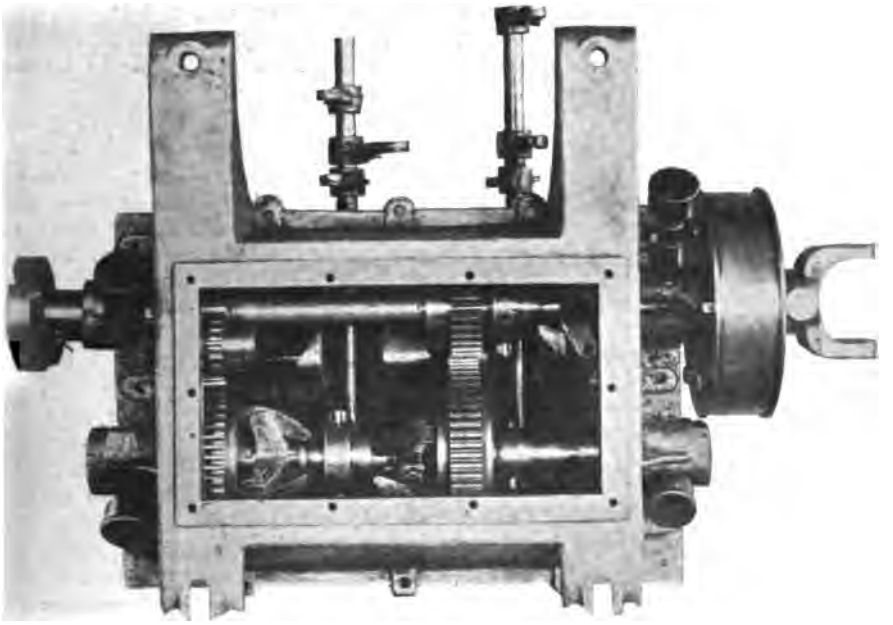
PAGE TIMER.

finished by grinding. The cam shaft is on the left side of the engine and is fully enclosed, but provided with an inspection plate. It carries a cast iron gear at its forward end which is in mesh with a bronze gear on the forward end of the crank shaft. The exhaust valves are operated by vertical push rods and tappets, and the springs of both exhaust and inlet valves are well protected from the heat of the engine. A hardened forged crank shaft of 1½ inches diameter, accurately counterweighted, is provided which runs in two 4 inch phosphor bronze bushed bearings in the ends of the aluminum crank case. The crank pins are 2½ inches long. Bronze connecting rods of I section are used and hollow hardened wrist pins. Shims are provided under the connecting rod caps to allow for adjustment. The aluminum crank case has removable ends, through which the crank shaft may be removed, and also a large inspection plate in its bottom. Four feet, projecting from the crank case, secure the engine to a sub-frame hung from the main frame members. A metal pan is provided under the engine and a fabric boot under the timing and secondary gears in front of the motor. The cooling fan is carried upon a stud screwed into the front cylinder, and is operated by a round belt from a pulley on the crank shaft. It delivers its blast directly upon the combustion chambers and valve housings, and is assisted by the draft created by the 16 inch fan spoked flywheel.

Ignition is by means of a double, dashboard, plain coil and spark plugs set in the cylinder sides under the inlet valves. Two sets of dry batteries are furnished. The timer is of special construction, and is carried upon the forward end of the cam shaft. It is of the platinum contact, single spark type, and consists of an aluminum casting having two compartments, one above the other. In the lower one is



THE PAGE RUNABOUT.



PAGE CHANGE SPEED GEAR.

eart cam fixed to the secondary shaft, and pon it is spring pressed the roller end of he contact making and braking element. This passes through and has a bearing in he narrow neck separating the two com-artments, and bears at its upper extremity platinum point which, under the influence of the cam, alternately touches two fixed platinum points corresponding to the two coils. The lower compartment may be packed with grease, but the lubricant cannot pass to the other compartment in which the contacts are located. A small glass window, fixed in the aluminium cover, allows the action of the contacts to be inspected, and adjustment may be made from outside without removing the case.

Lubrication is effected by means of a six sight feed Essex pressure oiler, the tank of which is mounted under the hood to prevent the chilling of the lubricant. Two feeds serve the main bearings, two the bronze bushed bearings of the cam shaft, and two enter the cylinder walls. The hollow wrist pins wipe the oil from a groove in the cylinder wall, and it is conducted down the channels of the connecting rods, thus lubricating the crank pins. A float feed, compensating carburetor is supplied, and is connected to the engine through an aluminum manifold. The muffler is of the Page Company's own design.

The engine is connected to the gear box through a double Oldham coupling. A change speed gear of the individual metallic clutch type, furnishing two forward speeds and a reverse, is made use of, the drive being direct on the high gear. Gears and clutches are housed in an aluminum oil retaining case, provided with a large hand hole. The clutches have large frictional surfaces and run in an oil bath, and the gears are of 10 pitch and 1 inch face hardened steel against phosphor bronze. Two levers are used to effect the gear changes. The inside one, in its forward position, engages the high speed, and in its backward position contracts a powerful brake upon a drum on the drive shaft. The outside lever, when thrown forward, engages the low speed, and when thrown backward puts the car on the reverse. Moving either one of these levers out of its neutral position throws the other into its neutral point, and the application of the pedal brake returns either lever to its neutral position.

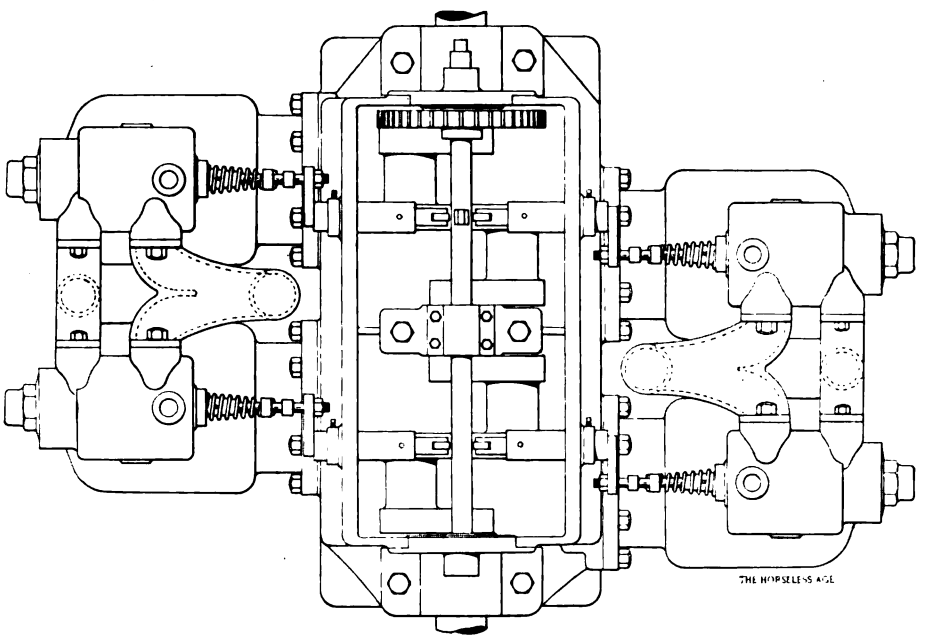
It is not necessary to remove the car floor in order to inspect the gear box, as the flooring is so arranged as to slide back and expose the change speed case.

This car has a wheel base of 84 inches, is of standard tread, and weighs about 1,250 pounds. The body is of wood, with divided seats, metal dash, metal fenders, and running board which carries a battery box on one side and a tool box on the other. There is ample carrying space on the rear platform, and also space under the seat beneath the full copper 10 gallon gasoline tank.

The Kansas City Gasoline Motor Truck.

The Kansas City Motor Car Company are building a 60 horse power truck, of which a side view, plan of chassis and several details were shown in our issue of February 14. Several other details are illustrated herewith, including the engine and the novel clutch. The engine is of the four cylinder, horizontal opposed type, with cylinders cast separately, with integral water jackets and valve chambers. It is located transversely beneath the frame of the truck, some distance back of the front axle. The cylinders are supported entirely by the cast iron crank case, to which they are held by cap screws, their outer ends or heads being unsupported. The inlet valves are automatic, and all valves can be removed without disconnecting any pipes or wires. The cylinders are 5½x5 inch, and the engine is rated as 60 horse power, at 1,350 revolutions. Each engine is tested by being placed in the car frame in which it is to remain. The frame is then placed on "horses," and the engine run under its own power for from five to six hours, during which time the bearings are tightened and adjustments made. The engine is then tested for horse power on a brake.

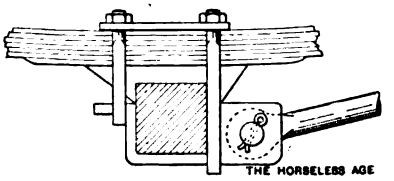
All valves are of special nickel steel, in one piece. The exhaust valve stem is long and the spring is held by a cupped washer and key. The valve chambers are on the upper side, and the inlet valves and cage are at the outer end, the exhaust valve being removable through the same hole as the inlet. Both valves are very accessible from the side of the car. The pistons are of gray



TOP VIEW OF KANSAS CITY TRUCK MOTOR.

iron, flat on top, and carry four diagonal cut unpinned rings, finished by grinding on a special mandrel. Three rings are above the pin, and one is at the bottom of the piston. The wrist pin is 1 3-16 inches in diameter, of unhardened steel, and is held by tapered set screws at the ends, which are threaded through the piston bosses and the pin and extend into the back of the bosses. The connecting rods are rectangular in section, hand forged of steel, and bushed at each end with bronze. The upper bushing is a sleeve forced into the rod, and the lower one is an adjustable split bushing. The cap is held by castellated nuts on through bolts, as shown in the drawing. The four throw crank shaft is of high carbon steel, hand forged. The flywheel is held by a straight key. The shaft runs in three divided bronze bushings supported from the under side, the upper caps being held by castellated nuts on studs from the supporting web. The entire top and a strip at each end of the case over the main bearings is removable, so that the engine shaft and flywheel can be taken out without in any way loosening or disturbing the fastenings of the crank case to the frame. This case is made of cast iron, and supported at the front and rear on heavy drop cross members of angle steel. The two-to-one steel gears are inside the case in the splash. The steel cam shaft, with its two case hardened steel cams pinned to it, is supported in three bronze bearings, the middle one of which is divided. The opposed cylinders of each pair are, of course, offset, but the ends of the valve lifting rods are also offset, so that they bear on a single cam, which operates the exhaust valves of the two cylinders, and in the same way another cam set at 90 degrees operates the other two cylinders. Hardened steel rollers are used on the valve rods, and the latter are prevented from turning by having the end of the valve stem fit into a cup shaped piece on the offset arm.

A forced feed oiler driven from the fan shaft forces oil to the upper side of each cylinder and to the centre of the crank case cover, where it drops directly onto the middle bearing of the crank shaft, which is provided with grooves and oil holes to receive it. The overflow furnishes splash for the case. The connecting rod heads are fitted with scoops, from which oil holes lead to the crank pin bearings. The cylinders are also supplied with oil by the action of these scoops, and the main bearings are provided for by hand grease cups.



KANSAS CITY SPRING SADDLE.

Jump spark ignition is employed, the current being either from dry or storage batteries located under the seat. A Lacoste timer is secured to the front end of the cam shaft, and is operated by levers from the steering column. A Stolp radiator is fitted into a kind of hood at the front. A gear pump fastened to the front crank case support and driven by a chain from the engine shaft draws its supply from the radiator bottom and forces it into the lower side of each cylinder jacket around the valves and out at the top back to the radiator.

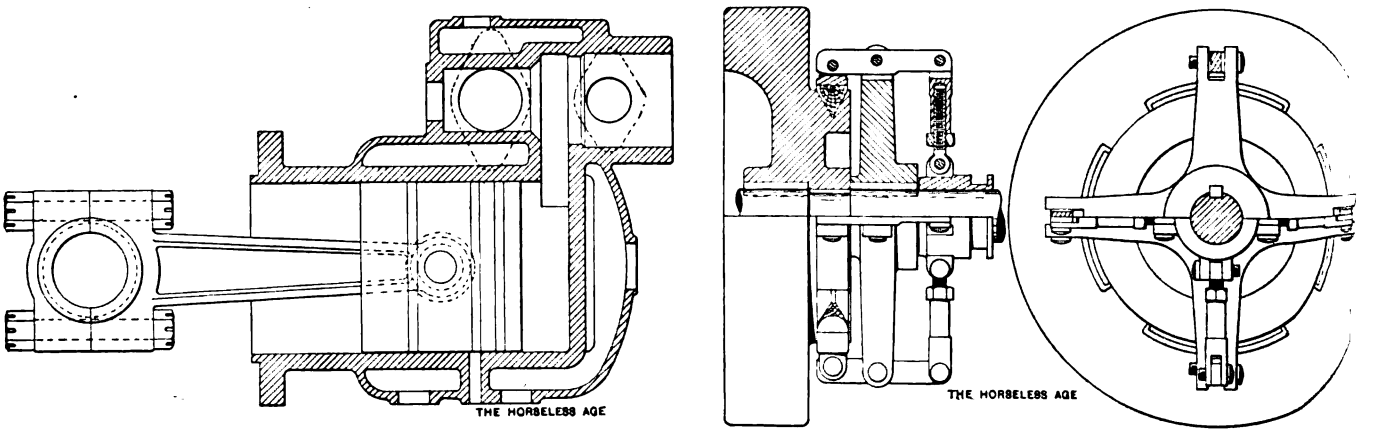
THE CLUTCH.

The clutch, shown in the drawing, is of a type which has proven successful under heavy duty on machines in the company's shop. An enlarged hub at the back of the flywheel is cut with a V shaped groove into which oil soaked hickory blocks are pressed to give the necessary friction. A heavy four armed spider is keyed to the transmission shaft, and pivoted to the end of each of its arms are short arms which carry the wood blocks. The other end of these pivoted arms is connected by arms of adjustable length to a collar on the shaft. By sliding the collar toward the flywheel the adjustable arms assume a vertical position and give a powerful toggle joint action which forces the wood blocks into their grooves. This type of clutch possesses good gripping qualities and can be slipped if desired, and wears well unless subjected to such excessive slipping as to char the wood, which ought never to occur in its use on a truck.

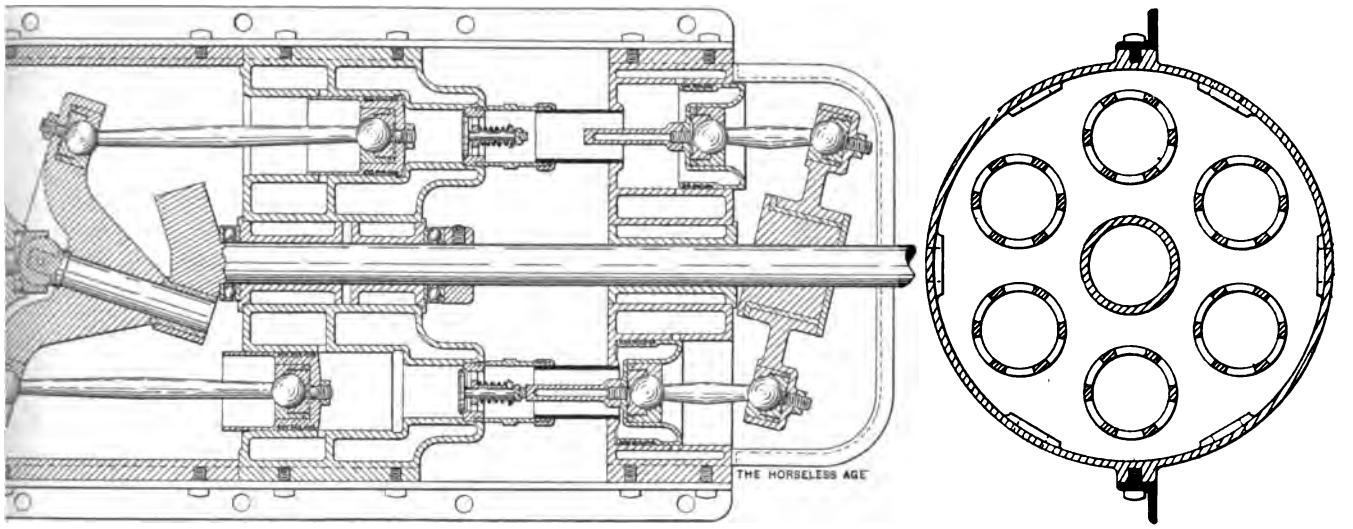
The change speed gear is a two speed and reverse sliding gear, and gives a direct drive on the high, with the lay shaft remaining idle. The low speed is about 4 miles an hour and the high speed about 12, at 900 revolutions of the engine, which can be run to 1,400 revolutions. This seems to the writer to be rather high for a 6 h.p. machine and Kansas City hills, but the manufacturers claim that this truck under full load will negotiate any of the hills easily. There is only one sliding gear on a square shaft, and one end of its hub carries the lugs of the high speed clutch. All the gears are of steel, case hardened, with four pitch and 2½ inch face teeth. The jack shaft, 2 inches in diameter, runs in Hyatt roller bearings at the ends, supported in special hangers. These hanger bearings have grooves cut into them, and are fitted with fibre collars to prevent dripping of the oil. A Cullman spur gear differential is used, and the bevel gear and pinion are both 4 pitch. The forward sprockets are of forged steel and carry a 1¾ inch pitch, 1 inch wide Diamond roller chain, which drives the rear sprockets. Compression grease cups are used on the four jack shaft bearings. An interlocking device prevents shifting the gears with the clutch engaged.

There are two sets of brakes, one on the jack shaft and one on each rear wheel. All of them are contracting steel bands faced with belting material and prevented from dragging by a small coiled spring. The jack shaft brake is applied by the reverse motion of the hand clutch lever. The rear wheel brake drums are of cast iron, and the steel plates which form the rear sprockets are fastened to them by cap screws. Both the sprocket and drum are held to the wheel by through bolts, which also hold the hub flanges to each other. These brakes are very large and powerful, and are operated by a foot lever.

The frame is made of heavy I section structural steel, well braced. The spring hangers are of the peculiar shape shown in



KANSAS CITY MOTOR CYLINDER, PISTON, CONNECTING ROD AND CLUTCH.



THE HALL MULTI-CYLINDER TWO CYCLE ENGINE.

etch. Both front and rear axles are section forgings of large size. Both springs are semi-elliptic and rest on addle blocks, which are notched over les. The radius rods are fastened J shaped band which passes under e. The front end of the radius rods to a pivot on the under side of the which support and brace the jack hangers. The heavy artillery wood are fitted with 5 inch Firestone solid tires.

upper part of the steering column ıder the wheel forms a brass cylin- out 3¼ inches in diameter, in which freely a bronze sleeve to which the g wheel is keyed. The inside of this has a double square thread of 1 inch which when rotated causes a rod l on the end of a rod inside of the g column to move up or down. The end of this rod is linked to one arm ›ell crank lever, the other arm of is connected by a ball and socket link to the steering knuckle.

'he Hall Gasoline Engine.

engine, built by F. E. Hall, of Wol- Mass., was shown for the first time recent Boston Show. It is a two gasoline engine with six horizontal ary cylinders, shown in end view in In Fig. 2 is shown a section of the A straight horizontal shaft with a one end passes through the centre engine. The motion of the six ordi- istons, which receive an impulse in ion at each revolution, is communi- through a straight connecting rod all and socket ends to a circular disc on a ball pivot at its centre A. The this non-rotating but wobbling disc bronzed bushed bearing in the disc end of the shaft, and the oscillations disc cause this axis to rotate the At the other end of the main shaft ›mewhat similar disc, equipped with rust bearings at each end and hav- roller bearing on its hub, which is keyed to the shaft. This disc operates six small pistons, which draw in and compress the charges for the firing cylinders. A projection on the end of each compressing piston pushes on the end of the inlet valve stems B, allowing the compressed charge at about 15 pounds per square inch pressure to rush into the head of the firing chamber and help drive out the spent charge through a ring of twelve ports which are about one-fourth uncovered as the fresh charge enters. This inlet at the top and exhaust through annular ports at the bottom gives probably as clean a mixture as is possible without mechanical or air scavenging. The exhaust passes directly into an annular space whose volume is thirteen times that of a single cylinder. This space acts as a muffler, and no other muffler is necessary. The entire space enclosing the firing chambers of the six cylinders is a water jacket, and the water inlet can be attached at any one of a ring of tapped and plugged holes. The makers claim that they have never known this engine to fire back into the compression cylinders. The carburetor can be attached to any one of a series of holes into an annular chamber or ring from which the compressing cylinders draw their charges. About 7 quarts of water are held in the cooling jacket. The timer is placed on a short shaft driven by mitre gears from the engine shaft. The entire engine is enclosed in a cylindrical case 15¼ inches in diameter and 33 inches long, and in large powers the space saved is considerable, as the 200 horse power engine occupies only 54 inches in length by 33 inches in diameter. The oiling is accomplished by two gravity feed cups, each having seven leads, one of which runs to the main shaft ring oilers and one to each of the pistons where they overrun, as at C. The action of the oscillating disc on the ball end of the connecting rods gives the pistons a slight twisting motion, causing a complete rotation about once in every 100 revolutions of the engine. This distributes the oil uniformly and insures very even wear on the cylinders and pistons, and as the piston rings are wider than the ports, no trouble is experienced by the ends springing outward. The main shaft is mounted on roller bearings, and is fitted with two ball thrust bearings.

The engine casing is fitted with large aluminum hand hole plates, and is very accessible. Any piston and rod can be quickly taken out, and by removing the end of the case all the pistons, connecting rods and the shaft can be removed in about ten minutes. Another claim for the engine is that it is practically vibrationless. Six two cycle cylinders give a very even torque, and no flywheel is used.

The Dentzeau Leather Auto Specialties.

George Dentzeau, 161 Grand street, New York city, manufactures a line of automobile specialties made of leather and similar materials. His leading specialty is the Dentzeau "all leather" license pad, which is made of patent leather sewn with silk thread. The figures are cut by hand from the same quality of leather as the pad, and are sewn on with oiled silk thread. The pads are lined with rolled steel. Mr. Dentzeau's other specialties include a leather bag for storing caps, veils, goggles, gloves, etc.; tire covers of enameled cloth, and lamp numbers of brass or aluminum.

"Flyer" Lubricant.

The Van de Sandt Manufacturing and Supply Company, Ltd., 73 Warren street, New York city, are making a new grease for lubricating purposes which is especially adapted for automobile lubrication. We are informed that a record of 75,000 miles with one filling has been accomplished with this grease, and that the average is 45,000 miles. The grease is claimed to be of special value in case a bearing has a tendency to run hot, as it has a cooling as well as a lubricating effect.

COMMUNICATIONS

Fake Automobile Schools.

Editor HORSELESS AGE:

Most every new industry, as it comes to be recognized as a lucrative and permanent source of income, brings with it some opening whereby the avaricious can work their graft schemes, and in a good many cases these graft schemes are carried on a long time and many persons are duped and parted from their money before the public realizes just what a fake it is.

In connection with the automobile industry, a great deal of grafting and faking has been accomplished through the agency of automobile schools, or supposed automobile schools. As the automobile industry promises and is now offering profitable employment to those skilled in its various branches, there are lots of persons anxious to secure the knowledge and skill required to make a repair man, mechanic or chauffeur. To these people a skillfully worded advertisement, stating that they can be thoroughly taught in an incredibly short time and guaranteeing a position at wages that could otherwise only be earned after spending years of hard and faithful apprenticeship, appeals irresistibly. They go to the so called school, are told that they can learn it all in from two to six weeks, pay their money for tuition (in advance), lay around the school until their money gives out or get disgusted, then either give it up altogether or get down to learning the trade on right lines. But what the students do after paying their money depends largely upon themselves. The manager of the school doesn't care. He loses all interest in the pupil immediately the money has been paid. This has been carried along a long time, yet the number of new students continually being taken in by these schools is surprising. The writer knows of a school of this fake variety in which from one to six new students are enrolled daily, and they each pay $25 for the course. After the student has completed his course, unless he is unusually apt and intelligent, he is not even capable of running an automobile, much less to take care of it.

The writer also knows of an instance where a student of an automobile school made application for employment in the repair department of a garage. He told the proprietor that he had a certificate from such and such an automobile school, and the proprietor said, "Very well, let me see you time this engine." After some hesitation the applicant admitted that he couldn't do it. "Didn't they teach you to do it at the school?" he was asked, and the reply was that he did remember someone doing it before a crowd at the school one day, but he didn't remember how it was done. "Well, didn't they make you do it yourself, to make sure you knew?" asked the proprietor. The applicant said, "No," and didn't get the job.

The pupils turned out by these automobile schools very seldom qualify as even fair mechanics or chauffeurs, and many of them are worthless. The garage men and owners of automobiles who hire chauffeurs know this, and give preference to the man who has had practical experience, and it is hard for the automobile school student to find employment. These fake schools have given automobile schools such a black eye that the good ones, of which there are few, suffer with them.

There is no reason why a person cannot learn to run and take care of an automobile in a school just as well as he can learn other things in a school. But it is ridiculous to assume that a person can become an expert automobile mechanic in six weeks. The expert automobile mechanic should be a machinist, and it takes a machinist from three to five years to learn his trade. How, then, can one expect to learn the machinist's trade, the intricacies of the gasoline engine, the electrician's trade, and the construction of the various other parts of an automobile in a few weeks?

An intelligent man can, however, learn how to assemble and dissemble the parts that go to make up an automobile, the theory of the gasoline engine and electrical ignition system, in a short space of time, provided he is taught in the right manner and applies himself diligently to his work.

There is to my mind one thing faulty about even the best automobile schools, and it is something they proclaim as one of their best features. They say, "We teach you nothing from books, give you nothing but practical experience." Why not give the student a book and let him follow the book along with the practical teaching. Then he can get the theoretical knowledge along with the practical knowledge, and in addition to knowing how to do this and that he knows why he should do it. When automobile schools get down to the same system as other educational institutions they will be of some value to the student and the employer, but at present the majority of them are of no value to anyone but the man who takes in the money.

The writer has noticed that a great number of the automobile school students are from the country. I have had occasion to visit a number of automobile schools, and in nearly every instance I have found the would-be chauffeurs and mechanics sitting around, cutting up, joking, laughing, doing everything but seeking knowledge. I find them well versed, however, in all the sporting and racing news of the automobile. I wonder how the term "school" can be applied to the place.

Automobile schools in general have been given such a black eye that it seems only fair to state that there are honestly conducted establishments of this kind, where the avowed purpose is to impart to young men the particular knowledge required to enable them to operate and properly care for an automobile, and the pupils are impressed that the purpose is not to teach automobile engineering, but to train men to know a car so as to be efficient operators and qualified to take care of it. The theory of the gas engine, carburation, ignition, etc., are taught by the instructors, and they take pride in seeing the students turn out to be skillful operators. There are three things which should be given more importance in all the automobile schools, and which would give quicker recognition as a factor of the automobile industry. These three things are discipline, system and theory.

R. D. P.

"Puzzling Action of a Gasoline Engine."

Editor HORSELESS AGE:

I have read with interest the article in your March 14 issue, "Puzzling Action of a Gasoline Motor—A Query," signed B. I have had a similar experience with a four cylinder engine; that is, now and then one cylinder would miss. I located the trouble in the push rods of the exhaust valves. Owing to the great heat the oil would burn onto the push rods and cause same to stick and not work freely. My remedy is to grind in the valves every month and thoroughly clean valve stems in kerosene so that they may work freely. This obviates any possibility of a so called "sticking stem" in push rods.

There are so many reasons why a gasoline engine does not work perfectly that the trouble sometimes appears where you least expect it. My plan of operation, which has worked successfully, is based on elimination. As everyone knows, most of the troubles occur with the ignition system or with the gasoline mixture. I find this difficult to come to perfection, owing to the different temperatures affecting the mixture. The carburetor I hardly think will ever be perfect, but if kept clean and not tampered with it is a long way toward getting a satisfactory result.

S. L. SCHOENFIELD.

Reduction of Electric Vehicle Mileage in Cold Weather.

Editor HORSELESS AGE:

In your issue of February 7 you have an editorial on the loss of storage battery capacity at low temperatures, in which the statement is made that the operation of electric vehicles during cold weather is at an added expense for charging current.

This is, of course, true, because in cold weather we have snow, ice, storms and bad roads, which equally affect the gasoline vehicle. It is not true in the sense in which the statement is made, as, while the capacity of the storage battery is reduced at cold temperatures, it also takes less current

ge the battery, and the cost per unit
er obtained is practically the same.
ıge is indeed reduced, for the rea-
ıove mentioned, which affect all au-
es, whether gasoline, electric or
and it is reduced also because the
neither takes in nor gives out as
urrent in very cold weather as in
he efficiency is the same and the
current the same.

ıte from a battery engineer for the
of those who are interested in the
ılities of the subject:

ıperature reduces the capacity. It
duces the discharge voltage and in-
the charge voltage. The effect on
is such at a temperature of 70°
hat a battery will give 50 per cent.
t it would give at 70° Fahr. The
however, is not a straight line, and
rees difference in the temperature
a great deal more difference in the
at a very low temperature than it
high temperatures. The tempera-
ven is not the temperature of the
the actual temperature of the elec-

The efficiency in ampere hours is
ılly independent of temperature, and
erence in efficiency, due to different
ıtures, is due to the voltage. It is,
r, customary to charge vehicle bat-
y means of resistance, and therefore
t of charging would be no greater
cold battery than with a warm one,
the battery would start to charge
ss resistance in series with it, and
the course of charging it would tend
m up, and the voltage required to
he charge would not be above what
would be capable of giving. If a
having a normal capacity of 100
hours were fully charged and then
to 0° Fahr. it would have a capacity
ampere hours. If the battery were
ld by artificial means 50 (plus) am-
ours could be put back into it, but
ıl voltage would be between 2.8 and
. If the battery were then warmed
mal temperature it would give its
ıpere hours. If at the end of this
ge it were cooled to 0 degree it
still be possible to put back 100 am-
ours."

her words, there is no difference in
ciency, by which is meant that the
ıt. of current which may be taken
mpared to the current put in, is no
ıt at varying degrees of tempera-
If a battery in which the voltage has
d to the discharge point is warmed
then give out the rest of the current
has been put into it, without drop-
the discharge point again; but on
er hand, when it has been discharged
l weather to the discharge point, it
s less current to charge it up again,
the mileage obtained is proportional
current put in at any temperature,
for the fact that usually cold weather
ıd going are simultaneous, likewise
ıg the horse or any kind of automo-
It takes more energy to go in bad or cold weather, but the oats cost the same.

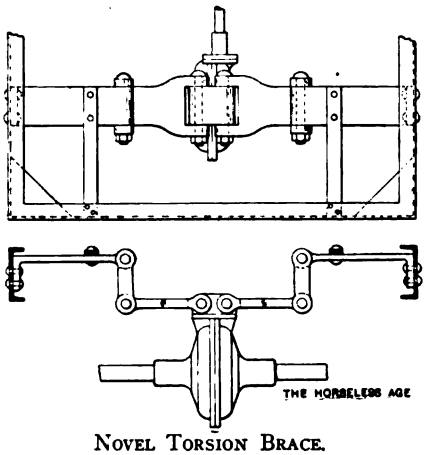
POPE MOTOR CAR COMPANY,
Waverley Department,
H. H. Rice, Manager.

[Our correspondent's argument is undoubtedly correct when applied to the case where the owner has his own charging facilities. But we are under the impression that where cars are charged at a garage a certain sum is paid per charge, independent of the amount of energy required for the charge. It would thus seem that cold weather is a blessing to the garage men, if it does not interfere with the use of the cars.—ED.]

Improved Torsion Brace.

Editor HORSELESS AGE:

The ordinary torsion rod arrangement used on bevel gear drive cars has the disadvantage that as the body rises and falls in passing over irregularities of the road, the bracket supporting the forward end of the rod is also raised and lowered, which causes the rod to slightly rotate the axle casing. As the rotation is resisted by the springs, internal strains are set up; and in addition the supports of the hub brakes, being rigid with the casing, are caused to move in such a way as to continually modify the adjustment of the brakes. With half elliptic



NOVEL TORSION BRACE.

springs the vertical body movement is small, and these considerations are of comparatively little importance. But with full elliptic springs the case is different. The movement of the body is now from two to four times as great, so that the rotation becomes excessive. The half elliptic springs may themselves be depended upon, at least in light cars, to act as torsion rods; but the full elliptic is not adapted to perform this office, since it is held at a single point directly over and considerably above the axle.

To get rid of the objection to the ordinary torsion the writer devised the following arrangement, which has been found to work very satisfactorily, controlling the torque reaction perfectly and yet having no tendency to cause rotation, no matter how great the motion allowed by the springs. It is up out of the way, and is practically invisible when the body is in place. Since with this device the motion of the axle must be in a strictly vertical direction, it is evident that it would not be applicable to half elliptic springs (unless they were shackled at both ends), since with the ordinary half elliptic the axle moves slightly backward as it rises.

A block or lug is fastened or cast on the highest part of the bevel gear case. Through the lug are two parallel holes extending in a fore and aft direction. Through each hole passes a bolt which unites the forked ends of a link free to swing in an up and down direction, but fitted closely so as to prevent any other movement. The other end of each link is shackled to brackets bolted to the frame of the car at a position directly over the axle. These brackets are further stiffened by a brace to the rear cross member of the frame. C. W. M.

Mr. Duryea's Comment.

Editor HORSELESS AGE:

Absence while attending the Boston Show, together with press of work, has prevented reading late issues of your valuable publication until recently.

I wish to disagree with you re some expressions in your issue of March 7. It is my belief that the reason people do not buy autos in the fall is not because they wish to save the interest on their money, but because they wish to see if anything new comes out at the shows. Let the new models be announced early, and let buyers be assured that nothing else will come out for another year, and they will buy early, so as to get as much use as possible out of their new model before it is superseded. The new toy is always most enjoyed, and they will use the new rigs more in the winter if bought in the fall than if bought in the spring, and the novelty is worn off during the summer. This is one thing desired by all makers and friends of the business, and the early show helps to secure it. The average auto buyer does not figure on saving a few dollars' interest. We have tried for several years to stimulate fall purchasers by giving a discount of 5 per cent. in the fall of the year. This really amounts to 10 per cent. per year, and we know by trial what the excuses are for not buying.

Your remarks re the guarantee I also take exception to, and maintain that a short guarantee is better than a long one. What the purchaser wants is reliable goods, and no amount of guarantee will carry him home when broken down 40 miles from anywhere on a rainy night. The long term guarantee is simply a selling argument and a good deal of a delusion. Some purchasers imagine that if the maker is willing to give a long guarantee he has absolute faith in his goods, and that therefore they must be reliable. Current literature points out a case of a manufacturer willing to guarantee his cars for three years, while his expressions re prompt delivery indicate that he is not snowed under with orders. I know of a car made by him in which the parts sent for replacement would not fit and could not be used. The conclusion to
not favorable to a long g

best guarantee is a reputation for fair dealing and good goods. Actions speak louder than words, and what the manufacturer has done to please his customers in the past is better evidence of what he will do than promises. The one year guarantee was well tried by the cycle makers, and was decidedly abused. Irresponsible makers found excuses for evading the guarantee, and honest makers found it a burden. Careless users took it for granted that all breaks were defects and demanded repairs accordingly. If this happened with a machine of one man power what may we expect from long guarantees on high powered autos? The repair bill is one great restraint to overfast and careless driving, and to be consistent you must get your opinions as to the guarantee in line with your sound and correct stand against lawlessness. There are many constructions which may be guaranteed for long terms with safety. My self-playing organ was guaranteed for six years, and has been the daily toy of the children for fifteen years, without a cent's worth of repairs except new hinges on the pedals. Sewing machines and typewriters likewise perform a reasonably fixed service, and are not so susceptible to abuse as is an auto.

The question of right or left side for the operator's seat can only be settled definitely by making the rig so it may be driven from either side. Our rigs are so made, and it quite frequently happens that occasion arises to demand driving from the other side. A passenger deaf in one ear or lame in one arm may find it a great convenience to sit on the other side. It seems to us that an auto can never be considered perfect until it can be driven as easily and certainly from either side as can a horse.

Your remarks on the defects of the Pennsylvania law are certainly to the point. It is high time that automobilists everywhere cease bowing to the yoke envious horse users would put on them, and proceed to fight for their rights. Pennsylvania auto users are now being given an opportunity to assist a State federation for this purpose. A letter to either the Philadelphia or Pittsburg Auto Club will bring full particulars.

CHAS. E. DURYEA.

High Speed Medical Work.

Editor HORSELESS AGE:

Dr. A. C. S., in his article on page 411, gives us some very good pointers about winter service, etc., but spoils the whole thing by his wind up. He tells us of the exceedingly icy condition of the streets, and yet he drove 38 miles in three hours, making fourteen calls as well. Now, had he driven the full limit of speed allowed in the country, a mile in three minutes, it would have taken one hour and fifty-four minutes to drive, leaving sixty-six minutes to make the fourteen calls, or a little less than five minutes per call. Had he driven 15 miles an hour he would have had less than two minutes for each call; at 13 miles an hour it would have taken all his time driving and none for calls, and that I should consider very fair for Brownsville and vicinity. As he speaks of the icy streets, we assume that at least part of his work was within the limit of "a mile in six minutes," and then where would the visits come in? As I own an auto, and also do a little in the practice of medicine, I have reason to think the doctor's reasoning a "wee bit off." M. D.

Piston Pins.

Editor HORSELESS AGE:

I notice in your issue of March 7 a contribution on piston pins. In addition to the different schemes enumerated there, I should like to mention one suggested by me about two and a half years ago and now employed by a successful motor car company of Cleveland. The accompanying sketch shows it.

The pin is roughed out to correspond with the final shape, hardened and ground to a sliding fit at B, and then ground taper at A and C so that both A and C are of the same taper, which is an exceedingly easy job on a proper grinder. The pin is then fitted into the piston, which has been reamed with a reamer of corresponding taper. On account of this taper it is possible to get an accurate fit in less time than by any other method. The pin is secured in place by the following

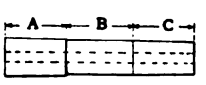


FIG. 1.

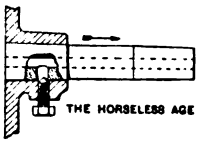


FIG. 2.

scheme: The set screw hole in the piston boss is slightly offset with respect to the hole in the pin, and the set screw end (pointed, as shown) has a tendency to push the pin in the direction of the arrow and insure a proper seating. The set screw is locked by a cotter pin. The combination of these two devices makes the piston and piston pin one solid block, and the pin will never work loose, owing to the almost absolute utilization of the bearing surface, with the possibility of a reasonably cheap manufacture.

I do not claim to have invented these little details; they are adaptations from European high speed steam engine practice, with proper regard to shop practice.

C. P. SCHWARZ.

Successful Nevada Motor Stage Line.

Editor HORSELESS AGE:

When I came to this part of the country I was more surprised at the successful operation of the automobiles in use here than at the great prospects for gold mining. After watching for years the development of the automobile, and doubting whether it would ever attain a state of perfection allowing it to be operated successfully on our mountain roads, I found about a dozen of them operated in a passenger service here (Manhattan) and Tonapah, a distance of 50 miles, with a part of the roads such that the freight teams all make a detour of 20 miles to avoid a summit which is too steep and muddy. The distance of 50 miles is covered by the automobiles in 4½ hours. Twice as much is charged for the fare in the automobile as on the horse stage, and many prefer to pay $15 for the rapid trip to $8 for the slow transportation.

The automobiles used for this service are mostly of the touring type, carrying five passengers; they are rather heavy and the speed is too high, which will probably make the repair expense rather high. I feel certain, however, that a light car for passenger use would not be too expensive to operate here; it should have plenty of power and (I believe) large wheels and solid or cushion rubber tires. That at least is the kind I have been looking for. B. ROBINSON.

To Prevent Accumulation of Frozen Mud on Wheels.

Editor HORSELESS AGE:

I noticed in a recent issue of your paper a complaint about frozen mud adhering to the wheels of a car in winter driving. If your correspondent will wash his wheels with brine, twelve parts of water to one part of salt, before starting out, he will have no further trouble of this kind.

GEORGE D. LAWS.

Carburetor Arrangement on Four Cylinder, Two Cycle Engines.

Editor HORSELESS AGE:

In a four cylinder engine of the two port, two cycle type, 4x4 inches, would use one carburetor or four, and when using one, would it be necessary to propose a check valve between the carburetor and each cylinder? GEO. [illegible]

[We would use one carburetor, as it costs less than four. Check valves in line to each cylinder base are not necessary as the piston cuts off the communication of each cylinder base with the other.—Ed.]

Automatic Carburetor Invention.

Editor HORSELESS AGE:

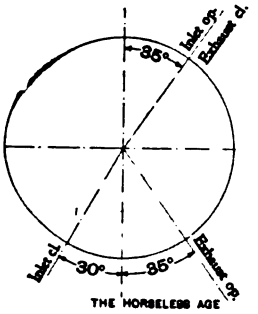
In your issue of February 28 you and Duryea make some slight mistakes which I should like to correct. Mr. Duryea quotes a Mr. Landau as stating "that the first practical suggestion of the automatic carburetor was made by Messrs. Bradley and [illegible] in 1902." Prior to this there were a number of carburetors with automatic valves, as will be seen in British patents No. 1887; 29,567, 1897; 3,273, 1900, and 1901, the latter being the invention of the Pan-American Motor Company.

In your note to Mr. Duryea's letter you state that the first float feed invention was suggested by Messrs. Bradley and Deacon, which again is wrong, as in each case the citations which appeared were Nos. 6,900, 1890, and 10,05[illegible] both by Butler, and No. 10,05[illegible] Wilkinson. EDITOR.

"Cams."

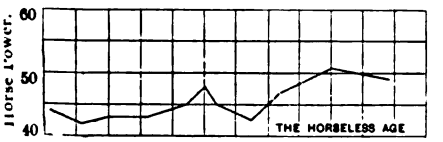
litor HORSELESS AGE:

I have read with interest Mr. Hall's ticle on "Cams," and while I give him ll credit for his endeavor to make pub- information which may be of benefit all of us, as designer he certainly did ›t do justice to himself drawing con- ısions from the test referred to in his scussion. This test, for some circum- antial reason, was not conducted on a ,sis to give the best results obtainable om that special engine, and I cannot



CAM DIAGRAM.

nderstand why Mr. Hall used these fig- res and did not wait long enough to ınd out the results which were obtained ›y using different settings of the cams. He shows a diagram which was used for ›nly one setting. He mentions that a ›ossible maximum speed of 1,600 revolu- ions under load was claimed. This state- nent is false, as I cannot see who could lo so, considering the compression ratio n the particular engine referred to. The ·ated horse power of the engine is 45 ›rake horse power to 50 maximum brake horse power, its size being 5½ inch bore ınd 6 inch stroke. A test taken a short :ime ago shows results which may alter



HORSE POWER CURVE.

Mr. Hall's figures quite considerably. The inlet cam was of one-quarter inch lift the exhaust cam five-sixteenths inch lift, and the setting for same was according to the accompanying diagram. The horse power obtained was quite different from that obtained in previous tests. I may mention that this test was taken with the Longuemare carburetor and was succeeded immediately by one using the Schebler carburetor. The result shows a curve running almost parallel to the one above, and the highest horse power we could obtain was 47½. A point which was not considered at all by Mr. Hall is that a cam should be selected which would give the highest power with a minimum consumption of fuel, and this is by far the most important point to consider.

M. J. HELMES, M. E.

Remedy for Slipping Clutches.

Editor HORSELESS AGE:

I write to ask if you can tell me what to do for a clutch and transmission that slip. I have a 1903 curved dash runabout that is in good condition and would give perfect satisfaction were it not for the fact that the clutch and transmission bands will not hold.

I have tried relining the bands with new fibre and putting new leather on the clutch; also putting wax, rosin and things like that on the leathers; but I still have the same trouble. It seems almost impossible to keep oil off the clutch entirely, and if I do not put a little under the bands they drag and make a great deal of noise.

As long as the road is good everything is all right, but as soon as it gets a little heavy the car begins to lag while the engine keeps on going. Instead of stalling the engine it slips. Then when the car stalls in a mud hole or sand I cannot get the bands to grip enough to hold the engine down, let alone pull the car out.

R. P. BLACKWELL.

[As long as you use machine oil on the clutch and friction bands you are bound to have trouble from slipping. Castor oil, either pure or mixed with glycerine, is a good clutch dressing. To remove the oil that accidentally gets onto the clutch lining use talc or fuller's earth, which can be blown under the bands by means of a glass tube. These powders absorb the oil, and ought to enable the clutch and bands to hold.—ED.]

Route to Asheville, N. C.

Editor HORSELESS AGE:

Will you or some of your subscribers please give me the best routes and the best roads to go to Asheville, N. C.? This is a trip I want to take some time in May. Also, would I have to have a license in every State through which I go?

C. LINKROUM.

[South of Baltimore the roads are very poor, and automobilists who wish to use their cars in the South usually have them shipped there. We can only give you the best route as far as Washington, D. C., which is as follows: Newark, Elizabeth, Rahway, Metuchen, New Brunswick, Dayton, Cranbury, Hightstown, Windsor, Edinburg, Trenton, Tullytown, Bristol, Philadelphia, Chester, Wilmington, Havre de Grace, Stepney, Baltimore, Ellicott City, Olney, Leesboro, Brightwood, Washington.

You must secure a license in Pennsylvania, Maryland and the District of Columbia, but require none in Virginia and North Carolina.—ED.]

Repair Expense of Two Cycle Cars.

Editor HORSELESS AGE:

There have appeared in the trade papers and newspapers many individual experiences relating to the expense of repairs of automobiles. Believing that a correct account taken from the books of an automobile agency would be of general interest, we got the consent of Young & Miller, our Detroit agents, to make abstracts from their repair books for this purpose. It was decided to draw off a statement of each individual account, submit it to the owners of the cars, and, if found correct, to ask them to verify it by a sworn statement before a notary public. Mr. Miller, of the above agency, consented to submit the statements to the owners, and found them perfectly willing to verify the correctness of the accounts in the proposed manner.

We are enclosing an affidavit which is exactly like the others, except as to the time the car had been in use, and the general average of repairs. As you will see, the affidavit states that the figures given do not include the repairs on tires nor the cost of gasoline and lubricating oil, as there is no way of getting at the exact figures for these items. We adopted this method of verifying the accounts in order to show that they are absolutely correct. We wish to say that this list does not cover all the cars that were sold by this agency during the time covered by the statements, as it was considerable of a task to reach even this number of people, a great many of them being out of town and having to be followed up, while others that we wanted to see were not to be reached. However, to show that the accounts here given were not specially selected, Mr. Miller makes a sworn statement and affidavit that the balance of the accounts on the books will not raise the general average of these accounts, so that those given are representative of all of the accounts on the books. Following is the affidavit of Frank C. Feckenscher:

"Frank C. Feckenscher being duly sworn deposes and says, for the period of time beginning April 1, 1905, and ending December 1, 1905, the statement attached hereunto is a true and exact account of repair work done to the Elmore automobile owned by him, and the detailed items of which statement amount to twenty-two dollars and twenty-five cents ($22.25). Aforesaid statement does not include any repairs to tires whatsoever."

Following is the statement referred to:

1905.

June 10—Fare to Fenton.....	$1.65
June 22—Two spark plugs.....	3.00
July 4—Fare to Fenton.....	3.50
Aug. 22—One porcelain for plug.	.40
Aug. 23—Taking up connecting rods, five hours.....	2.50
Aug. 28—New rim for wheel and labor	5.00
Sept. 14—One high fibre, 50 cents; one sprocket bushing, $1.50; labor, $3.60.....	5.60
Sept. 15—Labor.....	.60
Total	$22.25

THE ACCOUNTS OF THE OTHERS WERE AS FOLLOWS:

	Months.	Amount.	Average Per Month.
E. L. Rice	19	$18.05	$0.95
Thos. J. Quinn	9	14.60	1.62
J. W. Wilson	7½	22.90	.40
Frank Gerard	9	10.25	1.14
Dr. A. C. Lee	17½	10.65	.60
Benson E. Brown	4½	17.90	3.97
Paul Bock	13	41.35	3.08
C. J. Fox, Jr.	9½	30.85	3.24
Chas. W. Messer	5	11.25	2.25
Matt. Holdrith	6½	6.50	1.00
Miss Mabel Wright	15	11.85	.78
Frank C. Feckenscher	8	22.25	2.78
Geo. La Liberty	5½	8.85	1.60
Dr. John M. McManus	7½	46.10	6.10
J. M. Spalding	3	7.00	2.30
Dr. Milton G. Watson	17	61.53	3.62
Average	10	....	2.20

All statements were made out up to December 1, 1905.

ELMORE MANUFACTURING COMPANY.

German Automobilists' Liability Law.

The German Federal Council has given its consent to a bill defining the responsibility of owners of motor cars, which was drawn up in the Imperial Office of Justice. It lays down the general principles which will form the basis for the new regulations to be adopted by each of the German federated states to suit its own special conditions, and it will in all probability be passed by the Reichstag this session.

Clause 1 says that if a person is killed or sustains bodily injury or damage is inflicted by a motor car, the person on whose authority the motor car was running must give compensation for the injuries or damage suffered. Clause 2 says that in case a person is fatally injured, the costs of the attempted cure and pecuniary loss suffered by the injured person while incapacitated must be made good. If the deceased at the time of the injury had a third party depending on him, compensation must be made to this third party for the whole period during which the deceased, had he lived, would have been responsible for his sustenance. The third clause says that in case of bodily injury being inflicted, the whole of the costs of the cure and pecuniary loss sustained by the injured person during his incapacity to earn his living, as well as any loss sustained by the reduction, through the injury inflicted by a motor car, of his capacity to earn his living must be made good. Clause 4 says that the compensation to be made for partial or total incapacity to earn a living produced by injuries thus sustained takes the form of the periodical payment of a pension. Claims for compensation must be made within two years after injury has been sustained.

New Styles of Cars.

We show herewith photos of three new types of cars on stock chassis. The "Royal" car has a touring car body with Victoria



NATIONAL 40 HORSE POWER FOUR CYLINDER RUNABOUT.

lines; the National is a high powered runabout with torpedo back and a somewhat original design of fenders, while the Pope-Toledo runabout is of moderately high power, 20-24 horse power, and possesses a novel feature in a third seat for the chauffeur, which may be folded in entirely out of sight when not in use. Technical descriptions of the chassis of these cars have appeared in our columns during the past winter. All are four cylinder cars fitted with sliding change speed gears.

These illustrations will be of interest to those who have familiarized themselves with the 1906 models.



"ROYAL" VICTORIA, WITH TOP.



POPE-TOLEDO TOURING RUNABOUT.

ig Cornerstone of New A. C. A. Clubhouse.

cornerstone of the new club- of the A. C. A. on Fifty-fourth street, f Broadway, New York, was laid sday afternoon, March 21, in the e of a large number of the members. nt Dave Hennen Morris in his ad- numerated the following articles de- in the cornerstone:

f history of the club, by George F. Cham- ex-president; the club book; the club the present automobile laws of all the maps showing good roads, published by for the use of its members; a model of mobile; a pair of touring goggles; a t of aerial flights by the Wright Brothers; f sheets of "Three Men in a Motor Car," E. Scarritt, ex-president, dedicated to the prophecy, "The Future of the Automo- y Albert R. Shattuck, ex-president; a 'A Journey Through Other Worlds; a e of the Future," by Col. John Jacob current numbers of the automobile trade ; the silver coins of the United States; ly newspapers of New York city of 11.

r President Morris had reviewed the of the club, the cornerstone was laid Schuyler Skaats Wheeler, chairman building committee:

ıer President A. R. Shattuck then sıed concerning the future of the au- le, taking as his text Nahum 11:4: hariots shall rage in the streets; they shall ne against another in the broad ways; ll seem like torches; they shall run like the gs.

was of the opinion that the time al- to had already arrived, but looked to the time when the automobile be relegated to the scrap heap, and s will be the common carriers.

Rev. Wilton Merle Smith, pastor Central Presbyterian Church, pro- d the benediction.

new clubhouse will be 131 feet front t stories high, with a front of granite, brick and terra cotta, the upper por- eing as nearly of glass as possible. reet level floor, reached by a large e and a separate exit for cars, will as an immense foyer in which many m assemble. The upper storage sto- ll be served by two electric elevators largest size. The cars as a rule will ed in rows and lanes, but spaces de- by members will be partitioned off on grills for individual use.

top floor, made exceptionally light lights, will be fitted up under direc- f members of the club who are espe- interested in engineering matters as a repair shop, and will contain the club ometer, designed for measuring the and the efficiency of cars under all ions. Special amusement rooms and accommodations are provided for urs. The building throughout will reinforced concrete construction, and orage of gasoline will be outside of ilding.

main entrance to the club rooms at sterly end leads to a large lobby, hav- one side the office of the garage superintendent, and at the rear a reception room for ladies. A large staircase mounts from the centre of this lobby to the second floor, which contains the great assembly hall and library, 100 feet long and two stories high. This room will be in the architecture of the period of Francis I, and will be a reproduction of the hall of a celebrated château, for which special permission has been granted. On this floor and the mezzanine floor are located the large grill room, with complete kitchen and pantry, the governors' room, secretary's office, etc.

The building committee consists of Dr. Schuyler Skaats Wheeler, chairman; Albert R. Shattuck, Colgate Hoyt and Gen. George Moore Smith.

New York State A. A.

The matter of legislation was one of the most important to come before the directors of the New York State Automobile Association which met at Syracuse March 24. Giles H. Stilwell, of the legislative committee, reported that automobilists would agree to a slightly higher taxation for registration, but would oppose strenuously any attempt at excessive taxation. He advocated a legislative act providing for the use of all funds received from automobilists for the improvement of the highways of New York State.

The committee will confer at Albany in a short time with the advocates of the L'Hommedieu bill now before the Legislature, to see if some agreement cannot be reached which will be satisfactory both to the automobilists and to the supporters of the bill. The authors of the bill may make some concessions.

The following officers were elected for the coming year: President, Oliver A. Quayle, of Albany; vice president, H. S. Woodworth, of Rochester; secretary and treasurer, Frederick H. Elliott, of Syracuse. The present president, Judge William H. Hotchkiss, of Buffalo, declined to remain in the office. The directors passed a resolution of regret that he could not serve another year.

The report of Secretary Elliott showed seventeen clubs on its membership list, which includes all the clubs in the State. The total membership of these bodies is 2,365. This is a growth in two years from nine clubs with 1,253 members. It is thought that when the next report is received from the clubs the membership will reach 3,500.

The directors present were Emerson Brooks, New York; W. H. Hotchkiss, August H. Knoll, Buffalo; H. H. Franklin, F. H. Elliott, Syracuse; Norman H. Pierce, Binghamton; H. S. Woodworth, Rochester; O. A. Quayle, Albany; S. C. Tallman, Auburn.

The plan for a bureau of complaints at each automobile club, which Charles Terry, of New York, advocated at the annual banquet of the Syracuse Automobile Club, was indorsed by the directors. Mr. Terry wants every club to enforce the law in its city, and to keep its members from violating the law.

Reduction in Freight Rates on Autos.

Touring motorists will be interested to learn that reduced freight rates on automobiles, west of Chicago, have just been granted by the Western railroad companies, after some extensive negotiations by the traffic department of the Association of Licensed Automobile Manufacturers. The reduction amounts practically to about one rate and a half on the travel from Chicago to San Francisco and return. This, of course, will benefit all those going from New York, or any point east of Chicago, to the Pacific coast and back again, although the greatest financial advantage will be on the round trip between Chicago and San Francisco.

To illustrate, the present rate on the automobiles of tourists from New York to San Francisco and from Chicago to 'Frisco is the same; that is, $150. The east bound rate is higher than the west bound one. From 'Frisco to Chicago it is $170, while it is only $185 for a car from 'Frisco to New York. Under the new deal, any tourist who has paid the full tariff going west from Chicago to the Golden Gate may upon returning get the half rate of $85 from the coast to Chicago. Of course, a traveler from New York, or any other point east of Chicago, would get some advantage from this arrangement by paying the half rate back to Chicago, although he then would be obliged to pay the full rate from there east. In this way, a man going from Detroit to 'Frisco and back, for instance, will pay only $114.66, instead of $172.50.

According to J. S. Marvin, manager of the traffic department of the A. L. A. M., the idea in this is to afford a lower round trip rate on single machines belonging to tourists, with the belief that they will oftener take their cars with them under a more reasonable tariff. It is understood, of course, that a car will not be allowed the reduced rate eastward to Chicago unless it has paid the full tariff going west, and has not changed ownership in the meanwhile. The reduction will go into effect early in April.

Touring Information for A. C. A. Members.

The board of governors of the Automobile Club of America, believing that one of the most important functions of the club is to supply its members with reliable touring information, have appointed a clerk of the runs and tours committee to take charge of this department of the club work, and devote his entire time to the preparation and distribution of information concerning routes, hotels, repair stations, freight licenses and registrations, customs

ties and all the necessary data for touring both in the United States and Europe.

All of the information gathered by this bureau is at all times at the disposal of members, and they are invited to make free use of same.

All communications should be addressed "Clerk of the Runs and Tours Committee, Automobile Club of America, 753 Fifth avenue, New York City."

From the Report of the Massachusetts State Highway Committee.

During the year 1905 there were built 56.55 miles of new State highway, making a total of 622.43 miles in the State, and in addition to the newly constructed roads 95 miles of roads in the small towns were improved. The total number of applications received by the commissioners for the location and construction of State highways up to date is 708. These petitions cover altogether 1,784.82 miles of road, and they are from 285 towns and twenty-seven cities. During the past two years nearly 8,000 trees and 300 vines were planted along the State roads. The average cost of constructing the State highway roads during the past year was $5,708.88 per mile, and the average cost for maintenance of roads was $96.07 per mile.

The report on automobile registration shows that certificates of registration were issued to 4,889 automobile owners, 533 motor cycle owners and 102 to manufacturers and dealers. Licenses to operate were issued to 3,736 ordinary operators and 3,133 professional chauffeurs. The commissioners also recorded 1,500 transfers of ownership, and issued many hundred permits for temporary number plates.

Up to the present time the commissioners have heard sixty-three complaints about careless driving, have suspended or revoked six licenses, and have sent out more than 200 cautionary notices to persons charged with overspeeding. Eight hundred and thirty-six cases in which fines were imposed were reported by the courts, and to persons with more convictions cautionary letters were sent.

Twelve hearings were given in towns where selectmen had made special speed regulations, and in almost every instance where these special speed regulations have been passed the commissioners found that no effort was made to enforce the State speed.

The commissioners are firmly of the belief that no change in speed regulations should be permitted by local authorities without the approval of the highway commission. The local authorities have not reported as many serious offenses against the law to the commission for their action as they might have done. The commissioners believe that the suspension or revocation of licenses is the most effective way of correcting breaches of the law, and that when it is taken advantage of to its fullest extent the problem will be solved.

Limit of Glare Permissible.

A French court has just rendered a decision what constitutes a blinding light. A chauffeur was arrested recently for driving a motor car through one of the busiest streets in the city with a headlight so powerful as to confuse the vision of the pedestrians. Experts were called in to determine at what point a light became dangerous, and after much testimony it was decided that a light which is so strong as to blind a person at a distance of 5 yards and 9 inches is dangerous, and that the owner thereof is liable to a fine.

New York and Chicago Automobile Fatalities in 1905.

According to statistics furnished by the Coroner's office, Borough of Manhattan, New York, there were seventeen fatalities due to automobile accidents recorded in that office during 1905. Fifteen persons were run over and killed. One fell out of an automobile, and one was killed in a collision between an automobile and an Eighth avenue surface car.

In addition to these, one person was killed by a motor cycle.

Two hundred and thirty-five persons were killed in vehicle accidents of all kinds in Manhattan borough during 1905, as follows:

Run over by surface cars	110
Run over by subway cars	20
Run over by elevated railroad cars	45
Run over by trucks, wagons, coaches, etc.	42
Run over by automobiles	15
Run over by motor cycle	1
Fell out of automobile	1
Collision of automobile and surface car.	1
Total	235

The Chicago coroner's office records show that only five persons were killed by being struck by automobiles last year, although there were 137 fatalities resulting from street car accidents, and sixty-eight from horse and wagon accidents.

1906 Racing Board of A. A. A.

The racing board of the A. A. A. for the year 1906 has been announced as follows: Jefferson de Mont Thompson, chairman; William K. Vanderbilt, Jr., A. C. A.; E. Russell Thomas, A. C. A.; Samuel Walter Taylor, A. C. A.; A. G. Batchelder, New York Motor Club; S. M. Butler, A. C. A.; H. L. Bowden, Bay State A. A., Boston; R. Lincoln Lippitt, Rhode Island A. C., Providence, R. I.; Frank G. Webb, Long Island A. C.; Ira M. Cobe, Chicago Automobile Club; George L. Weiss, Cleveland A. C., Cleveland, Ohio; E. H. R. Green, Dallas A. C., Dallas, Tex.; Dr. W. H. Bergtold, Colorado A. C., Denver, Col.; L. P. Lowe, A. C. of California, San Francisco, Cal.

Technical advisers to the board (without a vote in the board, acting only in an advisory capacity): Peter Cooper Hewitt, of New York; E. R. Thomas, of Buffalo; A. L. Riker, of Bridgeport, Conn.; Henry Ford, of Detroit.

Improved Form of Touring Map.

The "autocarte" is an ingenious little device of French invention which is mounted on the dashboard of the car, and which, by the unrolling of a band of paper, shows the exact position of the car upon the road at any moment. With the high speeds which are now used, sign posts are becoming of little use, seeing that they cannot be read usually without slowing up. This is especially true when traveling at night. The "autocarte" has been invented to provide for this case, and it will no doubt be much appreciated, as it avoids the handling of maps and gives a sure indication of the road. The strip of paper has printed upon it a map of the road on a sufficiently large scale, so that all the needed points can be indicated. By using this device the driver can see at just what part of the route the car is traveling, and he can read ahead for a distance of 5 miles, thus finding all the obstacles, turns, descents, etc., long before they are reached. When traveling at night the "autocarte" is always illuminated, and enables chauffeurs to travel with security at a higher speed than usual.

Prizes for Denaturized Alcohol Inventions.

The French Government is offering a prize of 20,000 francs for the discovery of a denaturizing agent for alcohol that is superior to the one at present employed. The taste and odor of the denaturizing agent must be such as to render alcohol to which it has been added unpotable, yet the odor must not be so strong and repulsive as to interfere with the use of the denaturized article. Soluble substances leaving deposits on wicks and in fine tubes, such as cooking salt, are not available. The volatility of the denaturizing agent must be substantially the same as that of the alcohol, so it cannot be eliminated by fractional distillation. It must not comprise any element which attacks metals. It must not be poisonous like bichloride of mercury; it must be sufficiently low priced not to hinder the use of the alcohol for industrial and domestic purposes; it must not normally exist in commercial alcohol, and its presence in the alcohol must be easily ascertained.

Another prize of 50,000 francs is offered for the invention of a method of using alcohol for lighting purposes, the same as kerosene is now used.

LEGISLATIVE and LEGAL

The New York Automobile Bills.

ALBANY, N. Y.—Automobilists gained a double victory March 22 when the Cox bill was passed and the Lee bill was recommitted for a hearing. The Cox bill, which now goes to the Governor, enables motorists arrested for violating the speed laws to leave a surety company bond instead of their machines as guarantee for their appearance in court. The Lee bill, which is especially objected to by automobilists, would compel the driver of a motor vehicle, under severe penalties, to slacken speed to 6 miles per hour within 20 rods of a frightened horse, and, if the driver of the horse so signified, to stop within 10 rods.

The L'Hommedieu motor bill, which originally imposed a tax of 50 cents for every 500 pounds on all motor vehicles, except business trucks and motors exclusively for city use, has been reported by the Senate taxation committee with an amendment doubling the tax rate, and with the understanding that it should be recommitted for a hearing this week Thursday, if desired.

The Assembly Ways and Means Committee will give a hearing this week Wednesday on the Stanley bill, which seeks to establish a State commission for the purpose of examining and licensing would-be motorists.

Controversy Over Oiling City Streets.

CINCINNATI.—The validity of the Paxton bill, passed only about a month ago by the Ohio Legislature at the instance of automobilists, and which gives city councils the right to make contracts for sprinkling streets with oil, has already been questioned by men in Cincinnati engaged in the business of sprinkling with water. The council was about to make five year contracts for oiling certain streets when attorneys for the water men objected, saying that the United States Court in Missouri had held that oiling streets was not an improvement, therefore no part of the cost could be assessed against abutting property. The council deferred action, and referred the matter to the city solicitor for an opinion.

The Quebec Law.

QUEBEC, Canada.—The automobile bill which has been adopted by the provincial legislature provides for the registration of automobiles with the provincial treasurer; that non-resident owners shall furnish a bond to the provincial treasurer for $100 as security for any damage which may be caused by him in operating a machine within the Province of Quebec. The provincial treasurer, however, may make discretionary exceptions to this provision.

Officials Disagree.

LOS ANGELES, Cal.—District Attorney Lyman Evans of Riverside County has handed down an opinion to W. F. Montague, county assessor, in which he says that personal property of tourists is exempt from taxation, and cites law to that effect. When City Assessor Lewis of Los Angeles was shown this opinion he said: "That fellow doesn't know what he is talking about; the law is as plain as can be, and we are obeying it. We have an opinion handed down from the attorney general of the State in a case similar to the automobile tax, and we shall continue to assess and collect wherever we find the machines."

Agent Asks for Injunction.

OMAHA, Neb.—H. E. Fredrickson has asked Judge Troup for an injunction restraining the Powell-Bacon Company from receiving or buying cars from the Cadillac Company, or entering into a contract with the Cadillac Company for an agency. Mr. Fredrickson alleges that he had the Cadillac agency last year, and that under the contract the company agreed not to sell cars to anyone else in this territory. A car was sold to G. A. Joslyn by the company at Detroit, and Mr. Fredrickson asked his commission, amounting to several hundred dollars.

He alleged that in the meantime the Cadillac Company had agreed to give him the same territory for 1906, and addressed him as their agent until several days ago, when a letter was received saying that unless Mr. Fredrickson would release all claim for commission on the car sold, they would not give him the agency this year. He further sets up that if the Powell-Bacon Company gets the agency of the company for this year they will receive the benefit of his advertising without a dollar of expense, while he will be left without a car to sell, all agencies having been closed.

Preliminary Injunction Denied.

NEW YORK.—The Hartford Suspension Company recently sued Hollander & Tangemann, of New York, for using and selling the Diezemann Shock Absorber, an appliance for automobiles to absorb shock and vibration, and which is manufactured by the Diezemann Shock Absorber Company, Hoboken, N. J.

Pending trial the Hartford Suspension Company applied for a preliminary injunction, which was argued before Judge Lacombe, of the Circuit Court of the southern district of New York. In his opinion denying the motion Judge Lacombe says:

"Upon the argument the suggestion as to trademark and unfair competition was not pressed. There is left only an application for injunction upon an unadjudicated patent of recent issue, where there is a substantial conflict as to the prior art. These questions should be left for final hearing."

Another Jersey Bill.

TRENTON, N. J.—Assemblyman Wright, of Passaic, has introduced a bill making it a misdemeanor for any driver on the public road not to slow down when requested to do so by a person coming the opposite direction who shall signify his desire with the up-lifted hand. It is also a misdemeanor to drive any vehicle at a speed exceeding 30 miles, or for any driver to take out or use any vehicle without the consent of the owner, or to display any false numbers or marks. The penalty for violation of these regulations is $500 fine or sixty days in jail, or both.

"Auto Bumpers" at Middletown, Conn.

MIDDLETOWN, Conn.—Mayor Willard C. Fisher, late professor of economics at Wesleyan University, proposes to erect a series of "auto bumpers" along the principal streets leading into this city, which will throw motor car drivers from their machines if they strike them at too fast a gait. Where the road approaches the Connecticut River there is a sloping incline where, if the automobiles do not go slowly, they will be shunted off into deep water.

RICHMOND, Va.—The Byrd automobile bill has been passed by the Senate.

ANNAPOLIS, Md.—The Legislative Committee appointed to frame an automobile bill has reported a measure fixing the license fee at $3, and making the speed limit 12 miles an hour.

SCRANTON, Pa.—Frank H. Thomas, of this city, has brought suit for $1,000 damages against Frank B. Miller, because his sorrel mare died from fright, as he alleges, at the sight of an automobile.

TRENTON, N. J.—New Jersey automobilists are making a strong effort to have many of the objectionable features of the Frelinghuysen bill, which has already passed the Senate, eliminated or the bill killed entirely when it comes before the House.

CHICAGO.—Chas. A. Cody, automobile manufacturer and member of the Chicago A. C., was arrested last week for not having a license tag and numbers on his machine. Anton Marz, a chauffeur, was arrested because he had only a small paper tag on his machine.

WASHINGTON, D. C.—Senator Gallinger, chairman of the committee of the District of Columbia, will give a hearing this week on the Sims automobile bill, which has passed the House. It is hoped that many of the objectionable features may be eliminated in the Senate.

NEW YORK.—A petition in bankruptcy has been filed against the National Automobile Company, which has offices in the Times Building, and garages at 205 East Eighty-sixth street and 517 East Seventy-third street. The company was incorporated in New Jersey, with $250,000 capital stock. A statement on June 30, 1905, showed $27,000 assets, and $7,000 liabilities.

COMMERCIAL APPLICATIONS

Motor Trucks at Minneapolis and St. Paul.

Considerable interest is being shown in the motor truck in Minneapolis and St. Paul. In the former city this business is handled principally by the Pence Automobile Company, and in St. Paul by the Joy Automobile Company. Thiem & Co., Columbia Heights, are building a one ton truck propelled by a four cylinder air cooled motor and equipped with sliding gear transmission. They expect to have it completed in sixty to ninety days. The Diamond Iron Works, Minneapolis, have built a gaso-electric 5 ton truck for their own use. The Leslie Paper Company, Minneapolis, are to give a Kansas City motor truck a trial soon, and if found satisfactory will purchase one.

J. H. Allen & Co., wholesale grocers, St. Paul, are trying out a Four Wheel Drive truck. The Griggs Crosby Company, wholesale grocers, St. Paul, have had an electric truck service for some time.

There is unquestionably a big field for motor trucks in all the large Western jobbing centres.

Commercial Vehicle Notes.

The Oakland, Cal., police department will shortly own a motor ambulance.

The Z. C. M. I. delivery business, Salt Lake City, have purchased trucks for baggage hauling.

Several California real estate dealers are showing prospective buyers over their lands in automobiles.

The Military Academy at West Point will have an automobile ambulance in the near future.

It is reported that C. A. Strelinger, of Detroit, will start a motor truck manufacturing business.

The Sterling Engine Company, Buffalo, N. Y., is experimenting in the construction of a commercial motor truck.

W. A. Case & Sons Manufacturing Company, Buffalo, N. Y., are perfecting a three cylinder commercial motor truck.

An automobile stage line is planned from Sheridan to Tillamook, Ore.; also from Grant's Pass to Crescent City, Ore.

Antonio Martinez operates an automobile stage line between Santa Ana and Llanos de Oro., Ariz., a distance of 45 miles.

The Auto Rapid Transit Company, of La Crosse, Wis., may enter into competition with the local street railway company.

R. L. Douglass and E. J. Williams are operating automobile stage lines between Carson City, Nev., and neighboring mining camps.

The Central Oregon Transportation Company will operate an automobile stage service between Bolter's Ranch and Redmond, Ore., the headquarters of the Deschutes Irrigation and Power Company, by the middle of April.

Postmaster Drynan, of Redding, Cal., is planning to establish an automobile mail and passenger service betwen Redding and Weaverville.

Adams D. Claflin, Newton Centre, Mass., president of the Newton Street Railway System, will inspect the various lines in a Thomas car.

Herrick & Bromley, of Binghamton, N. Y., are planning for an automobile excursion line to Broome County lakes and summer resorts.

Charles Howland, Monterey, Cal., who carries the mails between that town and Jamesburg, intends to put in commission a ten passenger automobile April 1.

Schenectady people are asking for automobile stage lines between the centre of the city and the new temporary New York Central Railroad station on Green street.

F. J. Thomas, of Rochester, N. Y., has established an automobile excursion line from the Palace Hotel, San Francisco, through Golden Gate Park and the Presidio.

Tourists will view the beauties of the Yosemite Valley in autos the coming season, owing to the non-completion of the Sierra Railway Company's line from Jamestown.

The Springfield-Hampden Motor Vehicle Company, Springfield, Mass., has petitioned the city council for permission to operate an automobile stage line in that city and suburbs.

The Toledo Auto Touring Company, Toledo, Ohio, has incorporated for the purpose of operating public conveyances to and from the park and summer resorts in and about the city.

A. D. Renfro, who owns several automobile stage lines in Nevada, has ordered a 20 horse power Stevens-Duryea touring car, to be used between Tonopah and Manhattan, mining towns.

The Nielsen Motor Car Company, Detroit, will manufacture trucks and delivery wagons. They will have temporary quarters at Woodbridge and Randolph streets until a factory is erected.

Alexander S. Gardiner, of Huntington, L. I., one of the largest farmers on Long Island, has found an automobile a great convenience for gathering his cows together, and driving them to the cow barns.

John H. Hemingway, superintendent of parks, Worcester, Mass., and his men will hereafter travel in an automobile. They have a convertible car that can be used as a two seater or one seat taken out to make a place for tools.

The incorporators of the new Philadelphia and Chester Coach Company, which will operate an automobile stage line, are J. Frank Black, president of the Chester National Bank; George T. Hetzel and George W. Atherholt.

L. M. Hart, of Boston, has ordered a Thomas car to be built specially for use in Mexico in transporting bullion from his gold mine to the railroad. It is to be steel armored and equipped with Gatling guns for fighting the Yaqui Indians.

Wm. H. Perry, of Dawson, Alaska, has purchased a 24 horse power Knox machine for the purpose of operating an automobile stage line from Dawson to Dominion Creek, a distance of 34 miles. He says he can make the trip in a day, and that the road is excellent.

The city of Cleveland has purchased two Reo runabouts and a Studebaker electric runabout. One of the Reo cars will be used by the superintendent of street cleaning; the other by the superintendent of streets. The electric will be at the disposal of sidewalk inspectors, and at times may be in general service.

Because the Southern Pacific Railroad Company have refused to give San Fernando, Cal., adequate depot accommodations, the people of that town are boycotting the railroad, and are patronizing an automobile stage line which takes them to Glendale, where they connect with the Pacific electric lines to Los Angeles. A freight truck will be added.

The Rapid Motor Vehicle Company, Pontiac, Mich., have just completed one of their new twenty passenger trucks, which will be shipped East. We are informed that with a load of 2,900 pounds of iron engine pulleys and six men, the machine went up hill and over deep rutted roads on the high speed with no apparent effort. The car is rated at a ton and a half capacity, and is designed for passengers. It will be equipped with five side seats, each accommodating four passengers. The engine is 22-24 horse power.

Patents Issued February 27, 1906.

813,397. Spring Wheel for Vehicles.—José G. Babio, Brooklyn, N. Y. Filed June 10, 1905.

813,460. Metal Vehicle Body.—Hinsdale Smith and Arthur P. Smith, Springfield, Mass. Filed May 22, 1905.

813,462. Turntable for Automobiles.—Henry R. Stickney, Portland, Me. Filed December 28, 1905.

813,477. Vehicle Wheel Tire.—Charles C. Worthington, Dunnfield, N. J. Filed August 11, 1904.

813,529. Tire.—Russell G. Smith, Buffalo, N. Y. Filed January 14, 1905.

813,541. Automobile.—Frank M. Blair, Toledo, Ohio. Filed July 15, 1905.

813,623. Roundabout.—Edwin Donaldson, New York, N. Y. Filed March 9, 1905.

813,653. Carburetor.—Fred A. Law, Hartford, Conn. Filed April 10, 1905.

813,676. Vehicle Tire.—George M. Stadelman, Akron, Ohio. Filed April 26, 1904.

813,678. Vehicle Spring.—John W. Sutton, Collinsville, Ind. Ter. Filed January 21, 1905.

813,681. Combined Tachometer and Cyclometer.—Charles H. Warner, Beloit, Wis. Filed September 6, 1904.

813,683. Carburetor.—Earl E. Adams, Battle Creek, Mich. Filed April 10, 1905.

813,684. Motor Car for Preventing Side Slip.—Thomas G. Allen, London, England. Filed January 6, 1905.

813,900. Protecting Device for Pneumatic Tires.—Emile Lapisse, Elbœuf, France. Filed September 2, 1905.

813,905. Automobile Wheel Bearing.—Charles S. Lockwood, Newark, N. J. Filed May 6, 1903. Renewed August 1, 1905.

MINOR MENTION

An automobile club has been organized at San José, Cal.

Sioux City, Ia., automobilists are planning to organize a club.

Baltimore's first automobile show will be held March 31 to April 7.

An automobile show will be held at Omaha, Neb., April 4 to 7.

The annual automobile show at Denver, Col., will be held April 18 to 21.

Work has been started at the Muskegon, Mich., plant of the Continental Motor Company.

The Chicago Automobile Club Auxiliary Association will be incorporated, with $125,000 capital, to provide for the erection of the new clubhouse.

It is reported that the Southwest Automobile Company, of Joplin, Mo., will incorporate, with a capital of $50,000, for the manufacture of automobiles and motor cycles.

The Professional Chauffeurs' Club of New York are planning to organize their own insurance company, as they are not considered good risks by most insurance companies.

The Rev. John Roach Straton, pastor of the Second Baptist Church, Chicago, is now paying his pastoral calls in an automobile which was presented to him by his congregation on his birthday.

The Chicago Automobile Dealers' Association have elected the following officers: President, Ralph Temple; vice president, Orlando F. Weber; secretary, James Levy; directors, the officers and H. Paulman, W. L. Githens and Fred Pardee.

The Locomobile Company of America are erecting a new brick building 47x200 feet at their plant, Bridgeport, Conn., to relieve overcrowded conditions. They are also doubling their facilities for the tempering and heat treatment of steels.

E. M. Barnes, of Cleveland, formerly identified with the Wayne automobile works at Detroit, is reported to have bought the plant of the National Valve Company at Sandusky, Ohio, where he will manufacture parts for automobile and launch engines.

The Albany Automobile Club has elected the following officers: President, W. E. Millbank; vice president, J. B. Taylor; secretary, C. M. Page; treasurer, O. A. Quale; directors, the officers and John Newell. The erection of a new clubhouse at an early date is planned.

The Lancaster (Pa.) Automobile Club has elected the following officers: President, Dr. S. T. Davis; vice president, Philip H. Schaum; secretary, Jacob D. Rider; treasurer, Dr. Parke P. Breneman; board of directors, the officers and H. M. Hillegas, Dr. H. B. Roop and Martin Kinports. The club will be affiliated with the Pennsylvania Motor Federation.

An automobile club has been organized at Hackensack, N. J.

An automobile show was held at Hartford, Conn., last week.

It is reported that an automobile factory is to be located at Holly, Mich.

The G & J Tire Company have moved their Cleveland store to 1837 Euclid avenue.

The Motor Car Supply Company, Cleveland, Ohio, have moved to 1613 Euclid avenue.

The plant of the Auto Brass and Aluminum Company, of Flint, Mich., was sold to T. J. O'Hara, of Detroit, March 17.

The Detroit branch of the Goodrich Rubber Company is to occupy a new building at Brush and Jefferson avenues.

Wehrfritz & Quallo, 150 Mulberry street, Newark, N. J., have started the manufacture of automobile trimmings, tops, cushions and storm covers.

A State highway from Philadelphia to Pittsburg, 284 miles, is one of the good roads plans in Pennsylvania. It would cost $2,500,000.

The New York Motor Club will hold its second Orphans' Day celebration June 6. Its second National Economy test will be held the week of June 18.

J. M. Gardiner, of Chatham, Ont., and Wm. Milner, of Petrolea, are planning to establish an automobile factory at Chatham.

The Association Patents Company has secured control of the five Dyer patents. We will publish an article on the importance of these patents and possible anticipations in our next week's issue.

The New York Good Roads Convention met at Hornellsville, N. Y., March 21 and 22. Addresses were delivered by State Engineer Frank D. Lyon, Senator Horatio S. Earl, of Michigan; State Highway Commissioner James H. Macdonald, of Connecticut, and Ziba L. Squires, of Jamestown, N. Y.

The coroner's inquest to determine the facts in regard to the death of Mrs. Robert Craig, who was killed in an automobile accident in the Bronx, New York city, on March 9, was adjourned from March 21 to April 3. The hearing will be held at the coroner's office, Third avenue and 177th street, the Bronx.

The incorporators of the new Monarch Motor Car Company, of Chicago, were all associated with the bankrupt Monarch Automobile Company of North Aurora, Ill., with the exception of T. A. Quinlan of Chicago. The factory will be located at Chicago, and an 18 horse power four cylinder runabout to sell at $500 will be manufactured.

Fred H. Bogart, mechanical engineer of the Corbin Motor Vehicle Corporation, New Britain, Conn., will terminate his active connection with the company April 1. He will be retained by the Corbin Company in an advisory capacity, but he will be the head of a company for the manufacture of automobile parts which is being organized at Hartford.

An automobile show was held at Providence, R. I., March 19 to 24.

H. J. Horn has been appointed sales agent for the Wayne touring cars.

The second annual County Good Roads Convention will be held at Buffalo, N. Y., April 11.

The International A. & V. Tire Company are to open an agency at 214 Jefferson avenue, Detroit.

The Ritter Manufacturing Company, of Detroit, Mich., have moved to the Maxwell-Briscoe-McLeod salesrooms.

The Economy Auto and Electric Repair Company, Detroit, have opened their new store on Hastings and Larned streets.

S. L. Depew has sold his interest in the Detroit Auto Supply Company to Stanley Brooks, who has been elected vice president.

George K. Barton has taken the position of general salesman for the Dan B. Southard Company, 1409 Michigan avenue, Chicago.

The W. K. Prudden Company, Lansing, Mich., have moved into their new factory, which has a capacity of 400 automobile wheels per day.

Walter Wellman told of his plans for reaching the North Pole in an air ship at the smoker of the New York Motor Club last Friday evening.

The Mitchell Commercial Vehicle Company have moved to 121 West Thirty-first street, New York, where the Mitchell touring cars, as well as the trucks and delivery wagons, will be handled.

We learn that a Pope-Hartford car won a 3 mile handicap race in Australia and captured the J. R. Crooke cup, valued at $500. This was the first appearance of a Pope car on an Australian track.

The Milwaukee Trust Company, Milwaukee, Wis., has been appointed receiver of the Milwaukee Rubber Works Company, and business will be continued without interruption. The indebtedness of the company is regarded as trifling.

The site for the new Garford automobile factory at Elyria, Ohio, has been selected, and the main building will be 600x45 feet in size, besides several wings and smaller buildings, all of steel concrete construction. The total plant investment will be nearly $700,000. The city council is considering whether it has a right to grant the company permission for violation of the speed ordinance in testing their autos on a half mile of macadam road which the company wishes to lay.

The danger attending the operation of automobile engines indoors was evidenced recently at the garage of the Michigan Automobile Company, Grand Rapids, Mich., when George Woodland and three other employees were overcome by the fumes of the exhaust while testing an engine. The engine had been running for some time when suddenly Woodland fell over unconscious, and the three others were more or

less affected. Woodland was removed to a local hospital, where he remained in a serious condition for some time. The others suffered no serious ill effects.

The C. H. Blomstrom Motor Company, of Detroit, has filed notice of an increase of its capital stock from $100,000 to $200,000.

Garage Notes.

Elmer Wightman will open a garage at Tulare, Cal.

E. A. Cuddeback is erecting a garage at Fremont, Neb.

Brock's Garage, Cleveland, Ohio, is being enlargerd.

J. H. Vendig will open a large garage at Sea Gate, L. I., May 1.

Browne & Wright are a new automobile firm at St. Johnsbury, Vt.

Theo. R. Helb, Hornellsville, N. Y., will erect a garage this spring.

Lisk & Petry, Hudson, N. Y., are erecting a garage 40x60 feet in size.

Harry Groves, of Sioux City, Ia., is planning a garage in Mason City, Ia.

George E. Keith will build a new garage in the Campello district of Brockton, Mass.

The Davenport (Ia.) Automobile Company are building an addition to their garage.

M. Young, Riverside, Cal., is building a garage on Orange street. He will handle the Ford cars.

The Holyoke (Mass.) Automobile Company are increasing the floor space in their garage 75 per cent.

The Douglas Andrews Company, of New York, are to open a garage at Pittsfield, Mass., about April 15.

Fred King and Fred Piatt have formed a partnership to build a garage at Cooperstown, N. Dak., this spring.

John Burdick, 35 First street, Troy, N. Y., has opened a garage where he will handle the National and Walker cars.

The Welch-Esterberg Company, Milwaukee, will occupy a new four story building at Seventh street and Grand avenue.

Floyd Cook, Portland, Ore., is building an $8,000 garage at Fifteenth and Burnside streets. It will be completed by May 1.

R. A. De Forest and D. F. Poyer are to open a garage at Escanaba, Mich., where they will handle the Cadillac, Packard, Buick and White cars.

The H. D. Stebbs Automobile Company, Chattanooga, Tenn., have opened a garage at 725 Cherry street. They will handle the Rambler and Reo cars.

The Standard Automobile Company, Utica, N. Y., have opened their new garage, where they will handle the Stoddard-Dayton, National and Reo cars.

Benjamin L. Jones will have charge of the automobile business of Shinholser & Co., Macon, Ga. They handle the Franklin, Mitchell, Cadillac and Pope-Waverley cars.

The Berks Motor Car Company, Reading, Pa., of which C. A. Kohl is the principal owner, will open a garage at 379 Schuylkill avenue April 1. They will handle the Maxwell-Briscoe cars.

T. S. Morse is making extensive alterations in his garage at Lenox, Mass.

The Minneapolis Auto Company have opened a garage at 9011 Nicollet avenue, where they will handle the Auburn cars.

The Greenfield (Mass.) Automobile Company will open their garage on Federal street about April 1. They will handle the Rambler and Ford cars.

The H. A. Connors Company, Philadelphia, are fitting up a garage at Broad and Vine streets, where they will handle the Darracq, Rochet and Schneider cars.

The Mercedes Import Company of New York have opened a branch at 153 North Broad street, Philadelphia. H. B. Stillman, formerly with the Quaker City Automobile Company, has been appointed manager.

The Hampden Automobile Company, Westfield, Mass., operating garages at Westfield and Springfield, have elected Robert A. McKee president, and George W. Cook, of Springfield, treasurer and clerk. The company will hereafter be managed from the Springfield office. Three thousand dollars has been added to the capital paid in.

New Incorporations.

Independent Machinery Oil Company, Buffalo.—Capital, $10,000. Directors, O. F. Ryan, J. J. Walsh and J. J. Sullivan, Buffalo.

The Goodyear Rubber Tire Company of New York.—Capital, $1,000. Directors, K. B. Harwood, L. L. Lewis and P. W. Williamson, New York.

Milwaukee Auto Transit Company, Milwaukee.—Capital stock, $15,000. Incorporators, William C. Sieler, Kenneth E. Higby and Ernst von Briesen.

The Chemical Auto Company, Cleveland, Ohio.—Capital, $25,000. Incorporators, D. W. Marpass, E. G. Whitten, A. F. Neitt, J. M. Gee and Elijah Bates.

Automobile Exchange, Chicago.—Capital, $2,500. Manufacturing automobiles and accessories. Incorporators, Frank Schoenfeld, Milton L. Thackberry and Emil F. Link.

Lumex Anti-Vibrating System, Millbrook, N. Y.—To manufacture machinery and motors. Capital, $200,000. Directors, Harry Harris, J. J. Barber and S. F. Fromm, New York.

Argus Import Motor Company of New York, Memphis, Tenn.—Capital, $500. Directors, E. A. Waechter, Hamburg, Germany; W. P. Homan and E. M. James, New York.

The White Motor Company, Camden, N. J.—To manufacture and deal in automobiles. Capital, $150,000. Incorporators, James A. White, Charles F. Woodhull and Charles S. King.

The St. Louis Burghardt-Mills Company, Incorporated, New York.—To deal in automobiles. Capital, $25,000. Directors, Louis Burghardt, S. B. Mills, Jr., and F. J. Griffin, of New York.

The Toledo Auto Touring Car Company, Toledo, Ohio.—Capital, $15,000. Incorporators, Frank J. Van Loo, James Sheehan, U. G. Denman, Carl A. Hudson and Louis E. Krieger.

Webster Manufacturing Company, Detroit, Mich.—Capital, $25,000 ($11,500 paid in patent rights). An association for the manufacture of indicators for tanks and automobile equipment.

Automatic Air Motor Company of Guthrie, Okla., and Northeast, Pa.—Capital stock, $2,000,000. Incorporators, John J. Loomis, of Northeast, and Charles A. Bush and H. W. Pentecost, of Guthrie.

Rhode Island Machine Company, Providence, R. I.—Capital, $20,000. To make automobiles, engines, gears, parts, etc. Incorporators, Walter M. Jordan, Edwin G. Pinkam and Clayton Harris, of Providence.

Wayne Automobile Company of New England, Boston.—To deal in automobiles. Capital, $3,000. President and treasurer, John H. McCarthy, Hotel Lenox, Boston; secretary, George C. Lewis, 509 Tremont street, Boston.

Cooney Carriage Company, Toledo, Ohio.—Capital, $10,000. To make automobiles. Incorporators, John McGettigan, James J. Cooney, Charles R. Bowman, Josephine S. Lindsay, John V. Todd and Fred E. Bullard, of Toledo.

New Agencies.

Detroit, Mich.—H. J. Horn, Wayne cars.

Auburn, Ind.—George Shugers, Maxwell cars.

Detroit, Mich.—J. P. Schneider, Franklin cars.

Rockford, Ill.—George O. Forbes, Pope-Toledo cars.

Nashville, Tenn.—Dr. J. P. Miller, Maxwell cars.

Cumberland, Md.—Benjamin H. Biayas, Maxwell cars.

Toledo, Ohio.—Atwood Automobile Company, Franklin cars.

Lowell, Mass.—Middle Street Auto Company, Corwin cars.

Rockford, Ill.—E. L. & A. M. Burr, Orient cars (Winnebago County).

Toledo, Ohio.—Toledo Motor Boat and Power Company, Maxwell cars.

Grand Rapids, Mich.—Richmond-Jarvis-Vandecar Company, Maxwell cars.

Portland, Me.—Gilson Company, automobile tops of Springfield Metal Body Company.

Rockford, Ill.—E. K. Barnes, Pope-Waverley cars (Winnebago and Boone counties).

Fond du Lac, Wis.—The G. W. Worthing Automobile Company, Pope-Waverley cars.

Springfield, Mass. (for Western Massachusets).—Norcross-Cameron Company, Corbin cars.

Worcester, Mass.—Reo Motor Car Company, 160 Main street, Herbert F. Clark, manager.

East Orange, N. J.—The North Jersey Motor Car Company, Cleveland and Baker electric cars.

Newark, N. J.—Roseville Motor Company, Pope-Hartford, Tribune and Waverley cars (for Essex County).

Rockford, Ill.—A. E. Cutler Company, Stoddard-Dayton and Maxwell cars (Winnebago, Boone and Stevenson counties).

Cleveland, Ohio.—Commercial Motor Car Company, 444 Prospect street.—Logan touring cars, runabouts and delivery wagons.

Trade Literature Received.

Louis S. Ross, Newtonville, Mass.—Catalogue describing Ross steam car.

The Garvin Machine Company, New York City.—Booklet of the Garvin machines.

Four-Wheel Drive Wagon Company, Milwaukee, Wis.—Card describing the Four Drive motor truck.

B. S. Clark & Co., Providence, R. I.—"1906 Who Is Who," automobile directory of Rhode Island.

H. H. Franklin Manufacturing Company, Syracuse, N. Y.—Folder describing Type D four cylinder Franklin touring car.

Studebaker Automobile Company, South Bend, Ind.—Circular describing Model F 28-32 horse power, four cylinder gasoline touring car.

The Veeder Manufacturing Company, Hartford, Conn.—Card advertising Veeder odometer for commercial trucks.

Brown & Sharpe Manufacturing Company, Providence, R. I.—1906 catalogue of machinery and tools, 514 pages, sent free on application.

Knight & Kilbourne, 19 Huron Street, Chicago, Ill.—Booklet entitled "A Few Facts Concerning the Silent Knight Valveless Four Cycle Motor Car."

...THE...

Horseless Age

VOLUME 17 APRIL 4, 1906 NUMBER 14

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Compare the $2,500 Winton Model K with any car on the market selling at $3,500 or higher

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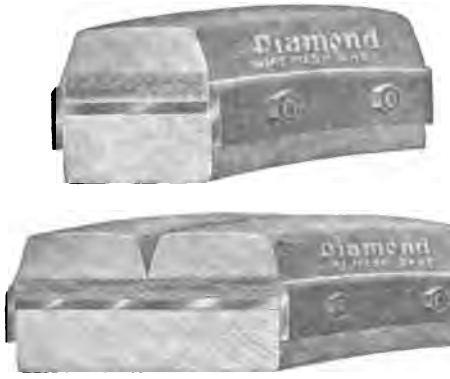
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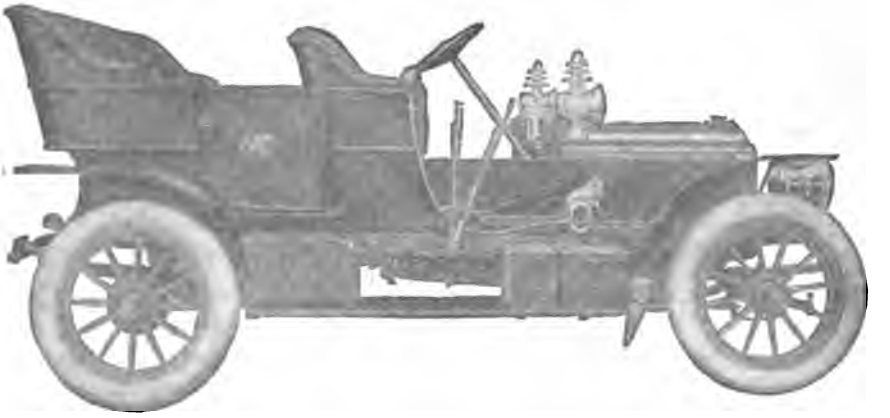
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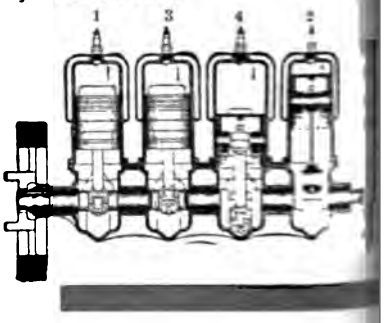
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Spring Overhauling.

By Albert L. Clough.

Every motor car claims as its due an annual general overhauling, and March or April is the most appropriate season in which to perform this, as the condition of the roads during these months is usually most unfavorable. Owing to the very mild winter which many parts of the United States have been enjoying, a great many cars have been kept in commission all through the winter months, and thus especially deserve to be thoroughly "gone over." The overhauling process is essentially an inspection, a general cleaning out, tightening up and readjusting process, and involves, perhaps, some minor replacements as well.

SCREWS AND NUTS.

About the first thing to do is to look to the tightness of every bolt, cap screw, stud and other holding device on the chassis. This requires the car to be run over a pit and plenty of light from an incandescent lamp carried upon a flexible cord. No mattery how conscientiously a car is washed while in service, the inside of the frame and many attached parts will probably be found encrusted with mud, almost concealing some of the nuts. Everything should be scraped clean, in order to make possible a rigid inspection. If any nuts, check nuts or cotters are missing, they should be at once replaced. The attachments of the gear case and engine base to the frame should be most carefully tightened, if found to require it, and the fastenings of brake, clutch and gear operating devices to the chassis, as well as those of the pump and other auxiliaries, should be seen to be secure. Special attention should be paid to spring clip nuts, as any looseness there will lead almost certainly to broken spring leaves, and the integrity of spring hanger fastenings requires investigation. The nuts that secure the body to the frame and those which hold the running board and mud guards should be set up to perfect tightness. Aside from loose nuts, one should be on the watch for loose rivets or other defects in the frame.

Sometimes, through successive adjustments for wear in chains, rear springs are forced out of their regular shape and position and "cocked up" so as not to act properly. In such instances the chain should be renewed and the springs set in the correct position by adjustment of the distance rods.

Spring leaves should be inspected for breaks, and the ends of the leaves may be slightly sprung apart and a little vaseline inserted between them in order to obviate squeaking.

STEERING GEAR.

If there is any one part of the overhauling of a car which should be done more thoroughly than others it is that of the steering gear. The fastenings of the foot of the steering column to the frame should be demonstrated to be tight, and if the irreversible device is found to operate with lost motion, this backlash should be taken up. This can generally be done with modern steering devices. Those of the screw and nut type sometimes employ a split nut, the halves of which after wear can be adjusted tighter around the screw, and those of the worm and sector type often have provisions for adjusting the sector closer to the worm as the tooth surfaces wear. The steering device should, of course, be freshly packed with grease. Every joint in the steering linkage should be inspected with the utmost care, because its condition is actually a life and death matter. Where ball joints are used, there is almost always provision for taking up wear by adjusting more closely the cap of the joint, which should be fastened with great care. Where joints are made by plain cylindrical pins no adjustment for wear is possible, and new ones have to be supplied, the holes in the ends of the linkage being reamed out to a good fit with them. Taper pins are occasionally used, and they afford some adjustment for wear. All nuts responsible for holding the linkage together should be locked in place in the most secure manner. The castellated nut with cotter pin is, on the whole, the best safety locking device. If not already provided, it will be well to supply each joint of the steering linkage with one of the small leather grease bags which buckle about the rods and protect the joint from dust, as well as constantly providing it with non-fluid lubricant, with which the bag is filled. When the front wheels of the car are jacked up the steering gear should turn with perfect freedom, and care should be taken that both wheels are adjusted perfectly parallel in the line of the car length when the steering wheel is set for straight ahead, otherwise the tires will suffer undue wear. The pivot pins upon which the steering knuckles turn should be demonstrated to be secure. When the front wheels are jacked up it will be well to notice whether their bearings are in correct adjustment. There should be only a very slight amount of play allowed, and nothing like a perceptible wobble permitted.

AXLE BEARINGS.

Ball and roller front wheel bearings should be washed out with gasoline, broken balls or rollers should be looked for and the bearings packed with grease and readjusted. Perfect freedom of rotation without "wobbling" shows a proper adjustment. Great care should be taken that the wheels are secure from any possibility of working off the axles.

In order to overhaul the live rear axle of a chain driven car, the chain should be taken off and the car be lifted clear by jacks under the axle spring clips. The axle should spin freely when one of the wheels is given a turn, and there should be no grinding or crunching sounds proceeding from the differential. Only a slight amount of end play should be observed when either wheel is alternately pushed toward and pulled away from the car body, and only the slightest amount of lateral play should be found when either wheel is lifted by hand. The axle should spin silently without any grinding or grating sounds. The wheels themselves must be seen to be most securely fastened in place. If the above tests result satisfactorily, it will only be necessary to pack the differential case with grease, to which has been added a little heavy cylinder oil, and to see that the nuts about the differential frame and truss rod are all tight. If, on the other hand, the wheels show too much play, or there is a grinding sound when the axle is rotated, it will probably have to be dissembled for the readjustment of the bearings, or the possible replacement of one or more of them, in case damage has been incurred. At the same time, the differential can be thoroughly inspected.

WORN SPROCKETS.

If the teeth of the rear sprocket show a very considerably different outline upon their opposite faces and are tending to become "circular saw like" in shape, it is time for a replacement. Once in a while a sprocket is found so arranged that it may be reversed—that is, the tooth faces which have heretofore been idle except upon the reverse, and are therefore but slightly worn —can be made the driving faces, and the life of the sprocket prolonged.

WEAR IN CHAINS.

To determine whether a chain is seriously worn it should be stretched out tight on a smooth floor, and then its ends should be pushed toward one another (without buckling it out of a straight line). The difference in its length when tightly stretched out and when its ends are forcibly pushed together is the sum total of the wear of the rivets. If this amounts to 2 inches or more in a chain of usual length, it may well be retired, although, of course, it will still give considerable service. It is rather bad practice to put a new chain on badly worn sprockets or a badly stretched chain upon new sprockets. Occasionally most of the stretch in a chain will be found localized at a few badly hardened links, and the replacement of these will obviate the necessity of discarding the whole. In replacing a chain the security of the master link fastenings is of great importance, and the utmost care should be taken that the rear axle is so adjusted by the strut rods that it shall be in perfect parallelism with the front axle, thus avoiding chain misalignment and excessive tire wear.

Distance rods which have worn their supports upon the rear axle and the frame are responsible for much rattling when a car is in use. Rather than endure the noise, one may be led to make new pins, properly fitted, to hold the rods in front and rear.

REAR AXLE ADJUSTMENT.

If the car to be overhauled has a shaft driven rear axle, the change gear should be placed in the neutral position, with the rear wheels jacked up, and the same tests as to end and side play and smoothness of operation should be made. The propeller shaft should also be tried for undue side and end

play. The axle should spin freely when one wheel is turned by hand, and if there is the slightest grind or bind in any part of the rotation, the cause should be sought and remedied. With one rear wheel on the ground, the other, when turned, should spin freely, carrying the drive shaft with it. Defects in an axle of this kind, unless some breakage of gears or bearings has occurred, are usually corrected by adjustment, and even adjustment is but very seldom required on recently designed axles. The driving gear case should, of course, be packed with lubricant and the grease cups over the bearings fully supplied. All nuts holding the halves of the axle and gear housing together and those securing inspection plates should be set up.

BRAKE ADJUSTMENT.

The brakes demand most careful scrutiny, as they are safety devices. When the rear axle is jacked up, it is well to be sure that when they are fully released they do not bind upon their drums, and when fully set they absolutely lock the drum against all attempts to turn the wheel by hand. There is only one safe way, however, in which to test brakes, and that is to drive the car part way up a short steep hill, stop it upon the steepest portion and see whether the brakes hold as they should. The inspection in the stable can assure one that the brake operating linkages are securely fastened together, and work freely, and that brake shoes or bands and their operating toggles or cams are not worn or insecure in any way.

FAULTY COMPRESSION.

After the running gear and its attachments are all secure and in proper adjustment, the power plant demands attention. After a season's use the engine will be none the worse for a thorough overhauling. Quite likely one or more cylinders will not show their usual compression. The motor should be cranked over and the cylinders which leak compression determined. It will then be well to gradually introduce, through the pet cocks or spark plug holes, a liberal quantity of kerosene, allowing the crank case to fill with it to such a height as to give a splash when the engine is turned over. The engine should be cranked briskly quite a number of times and kerosene injected once in a while. This treatment may be applied, from time to time, for a day or two, in order that carbon deposits may be softened and gummed oil removed. In order, however, to thoroughly remove carbon deposits from the piston heads they should be removed and gone over with a scraper. The kerosene treatment sometimes improves the compression, freeing the rings of carbonized oil which prevented them from springing out.

VALVE GRINDING.

Unless it has been done recently, all valves on cylinders which show any leakage of compression should be reground. In engines which have their valve seats integral with the cylinder casting the utmost care must be taken that not the slightest particle of the abrasive mixture of fine emery and machine oil gets into the passages and cylinder, as irreparable injury would be done to cylinder bores and pistons. Waste may be stuffed into the space around the valve before the grinding operation to catch the excess of abrasive, and all remaining particles should be carefully wiped off. Valves in removable cages are most conveniently ground.

The most common mistake in grinding valves is in the use of too great pressure in an attempt to hasten the operation. Light pressure, a frequent application of the abrasive and a brisk rotation of the valve on its seat—lifting it frequently to allow the emery to flow in—should give a good fit. The valve springs should be demonstrated to be of uniform strength, and the valves should close positively and freely.

LEAKS PAST PISTONS.

If, after the valves appear to be tight, a cylinder still shows leakage of compression, it should be removed from the crank case and the piston taken out. If a ring is found broken or partially black with oil, thus showing that it does not make perfect contact with the cylinder wall, new rings will have to be fitted. It will generally be found best to send the cylinder and piston to the factory to have this work done. The average repair shop does not possess the materials, the tools or the men to secure a first class job of this kind. If the work is done in a local shop, the rings should be obtained unfinished from the factory and carefully fitted, as having rings made by the repair man is expensive and uncertain. A few extra rings, in the rough, may well be kept on hand. Sometimes it proves quite difficult to determine whether leakage of compression is taking place past the valves or past the piston. If a supply of compressed air, intended for tire inflation, is at hand, it can be usefully employed to locate compression defects. An ordinary pipe plug which fits the spark plug holes may be drilled out to take a tire valve stem, from which the valve has been removed, and the valve stem soldered into the plug. This plug may be screwed into the spark plug hole of the cylinder to be tested and 100 pounds air pressure turned on, after the engine has been blocked on the compression stroke. It is then usually very easy to locate compression leaks, as there is so large a volume of air escaping. A lighted candle held at the exhaust or inlet port will show any escape of air, and the air may be detected passing the rings in a similar way. By blocking the engine at different points in the stroke the extent of the leak in such positions may be determined. Caps which close the valve openings in cylinder heads sometimes leak, as do screwed-in valve cages, and may require copper gaskets under them.

ENGINE BEARINGS.

When the compression has been rendered satisfactory, the bearings of the engine require investigation. The lower half of the crank case should be removed, as well as the hand hole covers, if any. The main bearings, as well as the crank pin bearings, should be freely squirted with gasoline in order to clean out the old oil. Looseness in the main shaft bearings can be detected by forcibly prying upward first upon the flywheel and then upon the forward end of the shaft (if it can be reached), and also upon the shaft between bearings. If there is much looseness it can be felt, and the oil will squeeze out of the bearings. Removable shims, between the bearing caps and their stands, are now usually provided, and such of these as will give the necessary take-up should be removed and the cap securely replaced. If no shims are provided, the flat portions of the caps should be slightly filed down to give the requisite adjustment.

In order to determine if there is looseness in the connecting rod tips, the crank shaft should be blocked and the connecting rods forcibly "worked" by hand in the direction of their length. If any lost motion is found, it may be taken up as in the case of the main bearings. When these bearings have been properly adjusted, with all nuts tight, the engine should spin freely without stiffness, when cranked, with the spark plugs removed. It is of great importance that all bearing caps should be left with their nut locking devices properly replaced. The bearings of the cam shaft or shafts should be demonstrated to be properly adjusted. Some idea of the wear in the wrist pin bushings may be obtained by working the connecting rod tips sidewise, when they are free from their crank pins.

In case any of the engine bearings are worn, so much that their further use is impracticable, they must be provided with new bronze bushings or rebabbitted, as the case may be. As the proper quality of bearing metal and of babbitt is not obtainable with certainty at the usual repair shop, it is well to procure the necessary bearing bushings in the rough from the factory, and to consult the factory as to the quality of babbitt which they use. In smoothing up shafts, preparatory to bushing or rebabbitting their bearings, emery or other abrasives should be used with great care and removed most completely from the surface of the metal. After rebushing, the engine should preferably be run from an outside source of power, until the bearings, which are kept flooded with oil, cease to show any tendency to heat.

The nuts which hold the cylinders to the crank case, those which secure the lower half of the case to the upper, and the nuts or clamps which fasten inlet and exhaust pipes to the valve chambers, indeed every nut or other holding device about the engine, should be left properly set up.

(To be continued.)

Two London automobile agencies employ lady demonstrators, and a project is being considered in Turin, Italy, to establish a school exclusively for women drivers, which would be the first of its kind in the world.

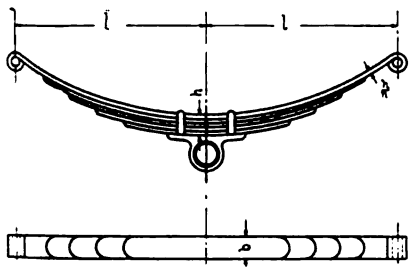
Springs.

By C. H. T.

Among the many problems that have arisen in connection with the development of motor cars is that relating to springs. The conditions which apply to horse drawn vehicles are not the same as those applying to the automobile. In the horse drawn vehicle we can use wheels of large diameter, which do not find every little inequality in the road as a smaller wheel does, and we also have the horse, which tends to anchor the vehicle to the road.

Spring design as applied to the automobile is still in its infancy, and the tendency of the times is not to improve on the springs, but to adopt some auxiliary device to help the springs out in their work. These conditions are to be regretted, for they are remedying the effect instead of "curing" the cause.

Judging from the many devices upon the market intended to prevent the breakage of motor car springs and to improve their action, one is truly led to believe that the automobile spring is in its first stages of development. While it is true that in a great many cases the breaking of springs is due to the overloading of a car, and also to reckless driving and violent rebounds, still it is also true that the motor car spring has not been brought up to its highest development. The spring maker has heretofore in the horse drawn vehicle never met the conditions which the automobile presents.



On the automobile we have to use a wheel of small diameter in order to keep our centre of gravity as low as possible, and where a larger wheel would eliminate much of the inequalities of the road the smaller wheel will find them all. Of course the pneumatic tire absorbs the smaller shocks, but that is not its true function, which is to reduce traction resistance, which it undoubtedly does on rough roads and at high speed.

The main fault of inefficient springs lies with the automobile manufacturer. He does not give the springs the attention they need, but has a spring drawn up by his draughting department, what he "thinks" is about right for his car. Nine times out of ten the spring is not suited to the conditions of his car, and the spring maker is then left to make up a number of springs, until he hits upon one that will not deflect too much under its full load, and that is the spring that is used. A little figuring beforehand would have saved money, time and trouble. We have any number of formulæ for plate springs, but those given by Reauleaux give the best results. These formulæ for semi-elliptic springs are as follows (Fig. 1):

$$P = \frac{S n b h^2}{6 l}$$

$$\delta = \frac{6 P l^3}{E n b h^3}$$

In these two formulæ

S = maximum direct fibre strain in the plate.
P = load on one end of the spring.
E = modulus of direct elasticity.
δ = deflection of end of spring in inches.
b = width of plates in inches.
n = number of plates.
l = half length of spring between eyes.
h = thickness of plates.

The value of E is usually taken as 30,000,000 and S at 80,000.

The formula for ascertaining the load is then

$$P = \frac{13{,}333\, n b h^2}{l}$$

while the formula for deflection is

$$\delta = \frac{P l^3}{5{,}000{,}000\, n b h^3}$$

The above calculations assume that the load on a spring is applied gradually. If the load was suddenly applied the stress and deflection would be momentarily double that due to a gradually applied load.

After a spring is tempered its tenacity and elastic limit increase. The steel from which springs are made has a tenacity of 100,000 to 140,000 pounds per square inch, and an elastic limit of from 70,000 to 90,000 pounds per square inch, before being tempered. After tempering in oil its elastic limit increases to from 100,000 to 140,000 pounds, while its tenacity increases from 140,000 to 200,000 pounds per square inch.

The safe working stress in a spring subject to bend may be taken at 80,000 pounds per square inch, and 60,000 pounds in springs subject to torsion.

In helical springs, such as are used for engaging the clutch, the following formulæ apply for finding deflection, stress and diameter of wire:

$$\delta = \frac{64\, N L R^3}{E d^4}$$

where

N = number of free coils.
L = load in pounds.
d = diameter of wire.
R = mean radius of coil in inches.
E = modulus of transverse elasticity.
δ = deflection of spring in inches.

If we take E = 11,500,000, then

$$\delta = \frac{N L R^3}{180{,}000\, d^4}$$

and by substituting we find

$$L = \frac{3{\cdot}43\, d^3}{2R}$$

and

$$d = \sqrt[3]{\frac{L 2 R}{3{\cdot}43}}$$

Cast Aluminum Automobile Bodies.

By W. G. Wall.

As the automobile industry advances wood is fast losing its popularity as a material of construction. Wooden frames are a thing of the past, as are also a few of the smaller parts which were formerly made of wood, and metal is now fast driving wood out of the field for dashes, lockers and bodies.

The reason for this change is that metal is much stronger for a given weight, neater in appearance, more durable, impervious to moisture and not so liable to crack, which latter defect is one of the greatest causes of trouble experienced in the use of wood. Especially is this true in regard to bodies, where large surfaces are exposed to the weather and at the same time subjected to very severe and continuous strains, as in going over rough roads even at ordinary speeds, so that it is a wonder that bodies made of wood hold up even as well as they do. It is also difficult to form wood in a substantial manner into the graceful lines and curves which are now demanded for automobile bodies.

These reasons have forced manufacturers to replace wood bodies with metal ones, the most common type of which are those made of sheet steel or sheet aluminum, supported on a wood frame. The disadvantage of using wood is, however, not eliminated in these bodies, and, besides, as the sheet metal is necessarily very thin, any slight knock is apt to either punch a hole through it or else mar it quite badly.

A few motor car manufacturers have been experimenting with and are now using seats of aluminum castings for their bodies, while some are making the entire body, with the exception of the base, of aluminum castings. When it is properly made and where cost is no consideration this is without doubt the ideal body for an automobile. It is quite light, very rigid, will stand hard knocks, does not require the use of wood (except for the floors and attaching the trimming), takes an excellent finish, is proof against all kinds of weather and, in fact, is nearly indestructible. That it is very substantial can be easily realized when it is considered that a great majority of all gear, transmission and crank cases are now made of aluminum castings.

The manufacture of a large body out of cast aluminum is quite a difficult undertaking, especially if the tonneau is to be cast in one piece, as the great size of the pattern makes it very hard to handle in the foundry, and even the making of these patterns requires considerable ingenuity. First a wood form of the exact shape of the body wanted must be built, upon which to make the master pattern, and it is from this master pattern that the final aluminum or brass pattern is made. Sometimes a white metal pattern is used for making the castings, but it is apt to spring and get out of shape owing to its weight. So, as there are to be two shrinkages—aluminum generally shrinking three-sixteenths of an inch to a foot—

double shrinkage has to be allowed in making up the form. It has been found that aluminum in very large, thin pieces shrinks sometimes as much as five-sixteenths of an inch to a foot, which makes it difficult to figure out the exact size that the form should be to produce a certain size body and make all parts fit together nicely.

The thickness of the final castings should be about five-thirty-seconds of an inch, and not over three-sixteenths, except where heavy ribs are used for bracing, or flanges for bolting the parts of the body together.

There are a number of ways of making the master pattern after the form on which to build it has been completed. It can be made of sheets of bees' wax laid over the form, or of several layers of very thin wooden strips, about an inch wide, laid across each other and glued together, the cracks being filled with wax, or else pieces of white metal hammered into shape over the form and soldered at their joints.

After the master pattern has been made, "follow boards" which conform with the shape of the pattern must be built up of wood, to hold the pattern in shape, or else they would warp or spring so that you could do nothing with them; especially is this the case with the master patterns, as they are necessarily quite frail.

From these master patterns the final patterns are cast, preferably out of aluminum, on account of its light weight.

These patterns must then be scraped and finished, fitted together and gone over carefully to see if all dimensions are correct. You are then ready to begin making the aluminum castings for the bodies, provided, of course, the molding boxes or "flasks" for holding the sand have been finished. The aluminum foundry is responsible for the rest of the work, which is the most difficult part of the undertaking, for no matter how experienced the molder is, he will probably lose the first few castings. Especially is this the case if the tonneau of the body is cast in one large piece, for it is nearly as thin as aluminum can be poured, and at the same time very large, so that it may require as much as a ton of sand to cast it, and as all this sand when packed in the flask must be turned over, it is a very difficult thing to do without injuring the mold, and the "flask" must be especially rigid so as not to spring with the load it contains.

Considerable sand (that is, weight) can be saved in molding if the "flasks" are made of metal and conform to the shape of the pattern.

The front seats, being smaller, are not so difficult to cast, and the doors and other parts are comparatively easy.

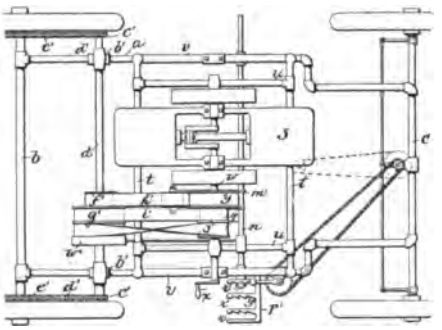
After the castings have been made, there still remains considerable work to be done, as the parts must be bolted together and the casting scraped down and finished, so as to get a good surface for the paint, and only a part of this surface can be ground down and buffed by machinery, as the corners and edges must all be gone over with a file, thus necessitating a great deal of hand work. The wood strips around the edges for holding the trimming, and the bottoms of the seats can then be put on, after which the body is ready to be painted and trimmed in the usual way. Thus it can readily be seen that, though this makes the best automobile body obtainable, it also makes the most expensive one to build.

Change Speed Gears of the Sliding Type—The Dyer Patents.

By Frederick W. Barker.

Two patents owned by L. H. and F. L. Dyer have been put forward as covering certain features of sliding change speed gears, and guide plate with separate recesses to hold the operating lever in its several positions.

The earlier of these patents, No. 675,650, issued September 11, 1900, on an application dated June 8, 1898, shows a motor vehicle whose motor shaft and



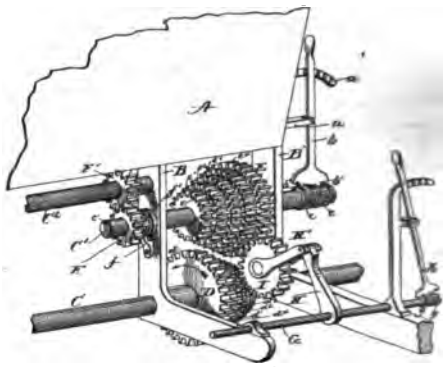
No. 675,650.

countershaft have pulleys connected by belts, a single shifting jockey pulley being employed to tighten the belts. The lever used in shifting the jockey pulley is adapted to engage in the recesses of the guide plate. The motor shaft *w* carries large pulley *y* and small pulley *z*, which are respectively connected to small pulley *f'* and large pulley *g'* on countershaft *a'*, by belts *h' i*. The pulleys *z*, *g'* also carry a crossed belt *j'* to afford reverse movement. The jockey pulley *l'* is carried by arms *m* having lever *o'*, which is connected to shaft *n'*. Said axle is capable of longitudinal movement in its journals, and can be shifted by the lever *i'*, which latter is entered in one of the recesses *r'* in plate P' and locked by the notches *s'*. Thus the jockey pulley can be shifted to any one of the belts accordingly as the high speed, low speed or reverse movements are desired.

Claim 9 of the patent, which covers the guide plate, without reference to the particular form of transmission mechanism employed, reads as follows:

"In an automobile vehicle a transmission gearing therefor, the operating handle *o'* therefor, the fixed guide plate *p'* having recesses *r'*, *r'* therein, substantially as set forth."

The claim is narrowly drawn, as it refers to the several elements by reference



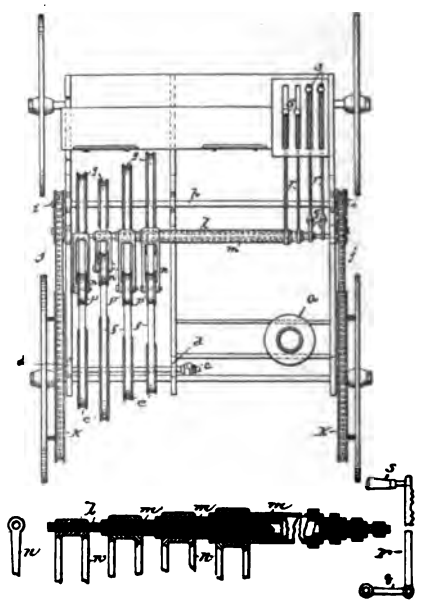
No. 295,536.

characters, indicating them as shown in the drawings. For a liberal interpretation of this claim it would be necessary to prove the alleged infringing devices to include the exact mechanical equivalents thereof.

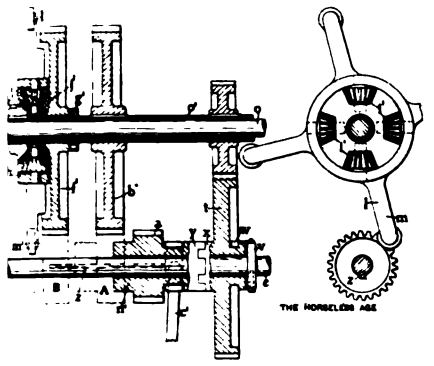
There are several earlier patents which show a recessed plate used in holding the change speed lever for sliding gears.

Gallup, No. 295,536, of March 25, 1884, shows a device relating to change speed gearing for seeding machines and grain drills; its mere application to a motor vehicle would not constitute invention. The shaft C², carrying cone series of gears, is rotated by shaft C', through pinions F' *c'*, and the parallel shaft C, carrying a reversed cone series of gears, is adapted to be engaged through an idler I, carried by shaft G. Shaft G is shifted longitudinally by operating lever K, which may be engaged in one or other of the recesses in a plate K'. To increase the number of speed changes, the shaft C' may itself be shifted by a lever *b*, which engages in a recessed plate *a'*.

Blake, No. 535,937, of March 19, 1895.—In this patent change speed pulleys and belts, a separate belt tightener P is used for each belt, the several belt tighteners being carried by separate hollow shafts *m*, each having an operating lever *r* and handle *s*. The handles slide in separate slots, and have



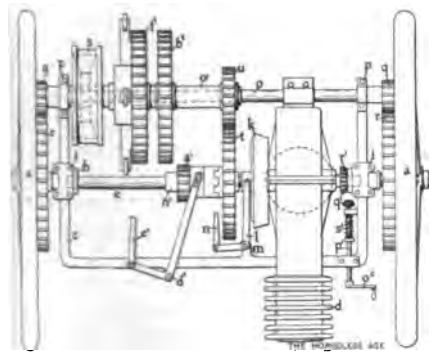
No. 535,937.



No. 662,401.

igaging racks as locking devices. The yer recessed guide plate, with single oper- ing lever controlling the several speed anges, clearly involves invention over the lake and various other early patented de- ices found in the art.

Dyer's second patent is No. 662,401, of lovember 27, 1900, filed April 26, 1899. ear *t*, which has clutch teeth *x*, is loose n motor shaft *e*, while small gear *a'*, hav- ig hub *n'*, and clutch teeth *y*, is slidable on aid shaft. Countershaft *o* has end pinions *q* meshing with driving gears *r r*, said haft *o* connecting with its sleeve *o'* through ifferential *s*. Sleeve *o'* carries the small ear *u*, and large gears *b'*, *f'*, the latter be- ig free and having bevel *j'* on one face eshing with bevels *i' i'*, *i' i'*, which engage ith bevel *k'*, that is splined to shaft *o'*. he bevels *i'* are carried in a frame *h'*, hich is loose on sleeve *o'*, and has radial rms *l*. When clutch *x y* is engaged the rive is on the high speed through gears, *t*, , etc. The low speed is acquired by slid-



No. 662,401.

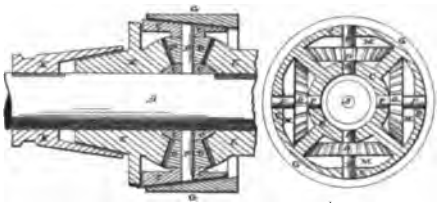
ng gear *a'* into engagement with gear *b'*. To obtain the reverse, gear *a'* is moved into he mesh with loose gear *f'*, an arm *l* of rame *h'* then contacting with hub *n'* of ear *a'*, whereby, through the bevels *k'*, *i'* nd *j'*, motion is communicated in the re- erse direction to sleeve *o'*.

Claim 12 which includes the means for eversing, reads thus:

"12. In an improvement in gearing, two hafts parallelly arranged, a gear rigidly astened to one shaft, a second gear in nesh with the first gear, but free to ro- ate about its supporting shaft, a clutch nember upon said gear, a third gear rigidly upported upon one of the shafts, a loose ear adjacent thereto, normally inoperative intermediate mechanism interposed between said gear and its supporting shaft, a gear keyed to the other shaft but capable of lateral or endwise movement thereon, a clutch member upon one face of the fourth gear, and a projection or hub *n'* upon the opposite face, substantially as set forth."

The normally inoperative mechanism between loose gear *f'* and shaft (sleeve) *o'*, comprising frame *h* and bevels *k'*, *i* and *j'*, which, together with hub *n'*, form the reverse, is the feature of this claim which is sought to be upheld. The prior art includes a number of different patented reversing devices, using sliding gears, of which several are noted hereinafter.

Lehmer, No. 320,665, of June 23, 1885, covers a reversing gear for traction engines. The power gear H, which is loose on shaft A, is locked thereto by clutch K, and transmits motion in one direction to shaft A.

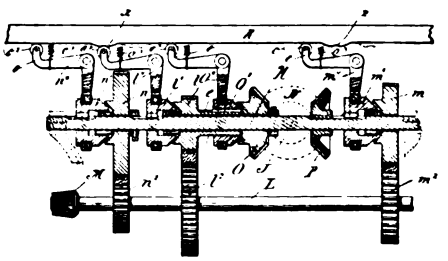


No. 320,665.

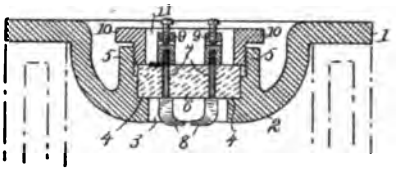
But when clutch K is released, and brake G is applied to wheel C, which pivotally carries the bevel pinions D, then motion is communicated through the splined gear E to turn shaft A in the reverse direction.

Duryea, No. 540,648, of June 11, 1895.—Shaft K has the bevel gears P, O, which are driven in opposite directions by bevel N from the engine shaft J. Gear P is fast on shaft K, while gear O is loose thereon. Clutches *l'*, *m'* and *n'* on shaft K, respectively, engage the loose gears *l*, *m*, and *n* to respectively drive the low, intermediate and high gears l^2, m^2 and n^2 on shaft L. For the reverse, clutch *l'* engages gear *l*, and the extension clutch O' on hub *e* of gear *l* engages with bevel gear O, whereby gear *l* turns gear l^2 and shaft L in the reverse direction. The device employs a separate clutch for each gear, using two clutches for the reverse, and it cannot be considered anticipatory of the Dyer patent, although interesting as showing the earlier state of the art.

Clapp, No. 577,185, of February 16, 1897.—(Copy of this patent could not be obtained.) Shaft 3 is the driving shaft and 4 the driven shaft which receives its power from the crank shaft through gear 63. Gears 69 and 81 give the high speed, 68 and 80 the intermediate, and 67 and 79 the low speed. These



No. 540,648.



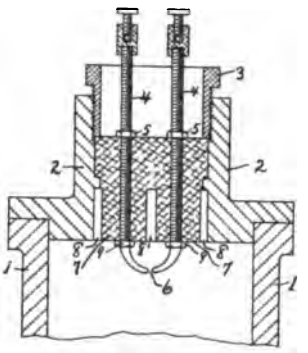
No. 582,540.

gears are always in mesh, the upper ones being loose on shaft 3, but adapted to be connected thereto by separate clutches 47, 46 and 45. The clutches being released, reverse motion is imparted to shaft 4 by connecting clutch members 71, 70 and 77, 78, the sprockets thereon being connected by chain 75. This arrangement does not conflict with the Dyer claim.

The Mueller and Canfield Spark Plug Patents.

It was recently announced that the Association Patents Company, an off shoot of the A. L. A. M., had acquired patents Nos. 582,540 and 612,701, the former entitled "Igniter for Explosive Engines," and issued to Oscar Mueller, of Decatur, Ill., on an application filed May 11, 1897, and the latter entitled "Igniter or Sparker for Gas, Oil or Vapor Engine," and issued October 18, 1898, on an application filed August 5, 1897.

Both patents show jump spark plugs with both spark terminals insulated. The Mueller plug, as shown by the illustration, consists of a disc of insulating material (glass, marble or some other substance of considerable strength, according to the specification), which is clamped into the wall of the cylinder head between a



No. 612,701.

shoulder in the opening and a gland, and the spark terminals are clamped into the disc. The two claims appear to be drawn very narrowly, and would not cover any of the present spark plugs, but the patent is probably considered of value because it is the first American patent relating exclusively to a jump spark plug. Claim 1 reads as follows:

An igniter for explosive engines comprising a cylinder head having an opening with a seat formed therein and a threaded rim encircling and extending outward from the seat, a non-conductor disc bearing against the seat and closing the opening, an annular nut screwed into the rim and against the disc, and a circuit wire connected with a pole piece that extends

through the disc, substantially as set forth.

The Canfield patent, No. 612,701, purports to provide a method of insulating the spark plug electrodes that will prevent fouling of the plug. The means of avoiding the fouling consists of a deep counterbore or recess around the inner end of the spark terminal, as shown by the drawing. The first claim reads:

In a gas, oil or vapor engine igniter or sparker a recess or counterbore around the electrode or electrodes and above its or their sparking points when said electrodes are used vertically, for the purpose of preventing an injurious accumulation of the products of combustion or other foul matter on the insulation of said electrodes, substantially as and for the purpose set forth.

The Automobile in Italy.

By Carlo Rizzardi.

In few countries has the automobile developed as rapidly as in Italy. As the means of a sport it is now enjoying great favor among the public, and the great contests are attracting general interest. This has aided in bringing about the high degree of perfection of construction which has been attained by the national automobile industry, a perfection which enables cars of Italian manufacture to rival with the best foreign makes in point of both speed and endurance. The success in international contests of any of the leading makes is considered by many as a thing of national importance. In consequence of these general sentiments automobile competitive events multiplied in 1905, and some among them, as, for instance, the Susa-Mont Cenis Hill climb and the Florio Cup race during the Brescia week, scored an international success. During 1906 there will be four of these great international meetings, as follows:

In April, Sicilian Circuit, a race over a distance of 600 kilometres, near Palermo, over rather hilly roads. The race is limited to touring vehicles selling at 20,000 francs, or less, and the prizes will consist of the Targe Florio and cash prizes aggregating $10,000.

In May, Gold Cup Circuit, an endurance and regularity contest over a distance of 4,003 kilometres, completed in eleven days. The aggregate of the prizes already exceeds $40,000.

In July, Susa-Mont Cenis Hill climb, a distance of 23 kilometres.

In September, Brescia week, a race over a circuit of 61 kilometres, which must be covered nine times without neutralizations. The prizes include the Florio Cup and cash prizes aggregating $20,000.

The international success of these meetings is already partially insured by entries received.

The Italian automobile industry, although still very young, has made enormous progress in the construction of cars, and already competes successfully in the markets of the world. Its products are known for neatness of design, high class finish, extremely scrupulous selection of material and reasonable prices. By reason of the constantly increasing demand for cars, particularly for export, there is a manifest underproduction in Italy of cars of the voiturette class, and of low priced larger cars—that is to say, cars selling complete with body at up to $2,400—and this type of machine is mostly purchased abroad. At the present the manufacture of small runabouts and of motor trucks (which latter must frequently be built special to suit individual cases) is considered as less remunerative than the manufacture of high grade touring cars; but it is certain that this field will receive greater attention by the Italian industry within the very near future. Evidence of the renown enjoyed by Italian methods of automobile construction may be seen in the fact that six of the largest and best known French manufacturers and one English have combined with Italian capitalists for the construction of vehicles of their design at Turin, Genoa, Florence and Milan.

The recently closed third annual Turin automobile show was a very successful event. The show comprised two curiosities of the 1905 season, the Richard-Brasier racer, which won the last Gordon Bennett race, which was exhibited by the "Fides" Société Italienne Richard-Brasier, and the "Itala" racer, which won the Florio Cup during the Brescia week. The 1906 models of Italian cars follow very much identical lines, the principal features being as follows: Pressed steel frame narrowed in front and without sub-frame; four cylinder motor, with cylinders cast in pairs, symmetrical valves and enclosed cam shaft gears; make and break ignition; constant level carburetor, with warm air inlet; fan in flywheel and behind radiator; very careful mounting of radiator; disc clutch; four forward speeds; chain drive in a majority of cases; water cooled brake on the differential, and expanding brakes on the rear wheel hubs; strongly inclined steering column and steering gear with large reduction factor; large diameter steering wheel carrying at the centre the throttle and ignition levers; all bearings, except those of the motor, of the large diameter ball type; very long and nearly flat springs; lubrication in proportion to the speed of the motor; gasoline tank under pressure at the rear of the frame; cars of 24 and 36 brake horse power for ordinary touring, 60 horse power for "grand tourisme," and 16 horse power for city use. At the recent Turin show there were among the exhibits four cars of American construction, three Reos and one White. It is to be regretted that no other American makes were represented, as they would certainly have met a demand. The importation of American cars into Italy occasions an average expense of $100 to $120 for transportation and $80 to $120 for tariff duty.

The practical application of the motor car is also expanding in Italy, notwithstanding the high price of gasoline, which varies in different localities from .90 to 1.10 lire per kilogram (48 to 60 cents per United States gallon). The high price of the fuel has had for its immediate effect most determined efforts to increase the fuel efficiency of the motor, and it has become the custom among manufacturers to furnish with each motor delivered a guarantee of its fuel economy. The roads in Italy are generally good, very numerous and well maintained and even in the least frequented districts the peasantry have never shown any hostility toward the new method of locomotion the rare exceptions having always been due to regrettable imprudence on the part of automobilists.

The Italian Touring Club, a national association comprising a membership of 50,000, is deserving of much credit in connection with the development of practical automobiling in Italy. It has organized several tourists' meetings which proved quite successful, has furnished a complete series of guides, profiles and monographs and at present is engaged in the publication of a new and special touring map of Italy on a scale of 1: 250,000, which will be given free to all members for 1906-7.

There is in Italy a "Club Automobilisti d'Italia," with its headquarters at Turin, which is a federation of a number of wealthy automobile clubs in the different principal cities, each of which possesses its own garage and organizes automobile contests.

Public services by automobile vehicles are also rapidly increasing in number. There are already several lines which exceed 100 kilometres in length, which have been in operation for some time and have given altogether satisfactory results. These lines are especially increasing in the vicinity of small towns in mountainous localities where the merchandise and passenger traffic is insufficient to justify the installation of an electric tram line. These services usually comprise a number of omnibuses capable of maintaining an average speed of 18-20 kil. p. h. on average roads, carrying about 20 passengers and a corresponding weight of baggage. The majority of vehicles in use are of the gasoline type, which appear to be entirely superseding steam. In Milan electric trucks have been in use experimentally for some months for the collection and distribution of mail matter. These trucks are fitted with a body arranged inside like a small office, in which two clerks are at work while the car is running. These electric mail wagons will be definitely adopted in Milan on April 1 next.

The A. C. G. B. and I. employ a 12 horse power Star car as an "instructors' car" to teach novices the art of driving. There is an extra pedal on this car in front of the seat beside the driver, by which means the instructor can instantly unclutch and apply the brakes in case his pupil should lose his head.

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Devoted to Motor Interests

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Pleasure Car Manufacturers as Commercial Vehicle Makers.

Although no definite announcements have yet been made, we have reason to believe that the engineering departments of several of the most prominent pleasure vehicle manufacturers are at present engaged upon commercial vehicle designs, and the practice of filling in the dull season of the year in the pleasure car trade with work on commercial vehicles appears to be spreading. This was a very natural development after it was once recognized that the pleasure car with delivery body substituted makes at best only a very poor commercial vehicle.

It is difficult for any new industry to gain its first foothold, and the commercial vehicle industry is no exception to this rule. By developing it in this manner, in connection with the pleasure vehicle industry, it may be possible to considerably reduce these difficulties. For one thing, we believe pleasure vehicle manufacturers can well afford to sell their commercial cars at a smaller profit than their regular product. The manufacture of pleasure cars is their regular business, and this requires a certain equipment, which, unless other work is found for it, must lie idle during a certain portion of the year. During this period of idleness the fixed charges on the plant—interest on capital invested, insurance, depreciation, etc.—continue, as does also the salary of officials. If the plant is being worked equivalent to its full capacity for half a year, the share of these fixed charges which must be borne by each car produced is just twice what it would be if the plant was fully occupied the year round in making cars of the same type.

Working the year round at the same rate on the pleasure cars which can be sold in a season is obviously impossible, and other methods must therefore be resorted to if the fixed charge item in the cost of manufacture of cars is to be reduced. As the plant must be maintained anyhow, it obviously pays to manufacture commercial cars during the slack season, even if only a small excess above actual cost in material and labor can be realized. Of course, the manufacture of commercial cars must show an actual profit, but in the calculation of the cost of production the fixed charges of the plant need not necessarily be entered against the car, as they must be against the regular product.

An exaggerated example of these conditions is furnished by electric lighting stations. These require an equipment which is utilized equivalent to its full capacity for only about two hours in twenty-four. Such a large equipment is necessary in order to take care of the greatest demand. So far as the equipment is concerned, it might well be worked twenty-four hours a day, in which case the pro rata fixed charges would be greatly reduced. In order to increase the coefficient of utilization of the equipment, current for power (which is required during the day, when the lights are off) is furnished for as low as one-quarter the cost of current for light in some instances. This is, of course, a line of work in which the fixed charges are relatively very high.

Aside from the profits which are to be realized by the manufacture of commercial automobiles at present, there are two distinct reasons why pleasure car manufacturers ought to devote attention to commercial vehicles during the slack season. In the first place, it is generally conceded that eventually the business automobile will far exceed the pleasure car in importance as an article of manufacture, so that most manufacturers will naturally be forced to take it up in the course of time, and those who take the step early will have the advantage. Secondly, when a manufacturing concern can offer its employees work all the year round, it can secure more competent men, and often at more advantageous terms.

Some Recent Patent Deals.

It will have been noticed from our news columns that the Association of Licensed Automobile Manufacturers have recently acquired title to a number of early patents, including the Dyer change gear patents and the Mueller and Canfield spark plug patents. Of these the Dyer patents are strongly reminiscent of the Selden patent. Dyer, like Selden, is a patent lawyer, and, like Selden, so far as known, has never made any attempt to place his invention on the market, although there have been opportunities innumerable during the past few years to exploit practical inventions in the automobile line. In this connection we cannot help thinking that there is much abuse of the patent law by persons familiar with its weaknesses. The patent law was framed to encourage practical invention for the benefit of the public and to insure to inventors the fruits of their labors. It appears, however, that the law can also be made effective as a means of retarding practical invention. In the early stages of an industry it is easy for those familiar with its state of development to obtain patents on a large number of combinations of mechanism without regard to their practicability. Owing to the newness of the art broad claims may often be secured that will cover combinations which the inventor never thought of. It is generally a laborious and an expensive task to develop an invention to a practical state, so this is preferably left to somebody else, and when the other party has overcome all the difficulties and achieved commercial success, he is held up with threats of an infringement suit or suit is brought against him. This is obviously an abuse of the spirit of the patent law.

The most meritorious of the inventions for which the "Licensed" Association has acquired title is undoubtedly that of Canfield, which invention covers a spark plug with a recess in the insulator around the plug terminal inside the cylinder. At the time this patent was applied for (1897) the jump spark system of ignition was almost unknown in this country. The object of the recess is to prevent the fouling of the insulator by a carbon deposit. Of course the so called "petticoating" of insulators, to increase the length of the leakage path, had been practiced in electrical work long before that time. There is, however, quite another principle involved in the action of the recessed spark plug insulator, namely, that as no combustible mixture reaches the bottom of the recess no soot can be deposited there, and this principle was recognized by Canfield and is enunciated in his second claim. Canfield in his specifications also mentions that he has found certain proportions of the recess to be most effective, and there is every indication that his is a case of practical, original inventive work. The effectiveness of the recess is testified to by the large number of plugs now on the market embodying it. It is gratifying to note that recognition is thus given to an early meritorious invention in the ignition line, and that the inventor has received at least some reward for his labors.

Surety Companies' Bonds as Security for Bail.

Probably no law which has been introduced in any State Legislature will be so welcomed as the act recently passed by both houses of the New York Legislature, providing for the acceptance of a surety company's bond instead of other security upon admitting to bail an autoist who is charged with violation of the law. This statute will enable surety companies (upon complying with the law) to execute bonds in blank, which may be sold at any time or place within or without the State to those who operate motor vehicles within the State borders. But a better way to dispose of these bonds, enabling autoists to always have them ready for immediate use, would probably be to give to the holder authority under power of attorney to execute the bond on behalf of the surety company, thus making the holder the agent of the company for that particular purpose. Or bonds could be procured by the various clubs and sold to the members, but the former would seem to be the more practicable.

Every State in the Union should have a law similar to the one referred to, which is now in the hands of the Governor. To such a law there could be no possible objection by anti-automobile influences. The State is sufficiently protected where the company has complied with the law, and the surety company is likewise amply protected in issuing bonds to automobilists, who constitute, as a general rule, men of good financial standing.

The A. C. A. Fuel Efficiency Contest.

After a prolonged period of idleness, so far as the organization of competitive events is concerned, the Automobile Club of America announces a series of practical trials to be held during the coming summer, starting off with a fuel efficiency test in May. Just now the thoughts of automobile men appear to be centring about such subjects as the possibility of a fuel famine, denaturized alcohol, fuel economy of motors, etc., and a test of this kind is therefore timely. There is still a good deal of misinformation extant in connection with this subject of fuel economy, and a practical competition, if well supported by the industry, cannot fail to have an educating influence in this respect. It is generally admitted that fuel efficiency increases with the size of cylinder, so that a single cylinder engine consumes less gasoline per horse power hour than a double cylinder of the same horse power; a double cylinder less than a four cylinder, and so on. The argument of increased fuel consumption has evidently been employed by salesmen against the four cylinder car, to judge from a recent experience of ours, when a gentleman investigating commercial vehicles was found predisposed against four cylinder machines on account of their "high fuel consumption," though he believed that none of the two cylinder vehicles was powerful enough for his purpose. He seemed to be under the impression that the fuel consumption was proportional to the number of cylinders, as he mentioned that in his opinion the disadvantage could be overcome if two of the cylinders could be cut out when their power was not needed.

There are essentially two possible bases of competition in a fuel economy contest, viz., least fuel consumption per unit of gross weight moved, and least fuel consumption per unit of useful load carried. Of these we consider the former the preferable one, as it takes account of the actual economy of the power plant, while the latter introduces questions of the proper relation of vehicle weight to load, and would encourage overloading the vehicles. If the former basis is adopted the best plan would obviously be to weigh each car with its passengers just before the start, and then measure it out a quantity of fuel in proportion to its weight, say 1 pint per 100 pounds. The car which went the farthest on its fuel allowance would be the winner. From an engineering standpoint this would be much more rational than supplying each car with the same quantity of fuel and declaring the one that went the farthest the winner.

Comparative Tests.

It often happens that car manufacturers wish to test different motor accessories, such as carburetors, mufflers, etc., in order to determine their comparative merits. Unfortunately, the equipment available for such purposes is not always the best, and the method employed frequently does not insure very reliable results. For instance, we have been present at tests of carburetors in which the method of procedure was as follows: The carburetor to be tested was connected to the test engine by a pipe, and the engine was started up on "small throttle," a rather crude Prony brake, with its arm resting on a balance scale, being applied to the engine flywheel. A certain weight was placed on the scale, and while one man gradually opened the throttle and adjusted the gasoline, the other adjusted the brake until the scale balanced, when the man at the throttle would quickly take the speed of the motor with a revolution counter. After a number of tests with different weights had thus been made, and the maximum power obtainable had apparently been found, another carburetor was substituted and the same procedure was repeated.

Now, it is obvious that this method is not only tedious, but is also more or less inaccurate, on account of the time elapsing between the tests of the separate devices, and the possibility of changes in the other conditions affecting the power of the engine, such as atmospheric conditions. If a very accurate comparison is desired, it is essential that the time intervening between the tests of the different devices be as short as possible, and that the engine be not stopped in changing from one device to another. In testing carburetors or mufflers this can easily be accomplished by connecting the two devices to be compared to a threeway valve, so that the change from one to the other can be made instantly, and if the power of the motor is absorbed by an electric generator provided with suitable instruments, the effect on the engine of the change from one device to the other can immediately be observed. Waste of time and errors due to miscalculation, etc., are avoided. It is quite possible to make a large number of tests to compare the different devices under the most varied conditions.

Amended New York Tax Bill.

In our issue of March 14 appeared an article on "Taxing Automobiles," in which the writer discussed and criticised the original automobile tax bill introduced into the New York State Senate by Senator L'Hommedieu. The original enactment has now been amended, and instead of the tax being levied and assessed according to the horse power of the machine, it is to be assessed according to the weight. "An annual State tax of $1 per vehicle and an additional 50 cents for each 500 pounds or major fraction thereof in weight exceeding 500 pounds" is now sought to be imposed "upon every motor vehicle, except motor cycles, owned by a resident" of the State.

The most objectionable part of the amended statute is the basis of computing the tax, which is founded upon weight. The tax sought to be levied by this enactment probably is meant to be a property tax, and it is supposed that the weight of the machine must have some relation to its value, or to the wear and tear upon the roads, since the revenue is to be devoted to the improvement of highways. Upon the latter theory the basis of assessment would seem to be more reasonable, but does the weight constitute a reasonable and lawful basis of levying a tax upon automobiles? This is the question that the courts will ask if the proposed act should be contested.

The objection to the original law of making a tax a lien on the vehicle exists in the amended act. By this provision there will arise complications in titles to machines, and no end of difficulty will ensue. Prohibiting the operation of automobiles upon which taxes have not been paid is also objectionable, as was pointed out in the article referred to, since it makes the intended property tax a privilege tax. Then, again, the tax may be easily avoided, since the law provides for assessing resident owners, and does not contain any provision preventing an evasion of the law.

Although an act taxing automobiles and appropriating the revenue to the improvement of highways is favored by automobilists, nevertheless, an appropriate law should be framed, if motor vehicles are to be taxed. The amended act of the State of New York is no better than the original with respect to the objectionable features pointed out.

Automobiling in Porto Rico.

By E. P. Hodges.

The articles in The Horseless Age about a year ago, relating to the prevailing conditions in Porto Rico affecting the use of automobiles, have evidently borne fruit; for, while at that time there were only three cars on the island—one an air cooled touring car, and the other two single cylinder water cooled runabouts, which had difficulty in surmounting the long and dangerous grades between Caguas and Aibonito Pas—today Porto Rico boasts of no less than twenty-six cars of all sizes, with half a dozen more soon to arrive. Most of these cars are used as pleasure vehicles, but exception must be made of those employed in the American railroad service between Camuy and Aguadilla, a distance of about 22 miles, and those in a sporadic service between Rio Piedras (a suburb of San Juan) and Carolina, a distance of only 6 miles over an excellent and level road. The railroad service is furnished by touring cars of the air cooled type, and the air cooling feature is found quite satisfactory, though somewhat expensive in the matter of cylinder oil, which, like gasoline, may be obtained in Porto Rico in unlimited



Public Service Automobile Starting Out for Caguas.



ON THE MILITARY ROAD, 2,300 FEET ABOVE SEA LEVEL.

quantities at a few cents advance over the New York prices.

The cars at present in use in Porto Rico, with one exception, are all of American make. Among the motorists of the island are Beekman Winthrop, Governor; Robert Frazier, his private secretary, and Terrence Hamill, chief of the island police. Many of the cars are kept in repair by the chauffeur and chief mechanic of the Governor's garage, and the demand for repair facilities has recently been increasing at such a rate that it is planned to shortly open a general automobile repair shop in San Juan, which will contain several lathes, a drill press, milling machine, etc. At present the mechanical repairs are done in local Spanish shops, the equipment and facilities of which are inadequate.

Seven Belgian 10 ton trucks will shortly arrive, and be put into commission about February 1 between San Juan and Ponce, a distance of 83 miles over the excellent but mountainous military road. These seven trucks will soon afterward be augmented by half a dozen more of equal horse power (70), and not only the Caguas-San Juan route, but all feasible roads will carry these successors of the present ox carts, which are satisfactory as to cost of moving freight but quite the contrary when it comes to the time occupied in transportation. Every effort has been made to secure an exclusive permit to handle freight between these more important points, but to no purpose, as it is plainly apparent that such a decision on the part of the authorities would work a hardship upon the poor ox teamsters who are dependent upon this employment for their daily bread.



A PLEASURE VEHICLE OF NATIVE CONSTRUCTION.

The consensus of opinion regarding the tire question as gathered by the writer from the various owners of the cars in Porto Rico points to the fact that there is no satisfactory tire yet on the market which will not go to pieces before 3,000 miles have been run on it. To begin with, the damp and tropical climate, together with the constant chemical action of the intense sun rays, works havoc with the rubber fabrics used in these productions, and if we add to this the destructive grinding action of the flinty projections on the smoothly rolled roads and the abrasive action between the inner and outer tubes, we can readily understand that the question of expense enters seriously into at least the mercantile enterprises prospective and under way today. All first class makes of solid and semi-solid tires have been given fair trial, with the result that in both cases the material or fabric soon shows deterioration. The solid tires, while lasting longer than their more resilient competitors, have caused some serious breaks in axles and disalignments in cylinders, so much so that if we choose between tire expense and machinery expense the race is neither to the one nor to the other. Leather treads soon heat the rubber and wear through almost as soon as the main tread of rubber. The climate, too, deteriorates the leaf springs, which in some cars here show a drop of about an inch after running about 6,000 miles.

The photographs herewith are of the larger cars used mostly by Americans, although quite a number of Porto Ricans drive their cars with consummate skill. I firmly believe that within six months the number of automobiles on this island will be more than doubled. The climate is fine all the year, and the extensive system of good roads offers an unending field for enjoyment.

Persian Motor Omnibus Line.

The Frankfort *Gazette* states, on Russian authority, that a regular motor service has been established between Enzeli on the Caspian Sea and Teheran, the capital of Persia, along a highway constructed by Russian engineers. Although the enterprise is Russian and is said to have been carried out at the instance of certain highly placed Russian personages, the initiative in the matter is reported to have been taken by the Shah in giving a twenty year concession for a motor service between the two places mentioned to Murtaza Kuli Khan, his brother-in-law, who studied mechanical engineering in Germany and is a friend of Russia.

WINTER EXPERIENCES.

Winter Experiences and Observations.

By Blank, M. D.

Automobiling is the beau ideal of summer sports. It is as surely the boreal of winter ones. But cold is not always unpleasant, nor is sport the sole function of the motor car. Eighty per cent. of my mileage is for business, pure and simple. That is why my cars have had to run 30 miles a day, at the least, through five seasons of slush and mud, of ice and rutted roads, of soft snow and occasional drifts. Winter riding is a necessity with me, often a pleasure, and a hardship only under conditions which would be equally potent in summer.

The success of cold weather motoring is very largely a matter of personal comfort. Work the car never so sweetly, if one is cold one is not happy, and trouble at such a time does not help one's eternal welfare. Here on Long Island we seldom reach extremes of temperature. Occasionally zero shows itself, but more often 30. But humidity is always high, and 30 is harder to stand under such conditions than a dry zero. Without a top a motor car is worse than an open trolley, summer or winter, and demands in the latter season all the fur and wool you can carry. Even then nose, fingers and feet suffer. But a top closed at back and sides makes all the difference in the world. My closed buggy top, entirely open in front, enables me to ride in bitter weather in my ordinary clothing and a cravenette rain coat. The air cushion formed in and by the top is as perfect a protection from cold and wind as a glass front, and much easier to see through. Of course, it is no protection from rain or snow. When facing the wind the effect of this cushion in my car extends ahead of the enclosure about 18 inches, as I have determined by observing the behavior of cigar smoke. A somewhat less distance when "reaching," and indefinitely when "running free." Now you have a glimpse at my other hobby. This makes a lap robe a matter of small importance with me, though it is very handy to tuck about the radiator.

Once on a very cold day this winter I put on the rubber storm boot (which completely closes the front of the car) to the eye level. The three cylinders of my motor are under the seat on the right side. The cushion is divided in the centre. The car handles from either side. The engine is designed to run hot, only valve and combustion chambers being jacketed. So I left the right hand cushion at home, also the right heel panel, and started out handling from the left side. In less than a mile I removed the boot. Again a mile and I unbuttoned my coat. Then my pretty plan being dissolved in perspiration, I went back home for the cushion and panel. Was roasted out. Yet with the cushion on (it is metal lined) the heat is not noticeable, even in summer. So with my car the personal comfort question takes care of itself. Given an enclosed top and I see no reason why, with a little expenditure of brains and money, any car may not be comfortable. In the very best cars about 30 per cent. of the heat furnished by the fuel burned gives you the enormous horse power you brag about at the club. Most of the remaining 70 goes into the cooling water and the exhaust, and is available for heating purposes. Considerations of bodily ease need in no way deter the coldest blooded from running 365 days in the year.

TRACTION.

Road conditions must be met by car design. My drivers are 36 inches in diameter, and carry three-quarters of the car's weight. I have one b. h. p. (honest) for every 70 pounds, all on, including myself. My tires are 3½ inch, with small cross corrugations. I have never used rope, chain, nor any other anti-skid or traction device. So far as traction is concerned, I've had no trouble, except when the car has rested some time in deep snow. Then starting forward generally results in one wheel slipping round and round, and no progress. Locking the differential, putting the lap robe under the slipping wheel or pushing are reliable but inconvenient cures. The easiest way out of the difficulty is not to start forward, but back for a foot or so in your tracks. Then go ahead, and there will seldom be any trouble. Skidding bothers me very little. Even on wet asphalt my car will stand sudden and violent brake application without misbehaving. I seldom try it, however. But on macadam which has been frozen and has thawed out about half an inch, my experience teaches me to drive with extreme caution. I think this is the worst possible road condition for any car. If, however, you are forced to the side, and find one wheel on wet ice and the other in the slime, then, indeed, you have attained the impossible and found a condition that is worse yet. An intelligent car can manage it just the same, if given its time. Well packed snow or dry ice is as easy as the same road in warm weather. Soft snow demands very careful steering.

TIRES.

Tires naturally follow traction. In my opinion they should be pumped up extra hard. It is safe to do so, as they do not heat up the same as in summer. The car steers easier and steadier, and traction is improved. I do not know whether it is easier or harder to puncture such a tire. I've heard both sides maintained. But I do know that on winter roads nails and tacks are covered up and harmless, or uncovered and particularly deadly. Wet rubber cuts very easily. When a rubber workman wishes to cut his material he always wets his tool. Hence these troublesome wind bags of ours should get extra attention. Frequent inspections at every stop and while running should be made. It's easy to tell that a front tire is flat, for the car tends strongly and constantly to turn to the flat side, that wheel being for the time some inches less in diameter. But one may run a long time on a flat driver and not know it. It seems foolish to advise a man to look at the bottom of his wheel to see if his tire is all right, but I know a man whose rim cut an $80 shoe into an utterly hopeless condition because when examining it while running he looked only at the top.

By inspecting at every stop I have been able to add to my collection of penetrating possibilities many specimens whose intentions were thus happily frustrated. And I always squirt a little rubber cement into the hole. Even without vulcanization it will keep out water, and water in the fabric is ruination. This is an equally good procedure in warm weather. I think that a shoe that has been punctured through the fabric should go back to the manufacturer at once, if it is possible. I always pull a string through the punctures when I send the shoe back. I do not know whether it helps the repair man any. A bill for such service has never been sent to me.

Tires sometimes play funny tricks. Several times I would find one or two, or even all four, flat in the morning. Examination revealed no punctures. When pumped up they seemed all right. Even the valves perfectly tight. After several such experiences I discovered that it only happened after very cold nights. This, I take it, contracts some part of the valve so that it leaks. When pumping, the compressed air heats the valve to tightness again, and, of course, while running there is no trouble. I think this is the explanation of the trouble which was described in a recent issue (February 21) of this paper. The reason Mr. Davis can find no leaks when his tube is blown up and placed under water is that the very process of blowing up has cured the leak, as indicated above. Certainly it must be some generally acting cause, or it would not affect five tubes at once.

EXPANSION AND CONTRACTION.

Of frame and running gear there is not much to say. I think, however, that metal when thoroughly chilled is much more brittle than normally. Such few breaks as I have experienced have always come in bitter weather. Nuts loosen up in the intervening warm spells, and must have attention. This I believe is due to the longitudinal contraction of the bolt in the extreme cold. This compresses the parts upon which bolt head and nut engage. In the subsequent expansion with a warm spell this compression does not keep pace with the bolt, and the nut is left free to back off, if not cotter pinned. Even if a castellated nut is pinned it is generally possible under these circumstances to turn it up another slot, and that one slot may be the difference between rattle and quiet. Bolts are sometimes broken by this contraction. Only recently an acquaintance of mine started his single cylinder motor after a bitter cold snap, and the first explosion drove the pis-

ton rod through the crank case and caused a few similar trifling damages. Examination revealed a broken bolt in the crank pin bearing. Coincidence perhaps. But that motor was running perfectly just before the cold wave, and the damage was done on the first explosion afterward.

BODIES.

Cold weather makes one important difference to bodies. Their paint and varnish suffer to a very great degree if water (especially if it is muddy) is allowed to freeze upon them. This is not always preventable, even by prompt cleaning, but is entirely so if the body is gone over once in a while with waste dampened with kerosene. Oil does not in my experience harm the varnish, and some elbow grease will remove it before the summer's dust causes it to become a nuisance.

LAMPS.

My oil lamps work just as well in cold weather as in summer, and need no extra care. So do the gas lamps, but there being so much more heat generated in them, for the sake of my lens mirrors, I take pains to leave the fronts open when I light them and raise the flames slowly. When all condensed moisture has evaporated it is safe to close them and give them a full head of pressure. My generator is filled with a mixture of wood alcohol one part, water three parts, and has never frozen. In summer I use a one to six mixture of the same ingredients. It works better than plain water, especially in non-clogging of burner tips. Why, I do not know.

Ignition is but little affected by reduced temperature. In make and break mechanisms those parts which are wholly or in part spring actuated may lag through stiffness of lubricant. This may cause a few missed explosions at first, but the trouble vanishes as the motor warms up. If it is so bad as to prevent starting, a few drops of gasoline will set things right. In high tension systems commutator springs may be embarrassed in the same way. Same remedy.

MOTOR STARTING.

Starting the motor may become a strenuous undertaking from other causes. I use an 800 degree fire test oil in my cylinders and crank case all the year round. On cold mornings it is like vaseline or butter, and it is all I want to do to move the pistons. These and the main bearings I loosen up with gasoline delivered from an ordinary squirt can. The extreme accessibility of my motor makes it a quick and easy job. When the motor is free I expect it to start on the first or second compression. It generally does, and on the magneto at that. If not, I try once on the battery. If, as very rarely happens, I am again unsuccessful, I insert the nozzle of my gasoline can into a spring covered hole in the inlet pipe and inject a few drops. Then, off she goes. After this séance, which, all told, may last five minutes, I expect the motor to start on the first or second compression all day, even if standing idle two or three hours. My expectation is justified. I can't say as much for some air coolers which I have frequent opportunity to observe. Air cooled motors seem to cool down to zero in ten minutes' idleness in cold weather. Then they are balky. I may be mistaken, and if so I hope to be corrected; but I've seen it take an hour to start a motor which had been idle but fifteen minutes. The batteries were O. K., and it ran all right after the first few explosions. The job was to get those explosions.

My carburetor is jacketed and heated by a by-pass from the exhaust. Practically it works at a nearly even temperature winter and summer. If the air is very cold and wet it does not vaporize all the gasoline, and some, in liquid form, remains in the inlet pipe. This is noticeable in no way until the car strikes some considerable grade, when No. 1 cylinder, which is nearest the carburetor, misses for several revolutions and black smoke comes from the muffler. As the front of the car rises to the grade the gasoline in the inlet pipe runs back to the mixing chamber, and the excessively rich mixture resulting is not attenuated in the inlet pipe enough to ignite until it passes the first cylinder. This is a curiosity rather than a trouble. All in all, I don't know that I've got a carburetor. I couldn't say as much for my first.

LUBRICATION.

To my mind the most important thing to be considered in cold weather running is lubrication. The design of this system in the car's economy makes all the difference between success and failure. In my car each cylinder has its own pressure cup, the pressure coming from the exhaust, which is led from the cylinder itself through the base of the cup to the top. There are no valves but the piston itself. These cups are but an inch or so from the motor, and, like it, run hot. There is practically no tubing. The action is automatic and positive, and can be accurately regulated. It is dependable. The oil reaches the piston during its stroke up and down, and for part of the up stroke is squirted into the channel of the piston rod, whence it is rocked through oil holes to the wrist and crank pin. From these three sources it goes to maintain the level in the crank case, where it is splashed into channels through which it runs to spouts from which it drops upon the main and cam shaft bearings and two to one gears. Under these latter is a standpipe which takes care of a possible excess. This system needs attention only in regard to the supply in the cups, and works when the engine does, without regard to outside temperature. The rest of the car is lubricated with graphite and grease, and needs as much and no more care in warm as in cold weather. Unless such a system is yours, I know of just one way you can avoid inconvenience and disaster: keep your barn warm. I'd do it anyhow, if I could. It's a cure for many ills besides those of lubrication. Lighter oils than one uses in summer help in one way, but must be used with greater liberality. Expense and a dirty car are the result. The question of winter lubrication is bigger than the cooling problem, and, with the growing use of the car in winter, it must receive more attention from the designers. I know of several excellent cars which cannot go on the road in cold weather, though their lubricating systems leave nothing to be desired in warm. Long piping is the main reason. Tubes of too small lumen is another. To run, a car must be oiled. It's hard to overdo and easy to underdo it. Too much means waste and dirt, but too little means disaster.

COOLING.

Finally, the cooling system. I've said all I have to say about air cooling. It's good in summer, but too good in winter. I prefer water. I have had no experience with anti-freeze mixtures. My cars can be drained to the last drop. If yours cannot, I should advise redesigning until they can. It is a good feature in any weather. It means a free, easy circulation and no air pockets. Water is cheap, and it is easy to handle a hose. If by good luck you are able to attach the other end of that hose to a hot water faucet, almost all the troubles of cold weather motoring fade away like mist. In my car there is but one point in the circulation where freezing is likely to occur in under three hours' standing. This is the one point where the piping is below the sills. Only once has this frozen so the water would not circulate. I have slipped a small rubber tube over the drain cock of the pump, in order to lead the water clear of the frame. Starting the motor and directing a stream from this tube upon the spot thawed it at once.

As I described in the "Doctors' Number," the circulation of this car is double. Thermo-siphon from tank to jackets to tank. Forced from tank to pump to radiator to tank. The maker, who is proud of the winter ability of his car, advises the removal of pump, piping and radiator in winter, so dispensing with the secondary circulation and relying on the primary alone. Now, I thought I knew more than this man who assisted at the birth of the modern automobile, and this piece of foolishness on my part led to an experience which I would have declared impossible had I not had personal knowledge of it.

I had a small operation to perform at an old Revolutionary road house on the water's edge some 9 or 10 miles to the south of us. For 6 or 8 miles the road runs in a general north and south line over salt meadows. A good macadam road bed. It was one of the two days this winter when our thermometers have touched zero, and the wind was high and from the north. I put the machine under the hotel shed and covered the radiator with a horse blanket. Was in the house about an hour. When starting for home I was very careful, owing to the extreme cold. I opened all drain cocks. They all bled. I started the motor

on the first compression. The radiator grew warm all over at once. Everything O. K., I made a quick, comfortable trip over the meadows, exposed to the full force of the strong north wind. Reached home, alighted, took my usual tour of inspection, placed my bare hand on the radiator, on top where it should be hottest. It was stone cold. Investigation showed it was frozen solid. I hurried to a public garage which is warm, turned a stream of cold water on the radiator, and soon discovered damages to the extent of but one small leak. Pump and everything else in apple pie order. I follow the maker's advice now. A tank of water diminishes a third in one day's running. On very cold days it does not boil at all.

This was all true of my first car, which had natural circulation and could be drained perfectly. But the lubrication gave me trouble. The engine was oiled by splash, and it worked all right if there was oil enough, but the pump, which was satisfactory enough in warm weather, would not work at all in cold, and every 15 or 20 miles I had to stop and squirt oil into the crank case with a gun.

CONCLUSIONS.

Such are the results of my experience. I think that winter work is harder on the car than summer. But if you want to run in cold weather do so, and get the fun out of it to pay for the slightly increased effort. I have to run, and I expect my car to give as good service as in summer, and am willing to pay the price. As a matter of fact, I think that unless a car is ideally housed, it deteriorates less while in winter commission than if idle.

No one is more fond of fussing about an automobile than I. But I confess working over it in a cold barn goes against the grain. All cars need attention all the time, and even to the enthusiast there comes a temptation to slight it in the winter.

As compared with horses, the winter car is a success. I've been towed (not this winter), but never on account of road conditions, and once I towed a team and truck up an asphalt hill slippery with sleet. On the other hand, I've had to shovel through drifts those same horses would have hardly noticed.

The Items of Cost and Convenience.

By Dr. C. E. Ferguson.

I have used my auto every day not only this winter, but every winter since I started to use the horseless carriage. I am now wearing out my second car, a ———, which is notoriously expensive on account of its inaccessibility. As an example, I had a stud worth 75 cents put in last month, and the time amounted to $13, making $13.75 all told.

For the last three years I have kept an accurate account of expense and distance covered. I keep the car in a shed at the rear of my lot, so do not have to pay for storage, and am able to use my car at all times of the night. And it is very convenient at 2 or 3 a. m., when you have a mile or so to go. I can cover the ground in about one-third the time I could with a horse, judging from experience. I therefore have a great deal more time in which to read, or rest, etc. I also find that, as I am consequently in my office more hours in the day, I get and can attend to a great many more emergency cases than I could if using a horse.

As regards cost, I will append a table, showing the cost for one year when the car was new, and the cost with the same care after two years' use. Also a table of costs with a later model of the same make. I travel about 6,500 miles each year; not by guesswork but by odometer.

Under the head repairs is included everything, such as oil cans, tools, bolts, side curtains, spark plugs, etc. Also cleaning, painting and varnishing. My car is always kept in the best of condition. In fact my old car ran better the day I sold it than when I bought it. Will here append a table showing total running expense for each year since 1900:

1901	$175.50
1902	222.00
1903	211.25
1904	173.00
1905	191.95

As regards use in cold weather no trouble will be experienced if a solution of calcium chloride is used for cooling purposes. If the chemically pure chloride is used very little rusting results. The oil cup or tank should be filled each day with just enough oil to last for that day. And the oil should be heated before filling the cup if the car is kept in a cold place. By heating the oil it will flow correctly until the engine gets warm.

In London a motor omnibus driver was recently fined 10 shillings for driving at 16 miles per hour. The defense presented testimony that the motors were fitted with governors making it impossible to go at more than 12 miles per hour, but a public carriage office inspector said that eight out of nine buses inspected were fitted with mechanical contrivances which counteracted the governors (accelerators?). It was also shown that the governors could be tampered with, as a notice was posted at the omnibus company's works threatening dismissal to any driver who did it.

YEAR 1900-1901. NEW CAR, 1900 MODEL. CAR TWO MONTHS OLD.

	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Gasoline	$3.00	$3.50	$3.00	$2.00	$4.00	$5.50	$4.50	$2.50	$5.00	$3.50	$3.50	$4.00
Tires	....	2.00	5.00	....	1.00	2.00	8.00	10.00	1.00	....	1.00	4.00
Repairs	2.25	5.50	2.00	6.00	6.00	17.25	7.50	10.00	20.00	8.50	....	3.00
Batteries	....	1.00	....	2.00	....	....	1.00	....	....	2.00	2.00	....
Totals	$5.25	$12.00	$10.00	$10.00	$11.00	$24.75	$21.00	$22.50	$26.00	$14.00	$6.50	$11.00

SAME CAR. 1903.

Gasoline	$3.00	$3.00	$3.50	$5.00	$4.00	$2.50	$6.00	$4.50	$4.00	$2.00	$8.00	$3.00
Tires	4.00	5.00	5.00	1.00	1.00	1.00	15.00	3.50	12.50	3.00	....	1.00
Repairs	5.00	3.00	7.00	9.00	11.00	14.00	..	9.00	6.50	12.00	19.50	7.25
Batteries	1.00	....	....	2.00	....	....	2.00	....	2.00	....	....	1.00
Totals	$13.00	$11.00	$15.50	$17.00	$16.00	$17.50	$23.00	$17.00	$25.00	$17.00	$27.50	$12.25

Total cost year 1901, $175.50
Total cost, 1903, $211.25.

NEW CAR, 1904 MODEL.

	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Gasoline	$6.50	$3.00	$2.00	$3.00	$8.50	$3.00	$3.50	$4.00	$6.50	$5.00	$6.00	$4.75
Tires	....	....	....	12.00	....	13.50	....	3.00	....	1.00	2.00	2.50
Repairs	23.00	10.25	15.00	13.00	2.25	1.25	13.25	5.25	10.50	2.00	.75	11.75
Batteries	....	....	1.00	....	1.00	....	....	....	2.00	....	1.00	....
Totals	$29.50	$13.25	$18.00	$28.00	$11.75	$17.75	$16.75	$12.25	$19.00	$8.00	$9.75	$19.00

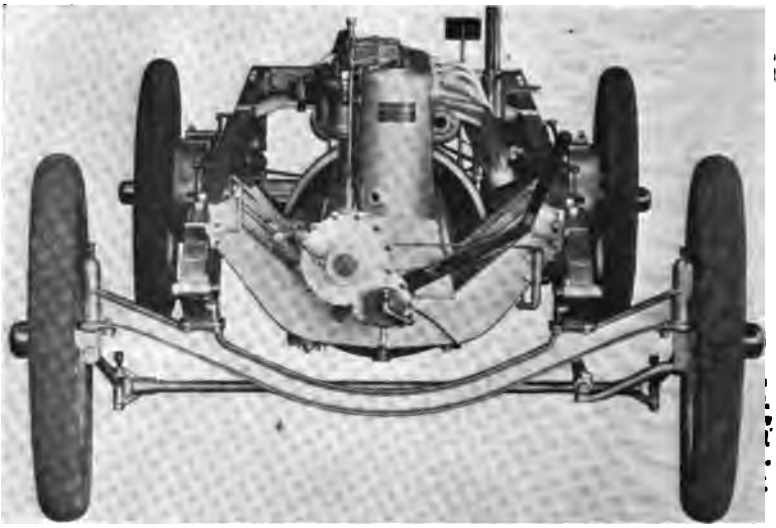
Total for year 1904, $173.

NEW VEHICLES AND PARTS.

The Northern 1906 Four Cylinder Touring Car.

The Northern Motor Car Company, of Detroit, have this year added a four cylinder car to their line, which heretofore consisted of a single cylinder runabout and a double opposed cylinder touring car. The new four cylinder car is of quite original design, its most striking features being the following: The service brakes and clutch are operated by compressed air; all four cylinders and the upper half of the crank chamber are a single casting; there are no side control levers; the motor is started by a ratchet lever with an automatic spark retarding contrivance; the enclosed cam gears are used as a circulating pump.

The chief specifications of the car are as follows: Motor, four cylinders in one piece, vertical and water cooled, 4½ inch bore by 5 inch stroke, rated at 30 horse power; jump spark ignition from storage battery; shaft drive with only one universal joint; three speed and reverse sliding gear on the rear axle; 112 inch wheel base; 54 inch tread; 32 inch wheels with 4 inch tires; side entrance tonneau body accommodating five passengers. The weight of the car is 2,250 pounds.



FRONT VIEW OF NORTHERN CHASSIS.

MOTOR CONSTRUCTION.

The one piece casting forming the four cylinders is of gray iron, and the cylinders, before being machined, are heated to a dull red and galvanized inside and out, including the inside of the water jackets. This prevents the inside of the jackets from rusting, removes all undue strains in the metal (as the heating and subsequent cooling effectively anneals the casting) and fixes any loose particles of grit or sand which may remain after cleaning, preventing them from lodging in the pipes, radiator or pump, though little sand is likely to remain, as every casting is thoroughly pickled in fluorhydric acid, which is claimed to dissolve the sand, and thus remove it. After each operation the castings are tested under hydraulic pressure, and it has been found that the galvanizing process is very effective in closing the pores of the metal, making perfectly tight water jackets.

The multiple cylinder casting is first planed along the base, making a flat surface, which is then bolted against the vertical surface of a large jig and the whole clamped to a double boring mill, which bores two alternate cylinders in one operation. The table is then shifted and the other two cylinders are bored. This method insures accuracy in the distances between the bores and in the perpendicularity of the bores to the base. After all the holes have been drilled and tapped the cylinders are tested under 40 pounds hydraulic pressure. They are then placed in a special jig, with their base against a flat plate and located accurately by dowel pins. The jig is then clamped to a Heald grinding machine and the bores are finished to the exact size. During this process all loose grit and emery is removed by two suction pipes, which are placed in the openings in the heads over the valves. On each side of the crank case upper half are two hand holes extending the entire length of the case. The lower half is of aluminum, and is cast to form not only the supporting arms, but a continuous pan, the outer edge of which is lipped and rests on the frame. At the rear this base casting extends backward and forms a flywheel shield. On the right side of the engine the pan is formed into two communicating oil reservoirs, each with a cork float and an outlet into the crank case. The latter is divided into two parts by a central web supporting the middle bearing. On the cover of the oil reservoir is a gauge showing the amount of oil in the tank. Between the upper and lower halves of the case is placed a fibre gasket.

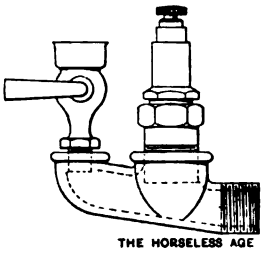
The gray iron pistons have a slightly concaved head and carry three step jointed, eccentric, pinned rings above the piston pin. These rings are ground on the outside, after being cut open, and are fitted to the slots by grinding on a magnetic chuck grinder. An oil groove is cut around the centre of the piston and carries oil into the hollow wrist pin. This pin is of carbon steel, hollow, case hardened and ground. The connecting rods are I section manganese bronze castings, bronze bushed at the upper end, split on one side and cap screw clamped, the sleeve being prevented from rotating by a small set screw on the opposite side. The lower bushing is divided, and the cap is hinged and held by a bolt with a flat sided head and two lock nuts. A fibre liner is used. The crank shaft is a carbon steel drop forging, finished all over, with integral flywheel flange. The shaft is drilled hollow from end to end for the air to pass through to operate the clutch. It runs in three divided babbitt bearings set up with a fibre shim.

The cam shaft with its eight cams is of carbon steel, case hardened and offset one-eighth inch from the centre line of the push rods, to reduce the side thrust in opening the valves. Similarly the crank shaft is offset three-quarter inch from the centre plane of the cylinders, to reduce the side thrust on the cylinder walls. The valves being in the heads, long, thin push rods, with rollers at their lower ends, are used to operate the rocker arms on top. To prevents its turning, the rod is fitted with a key which slides in a groove or spline in the steel guides. The two adjacent guides



NORTHERN FOUR CYLINDER TOURING CAR.

are held by a bronze yoke and single nut on a stud from the crank case. The upper end of the rod is a five-sixteenth inch cold rolled piece, hexagonal near the bottom, to facilitate screwing it into the lower end of the rod. On top of the engine casting are bosses carrying a pivot pin for the valve rocker arms, one end of which presses down on top of the valve stem, and the other end is thimbled and fits loosely over the upper end of the push rods. Short conical helix springs are used on both valves, and held by a cupped washer and pin through the valve stems. The valves are set into cast iron valve cages which fit into the top of the cylinder casting, and are made tight by copper-asbestos gaskets at top and bottom. The valve heads are of cast iron, with stems of steel pressed into the head and riveted. The spark plugs are placed in the side near the top, in a pipe with an elbow, as shown in the drawing.



SPARK PLUG FITTING.

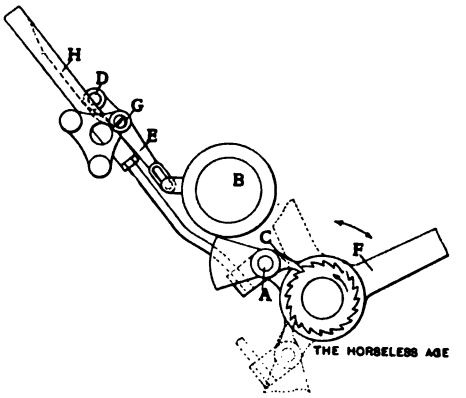
CIRCULATION SYSTEM.

Water enters the jacket (which extends the entire length of the cylinders) at the bottom in front and leaves on top in the rear. The cam gears are of Parsons bronze with six pitch stub teeth, are encased in a bronze housing and form the water circulating pump, giving the usual circulation from the radiator through the engine jacket and back again. The front end of the engine shaft extends forward under and in front of the radiator, and the gears and case, forming the pump, are assembled as a unit and then slipped over the end of the engine shaft. The gear on the engine shaft has a long hub, which fits over a key in the engine shaft, and has a bearing in the pump casing. The cam shaft gear is on a small shaft of its own, the rear end of which carries a Woodruff key fitting into a keyway in a sleeve on the end of the cam shaft, to make a permanent coupling. The water enters the case at one side, and passes between the gears and out at the other side to the engine jacket. On each side of the small gear is cut a groove which catches any water leaking by the side of the gears, and allows it to return through an opening in the case on the suction side, so that there is no tendency for this leakage to pass out through the stuffing boxes. This has been found to operate so successfully that there is practically no leakage, even with stuffing boxes adjusted loose.

IGNITION.

The jump spark is produced by storage batteries carried under the tonneau seat, and a quadruple coil on the dash. The timer is of the Lacoste roller type, ball bearing, and placed on the front end of the cam shaft extension, and the plugs are not inserted directly into the cylinders, but into an elbow shaped tube, as shown in the drawing. This protects them from oil, and the narrow openings and bent tube apparently do not in the least detract from the certainty of the ignition. The carburetor is of the float feed type, with centre nozzle and auxiliary air inlet of special design, which has been found to work well on the engine. The 16 gallon galvanized iron gasoline tank is fastened to the body under the front seat.

The exhaust pipe is a single rolled iron casting connected by an iron pipe to the large double muffler. The exhaust passes into one section of the muffler and through into a second. Each of these is practically a hollow cylinder of 5 inches diameter by about 40 inches in length, which gives an enormous volume, compared to the usual type.



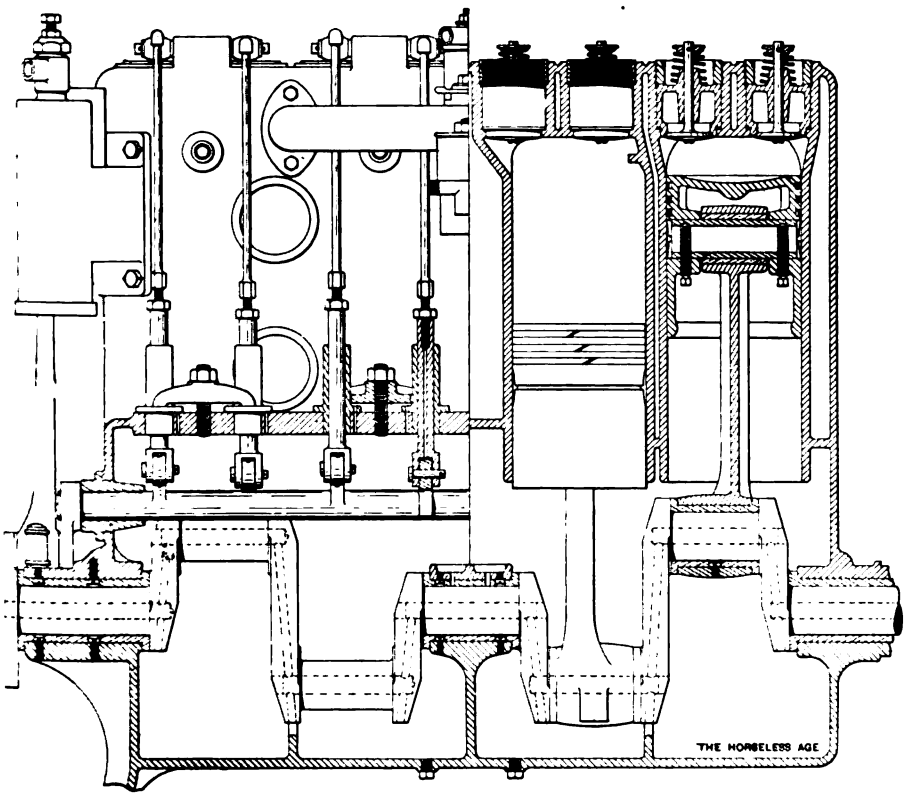
SAFETY STARTER.

STARTING DEVICE.

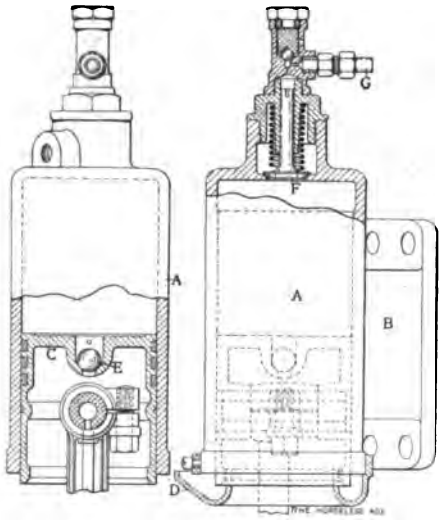
The starting device is unique. It consists of a lever pivoted on the shaft, and a ratchet and pawl so connected that pulling the lever through an arc of about 90 degrees throws the engine over. The lever is so arranged that before taking its grip on the shaft it retards the spark, making a back kick impossible. An illustration of the mechanism is shown in the accompanying drawing. Lever F, pivoted on the engine shaft, carries at its end the weighted pawl C, which is pivoted at A. When the lever is thrown over to the left the pivot centre of the pawl C moves into a position below the ratchet, and consequently a pull on the lever to the right now throws over the engine, and the pawl disengages. At the stationary point G is pivoted the two armed lever D E, the slotted end of which rotates the timer, and the other end of which carries a steel roller, which works in a slot on the back of a flattened rod connected to the end of the starting handle. This rod rolls on two small steel wheels carried on a triangular frame, also pivoted at G. As the starting handle is moved to get its grip it pulls downward on the flattened rod so that the part H of the slot in its back raises lever D, the other end E of which throws the timer over to a retarded position.

AIR PUMP.

The air control system comprises a plunge pump on the rear of the engine casting, operated by a channel section

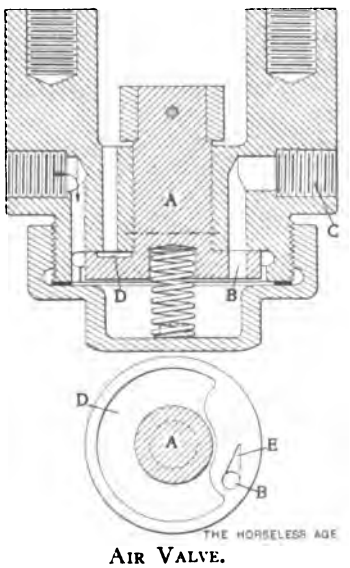


NORTHERN MOTOR.



AIR PUMP.

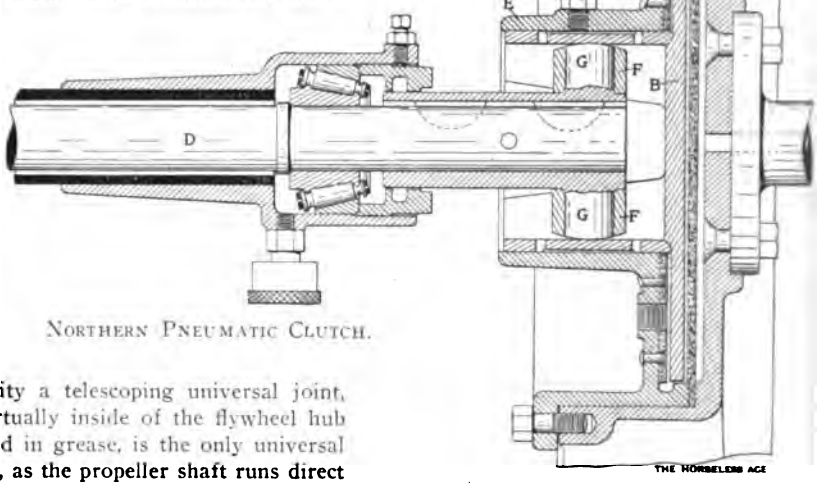
bronze connecting rod from a small crank on the rear end of the cam shaft, as shown in the drawing. The cylinder A is secured to the engine casting by cap screws, through flange B, and the piston C is practically like a gas engine piston, of 2¼ inch diameter and 3 inch stroke. The piston is fitted with three regular eccentric rings above the hollow pin. At the bottom of the cylinder is a cup shaped piece D containing felt saturated in oil, into which the bottom edge of the piston dips. The oil is carried up the walls by means of an oil groove cut around the piston, and into the hollow piston pin and to the bearing. The surplus then passes down through a hole in the connecting rod to the crank end. The ball inlet valve E is located in the head of the piston. The air is forced through a regular poppet valve F in the cylinder head through a pipe G to two three-way disc valves, one of which controls the air brakes and the other of which connects by a pipe to the engine shaft, the end of the pipe running in a sleeve about 3 inches long, which, with the oil, makes a tight joint. The air passes through the hollow shaft and operates the clutch. By a connection to the pump cylinder near the bottom of the stroke a feeding pressure of about 1 pound per square inch is derived for the gasoline tank under the front seat.



AIR VALVE.

THE CLUTCH.

The pneumatic clutch is contained in the flywheel, and consists of a leather disc A of about 11 inches diameter, which is made fast all around its edge to a drum on the inside of the flywheel, so that it turns with the wheel. Back of it is a small chamber into which the air enters, and the leather is bulged out in a similar way to a diaphragm valve. It presses against a steel plate B, which is forced over against a leather ring C fastened rigidly to the flywheel. Thus the steel plate B is pinched between the two leather plates and made to turn with the flywheel. This steel plate drives the propeller shaft D. Its hub E has two longitudinal slots cut in it, into which fit squared blocks F F on the ends of two pins G G projecting from the end of the propeller shaft. This combination, which is in reality a telescoping universal joint, and is virtually inside of the flywheel hub and packed in grease, is the only universal joint used, as the propeller shaft runs direct into the transmission case, which is part of the rear axle casting. The flywheel has fan shaped spokes, and is the only fan used to draw air through the radiator.

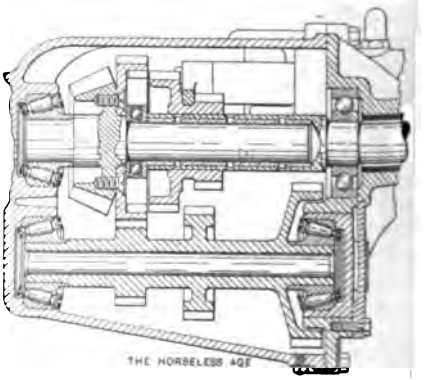


NORTHERN PNEUMATIC CLUTCH.

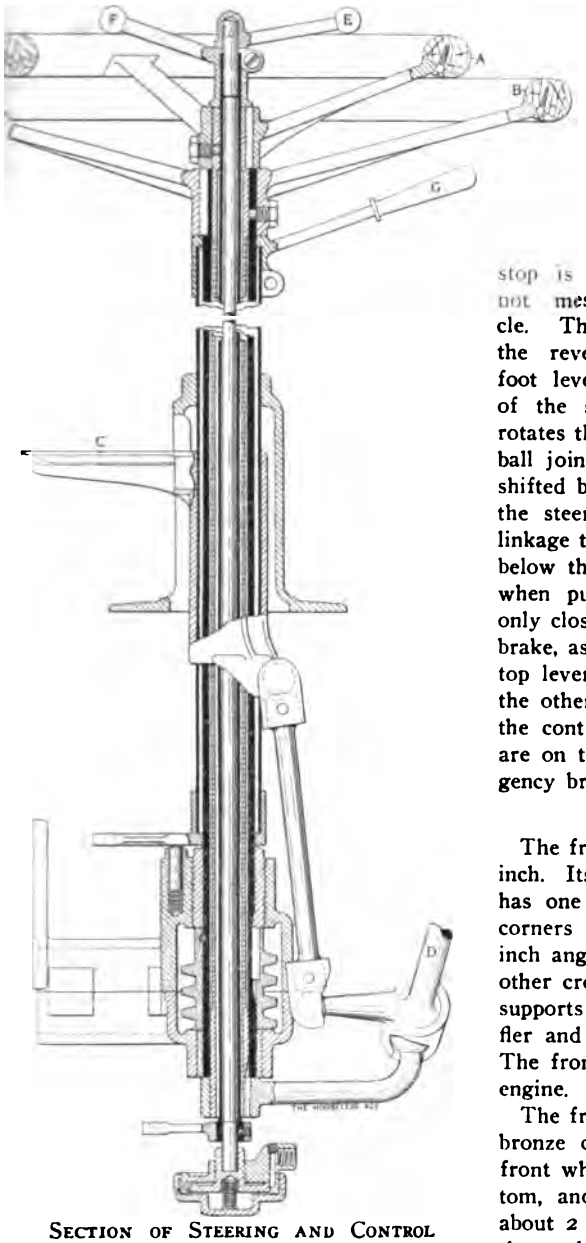
The clutch is controlled by means of a small lever on top of the steering wheel, which controls a three-way air valve, shown in the cut. By moving the lever the central piece A of the valve is rotated so that the hole B in it coincides with an opening C to the clutch. Air enters the valve at the opposite side and passing down fills the chamber at the bottom around the spring and passes out through B and C to the clutch, when the lever is moved to A, so that the hole B no longer registers with the outlet. When in this position the air already in the clutch is allowed to escape, as the inner end of the opening C is now over an annular depression D, and this annular groove communicates with the atmosphere. The slot E is provided to gradually allow the air to pass to the clutch, before the passage B exactly registers with C. This prevents the clutch from gripping suddenly, as would be the case if the full pressure were admitted at once. No pressure tank is used, the pump connecting directly with this clutch valve and with another similar valve which admits the air pressure to a small cylinder which controls the rear wheel brakes. The brake cylinder is shown in the drawing. This brake i applied by moving the throttle lever jus under the wheel to its extreme backwar position. By this arrangement the first mo tion in applying the air brake throttles th engine, but the clutch must be disengage separately, as it is not interconnected wit either brake. When air is admitted to th little cylinder the plunger moves along to apply the outside contracting, belting faced steel bands upon the rear hub drums. These drums are pressed steel, bolted through the spokes and hub flanges. When the air pressure is released the plunger returns under the action of the stiff spring shown. The inside expanding bands of similar construction are operated by a foot pedal. Steel rods are used to pull the brakes.

CHANGE GEAR.

The change gear case is cast integral with the middle portion of the rear axle casing. The lay shaft is below the main, squared shaft, on which a double sliding pinion moves. This square shaft is hollow and



CHANGE SPEED GEAR.



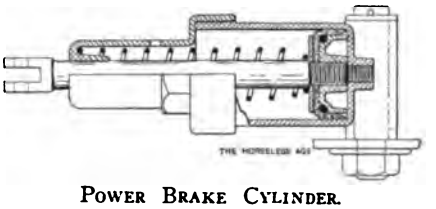
SECTION OF STEERING AND CONTROL COLUMN.

fitted with a bronze bushing forced into it, forming the bearing for the shaft, which carries the bevel pinion and the internal gear. This long bushing maintains the alignment, and is oiled by holes through the squared shaft. The drawing illustrates the gear arrangement. When the sliding gear pair is moved to the left one of them meshes with the internal, and the whole gear is locked, giving the high speed or direct drive. The three gears below are all integral and bored out hollow, as shown. These gears run on two Timken bearings, one at each end. Moving the pair to the right, so the larger gear meshes with the middle one on the lower shaft, gives the intermediate speed, and moving it still further to the right, so that the middle one meshes with the large gear on the lower shaft, gives the low speed. The gear shifting rod is held at each speed by a spring pressed pin which fits into a slot. This gear shifting rod carries on an arm an idler gear (not shown), which is wide enough to mesh with both of the extreme right hand gears at once. When the rod is in the proper position for reverse, and at no other time, the retaining pin comes opposite a slot in the casing, and the rod can be rotated slightly, which rolls this idler gear into mesh with the other two, thus reversing the motion. A stop is arranged so that the idler cannot mesh deeper than its pitch circle. The rotating of this shaft giving the reverse is accomplished by a small foot lever which projects from the base of the steering column, as shown. This rotates the shifting gear rod by means of a ball jointed linkage. The other gears are shifted by the small hand wheel on top of the steering wheel through a sleeve and linkage to the gear shifting rod. The lever below the wheel controls the throttle, and when pulled into a reverse position not only closes the throttle but applies the air brake, as previously described. Of the two top levers the left controls the timer and the other the air valve to the clutch. All the control devices, giving seven motions, are on the column, as shown. The emergency brake pedal is ratchet retained.

RUNNING GEAR.

The frame is made of angle steel, 2x3x¼ inch. Its side members are straight, and it has one cross member at the rear. The corners are stiffened by pieces of 6x6x⅜ inch angle iron riveted to the frame. Another cross member of 1½x1½ inch angle supports the forward end of the long muffler and stiffens the middle of the frame. The front end is sufficiently braced by the engine.

The front axle is an I section manganese bronze casting of Lemoine pattern. The front wheels are set in slightly at the bottom, and the steering heads are also set about 2 degrees from the vertical, so that the tendency is to run straight ahead when free. The central part of the rear axle is a ribbed aluminum casting forming part of the change gear case. The axle casings are 3½ inch Shelby steel tubes with three-sixteenth inch walls. These tubes are ground to size and are fitted into the middle housings by a 6 ton hydraulic press. They are not fastened in any other way. The live axle shafts are of 1½ inch carbon steel and run in Timken roller bearings. The wheels are straight, key and nut retained. No truss rod is used.



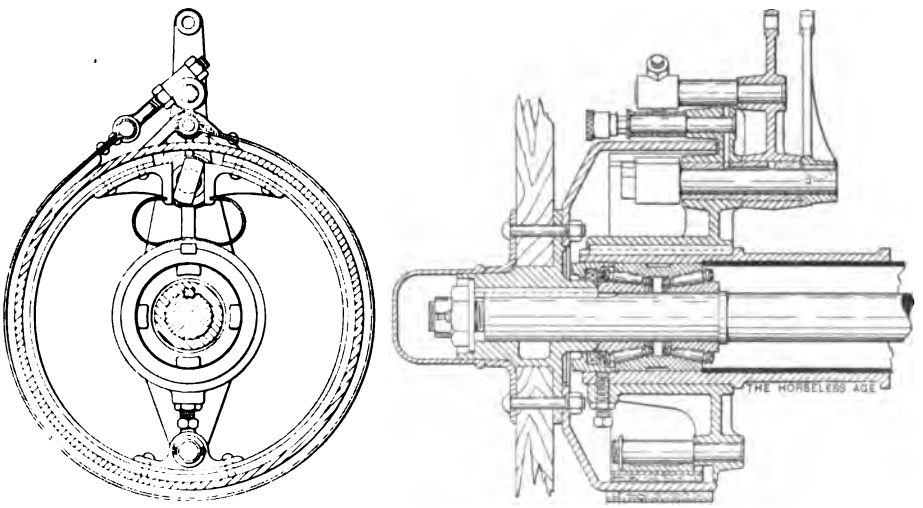
POWER BRAKE CYLINDER.

The same sized full elliptic springs are used at both the front and rear. They are 2 inches wide by 36 inches long, placed on top of the axle and under the frame. The rear spring supporting saddle is offset to rest on the rear axle as close as possible to the supporting bearing of the wheel.

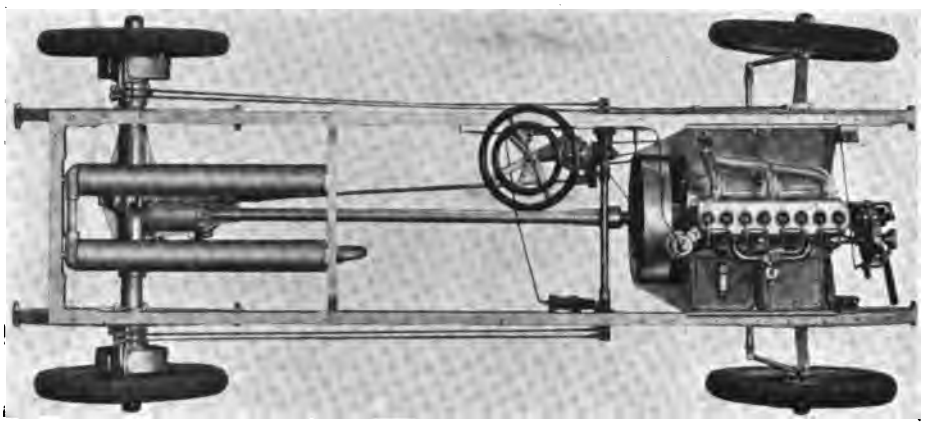
CONTROL.

The entire control system is arranged on the steering column, which is on the left side. There are no side levers on the car. The wheel was placed on the left after careful study of the subject. The three forward speeds are controlled by a small hand wheel A just above the steering wheel B, and the reverse by a small foot lever C projecting from the base of the steering column. Both wheel and lever act on a single gear shifting rod D, which runs back to the change speed gears. Above the gear shift wheel on the right is a small spark control lever E, and on the left a similar one, F, which controls the air to the clutch. Just below and on the right of the column is a short lever G, the forward motion of which opens the throttle, and the backward motion of which closes it until the neutral point is reached, when further motion applies the air brakes. The emergency foot brakes on the rear wheels are applied by a pedal. All brakes and gear shifts are independent of the clutch.

A look at the plan view of the chassis will show it to be of clean-cut appearance,



NORTHERN INTERNAL AND EXTERNAL HUB BRAKES.



PLAN OF NORTHERN CHASSIS.

unobstructed by cables, tubes and rods, this being one of the few machines in which the driving shaft runs direct from inside the flywheel to the rear axle. The location of the headlights on top of each of the front metal fenders is also an innovation, but one backed by good reasons, as with the lamps in this raised position the road is better illuminated and the disagreeable long shadows are eliminated. Being directly over the wheel, the lamps light the wheel track and also indicate the true width of the car, making it easier for passing vehicles to judge their distance; they are out of the way when cranking, and more protected from mud and accidental injury by collision with barn doors or walls. The fender is made very rigid.

1906 Haynes Cars.

The Haynes Automobile Company, of Kokomo, Ind., produce two models for 1906. Model R is a large 50 horse power touring car, and Model O a smaller, 30 horse power car, built along similar lines. All important parts are nickel steel, which was first used by Mr. Haynes in his axles as early as 1899. Roller bearings are used throughout the construction, in preference to ball bearings, the only ball bearing in the car being that of the radiator fan. The engine shaft runs on special adjustable roller bearings of Mr. Haynes' invention. The driving bevel pinion is a particular feature, having steel rolls instead of teeth. The clutch is of the contracting band type, and is also distinctive. The usual type of pressed steel frame is employed, but is reinforced from the front for two-thirds of its length by a bent wood sill which fits closely into the pressed steel frame.

The following general description of Model R also covers the smaller machine, except for deviations which will be mentioned. This 50 horse power touring car has a four cylinder vertical engine of 5⅛ inches bore by 6 inches stroke. The crank case of the engine forms the support and rests directly upon the frame; no sub-frame is used. A three speed sliding gear transmission of the usual type is used, which embodies a special feature in that by an arrangement of pawls inside of one of the gears, it is rendered impossible to strip a gear when changing from a higher to a lower speed. The drive is by propeller shaft to the divided rear axle. The wheel base is 108 inches, and the tread 56 inches; the wheels are 34x4½ inches both in front and rear. The seating capacity is five, although there is room for two extra seats if desired. The car weighs complete 2,750 pounds.

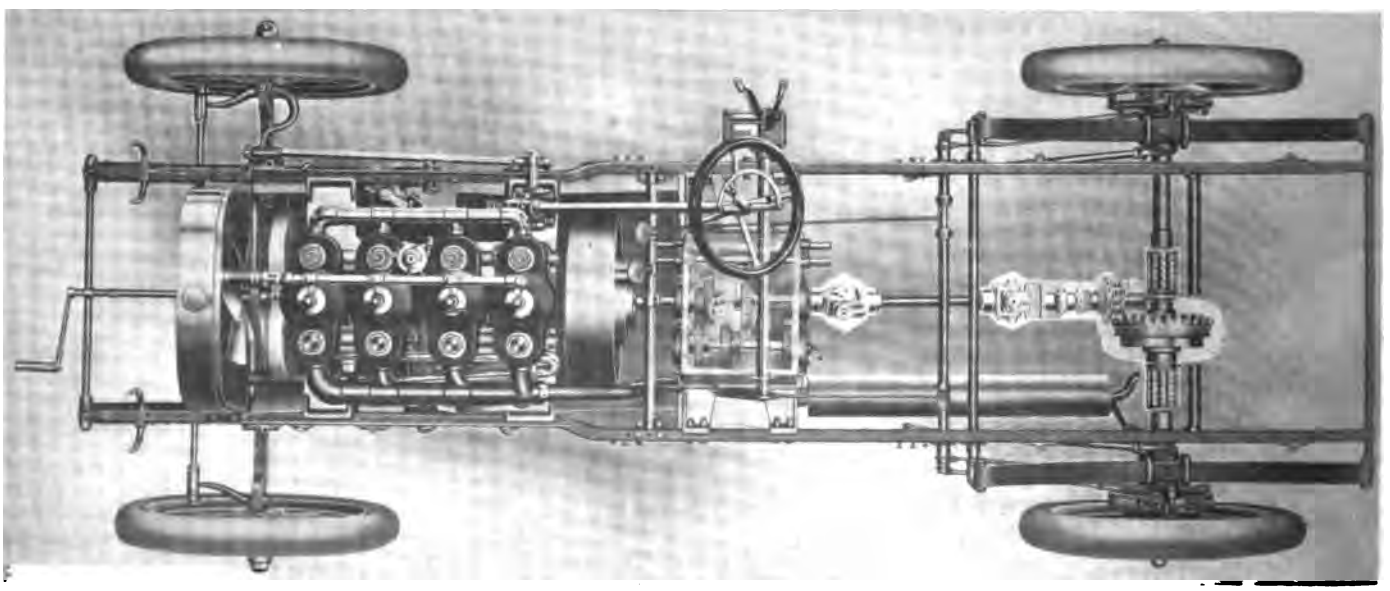
The smaller model has a 30 horse power engine, 4¼x5 inches, with the cylinders cast in pairs, but in other respects practically the same as the 50 horse power engine. It is fitted with 32 inch wheels and 4 inch tires. The wheel base is 97 inches, and weight 2,250 pounds.

BODY.

The bodies of these cars are specially constructed of aluminum castings, backed by wood. The tonneau on the larger car is very roomy, the rear seat being 54 inches wide. Only a partial division is placed between the two front seats. The dash is made of pressed aluminum with curved top. The sheet metal hood is without slats, hinged at the top, and each side doubles and folds back. The usual running boards, brass edged and covered with rubber, are supported on two drop forged steel hangers. The fenders are metal; the front having a large flare and fitting close to the frame; the rear fender is horizontal above the wheel.

MOTOR CONSTRUCTION.

The individual cylinders are the usual gray iron castings, with valve chambers on opposite sides and the water jackets integral. These jackets carry an unusually large body of water, which extends completely around the valve chambers and stems. The exhaust pipes are cap screwed to the left side of the engine, and joined by a union to the pipe which leads to the muffler. This muffler is so constructed that one jet of gas is made to oppose another, and thus reduce the velocity and noise. The brass inlet pipes on the right side of the engine support the Schebler carburetor, which is used on all models. Over the valve chambers are brass screw caps, the spark plugs being screwed into those over the inlet valve. These caps are ground to



PLAN OF CHASSIS OF HAYNES TOURING CAR.

fit, and no gaskets are used. The valves are of nickel steel, in one piece, with very long stems. The usual type of spring is employed and retained by a washer and a notched key through the stem of the valve. The valve lifting rods are of steel, and carry hardened steel rollers at the bottom, the axes of which are flattened at the ends and run in slots in the bronze guides to prevent the rods from turning. The guides are screwed into the aluminum housing which holds the cam shaft in place and is cap screwed to the outside of the case so that it can be quickly removed and the cam shaft taken out. These shafts are made of carbon steel, with the hardened steel cams pinned and brazed in position. At the centre of the cam shaft are mitre gears which drive the vertical timer shaft. These shafts are supported in six white bronze bearings.

The crank case, of the usual two part construction, is cast of aluminum. The upper half supports the bearings and forms arms of large channel section, which rest directly on the frame and support the weight of the engine; the lower half of the case is a dust and oil pan, which may be easily removed, facilitating access to the main bearings and connecting rod ends. The crank shaft is a high carbon steel drop forging, and runs on special adjustable roller bearings. The rollers do not run on the shaft itself, but on a hardened steel sleeve over the shaft. The series of rolls are carried in a cage, and are surrounded by a hardened steel sleeve, which is cut open diagonally; the outside of this sleeve is tapered, and is surrounded by another tapered sleeve fitted in such a way that it can be forced over the hardened split sleeve by a screw collar at the end, and thus reduce the diameter of the circle in which the rollers run. By this means a quick adjustment for wear is provided. Five of these bearings are used on the engine shaft, giving a total bearing length of 19 inches. The connecting rods are I section drop forgings, adjustable at both top and bottom; the top bearing is a bronze sleeve split at one side and retained by a bolt and nut. At the lower end the cap is held by studs from the rod and cottered lock nuts; this bearing is a divided babbitt box flanged at both ends. The pistons are very long, with flat heads, and carry three sets of triple rings in slots above the pin; another single ring passes directly over the end of the wrist pin, to hold it in place. In each slot there are one broad ring (seven-sixteenth inch in width by one-eighth inch in thickness) at the bottom and two narrow rings (each seven-thirty-second inch wide by one-eighth inch thick) over the broad one. The openings of the upper rings are on the opposite side from that of the under ring, and the latter, by its expansion, is in close contact with their under side, and thus prevents any gas which may have leaked through their joints from passing underneath to the other side; thus each piston carries ten rings. This arrangement insures a good fit and holds compression well. The cam



HAYNES 50 HORSE POWER TOURING CAR.

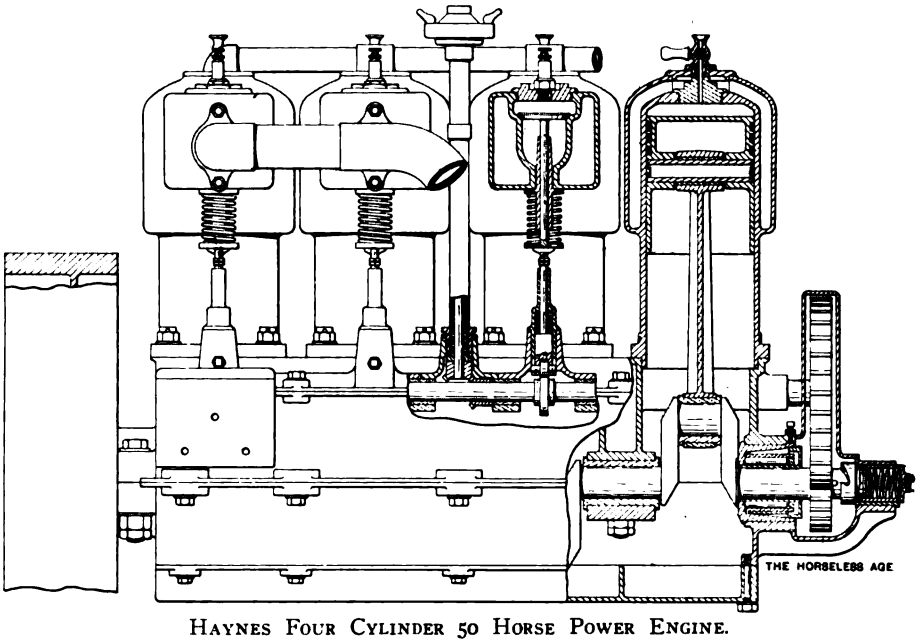
shaft gears are a combination of bronze and fibre, and mesh with a steel gear on the forward end of the engine shaft; they are entirely encased in aluminum and run in oil. The 22 inch flywheel with cast fan blades is keyed on the tapered end of the crank shaft by a large Woodruff key.

COOLING.

On the left side of the engine is an auxiliary shaft, driven by enclosed aluminum spur gears from the middle of the cam shaft. At the forward end of this shaft is a rotary bronze pump, consisting of an outside cylinder, in which rotates a smaller eccentric cylinder with vanes sliding in radial slots on opposite sides. These vanes are spring pressed against the inside walls. A place is cut out for this pump on the forward supporting arm of the engine, and a semi-flexible coupling is inserted in the shaft between the pump and the driving gear. The usual system of circulation is employed, viz., from the radiator through the pump to the lower part of the cylinder jackets on the exhaust side, and out at the top to the radiator, which is of the cellular type. A ball bearing aluminum bladed fan is mounted on a bracket at the rear of the radiator, and is driven by a flat leather belt from a pulley on the exhaust cam shaft.

LUBRICATION.

A McCanna force feed oiler, with separate plungers to each feed pipe, is mounted on the rear supporting arm of the engine at the left hand side, and gear driven from the rear end of the pump shaft. No sight feeds are used on the dash, but bleeder tests are arranged on the oil case for each feed pipe. There are five leads, one to each cylinder, and the fifth to the top of the aluminum case over the gears which drive the pump shaft. The oil which enters at this point supplies the crank case, which has splash lubrication. The bottom of this case is divided by three small partitions into four compartments. At the bottom of each are two drain cocks, one being connected to a short standpipe on the inside, for testing the oil level in the case, and the other being intended for draining the case. The cam shafts and main bearings are taken care of by the splash, the main bearings, being rollers, of course requiring but very little oil. The ends of the connecting rods are drilled with oil holes, and receive oil by dipping



HAYNES FOUR CYLINDER 50 HORSE POWER ENGINE.



HAYNES BAND CLUTCH.

in the basin. The hollow wrist pins scrape their oil from the cylinder walls.

IGNITION.

Ignition is by jump spark from a storage battery located under the rear seat. A quadruple vibrating coil is located on the dash, and the wires lead through insulating tubes in the dashboard to long fibre tubes supported on top of the engine, and thence to the timer and plugs. This timer is of the Lacoste type, and runs on ball bearings at the upper end of the vertical shaft above mentioned.

CLUTCH.

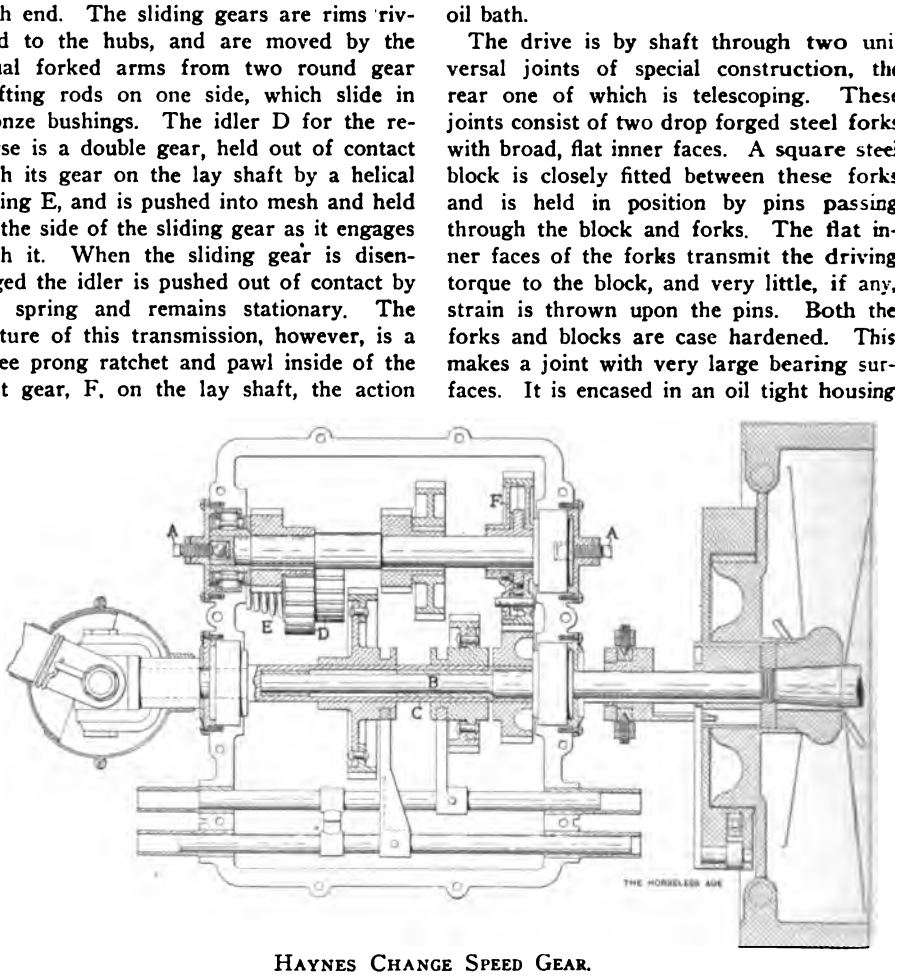
In the accompanying photo is shown a view of the contracting band clutch. The band A of this clutch is steel, and the drum B is a bronze casting with integral forked arms C C, which are driven by lugs on the outside of the flywheel, which fit between the forked arm ends. Between the lugs and the forked ends heavy coiled springs are interposed, which effectively relieve the strain if the power is suddenly applied. This drum is 10¼ inches in diameter and has a 1⅞ inch face; its hub is turned to a bearing for the end of the crank shaft. The loose steel band A enclosing this drum is diagonally split, one end being attached to an arm D extending from its hub, and the other end to a lever E, which contracts the band on the drum when moved by a cam F controlled by a foot pedal. As the drum is driven by the flywheel and the hub of the contracting band is keyed to the transmission shaft, the power of the engine can be gradually applied as the band is contracted, and the car started smoothly and without a sudden jump. This metal to metal clutch is extremely smooth in its action, and has a long life. It can be instantly adjusted by tightening or loosening a single set screw G, which can be reached by raising one of the footboards. The clutch hub is fitted with a grease cup H. The spring connection between the clutch arms and the flywheel lugs provides flexibility.

TRANSMISSION.

The three speed and reverse sliding gear transmission runs on the same special adjustable roller bearings as used in the engine. The divided case is of aluminum, the under side carrying the four supporting arms, while the top is removable, leaving the shafts and bearings in place. This top is fitted with a large circular cover held by a hand wheel clamp. As in the case of the engine, the arms rest directly on the side frame members. The shaft and gears are all made of nickel steel.

The end play of the lay shaft is taken up by a set screw A and lock nut, which abuts against the hardened steel ball which bears on a hardened steel washer against the end of the shaft. The clutch shaft B is tapered and extends for about 11 inches inside of the hollow square shaft C, upon which two shifting gears slide; it runs in two bronze bushings, separated about 3⅝ inches, one at each end. The sliding gears are rims riveted to the hubs, and are moved by the usual forked arms from two round gear shifting rods on one side, which slide in bronze bushings. The idler D for the reverse is a double gear, held out of contact with its gear on the lay shaft by a helical spring E, and is pushed into mesh and held by the side of the sliding gear as it engages with it. When the sliding gear is disengaged the idler is pushed out of contact by the spring and remains stationary. The feature of this transmission, however, is a three prong ratchet and pawl inside of the first gear, F, on the lay shaft, the action of which is very similar to a coaster brake, and allows the car, if on any speed but the high, to coast whenever its speed would drive the gear faster than the engine would drive it. This device relieves the gears and driving mechanism of the tremendous strain thrown upon them by carelessly shifting from a high speed into a lower before the car has slowed down to a corresponding speed. With this arrangement it is impossible to strip a gear in passing from a high to a lower speed; but this is in a measure offset by the loss of the use of the engine as a brake on any but the high gear, which is the usual direct drive. The hub of this gear is separate and keyed to the lay shaft. This hub has a flanged rim carrying three ratchet teeth, which are engaged by three flat spring pressed pawls carried by the gear. Whenever the hub, which is practically part of the lay shaft, is rotating faster than the engine is driving the gear, the teeth leave the pawls, but when the gear and its pawls start to go faster than the hub the pawls engage. To prevent the noise of the pawls dropping into the ratchet when the hub is moving faster than the gear, a thin plate with a camlike edge engages pins in the pawls and holds them out of contact. This plate is between the cover and the hub flange, and by friction is either retarded or advanced as far as will be allowed by a pin from the gear cover working in a slot in the plate. All gears are of 1¼ inch face, and run in an oil bath.

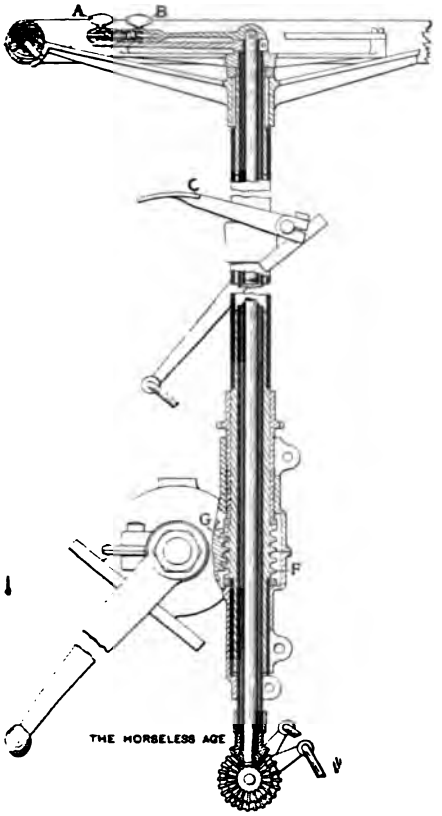
The drive is by shaft through two universal joints of special construction, the rear one of which is telescoping. These joints consist of two drop forged steel forks with broad, flat inner faces. A square steel block is closely fitted between these forks and is held in position by pins passing through the block and forks. The flat inner faces of the forks transmit the driving torque to the block, and very little, if any, strain is thrown upon the pins. Both the forks and blocks are case hardened. This makes a joint with very large bearing surfaces. It is encased in an oil tight housing and packed in grease. The driving shaft is of special steel, 1¼ inches in diameter, and encased in a tube. The bearings of this shaft and throughout the rear axle are Hyatt rollers.



HAYNES CHANGE SPEED GEAR.

ROLLER PINION AND REAR AXLE.

A short shaft extends from the rear universal joint and carries at its end the driving pinion, which has hardened steel rollers instead of teeth. This pinion shaft is supported at the forward end by double Timken roller bearings, and at the rear end by a plain bearing. The teeth on the bevel gear are somewhat sprocket shaped, to mesh with the rollers. It is claimed by the makers that after 6,000 miles running the



HAYNES STEERING COLUMN.

rolls and teeth were barely polished. The bevel pinion's rollers and pins are hardened. The live axle consists of a 1½ inch shaft of nickel steel, encased in steel tubes. One wheel is keyed to the outer end of this steel shaft, the other to a close fitting steel sleeve over the shaft. This construction will be made clear by a study of the accompanying drawing.

FRONT AXLE AND STEERING GEAR.

The front axle is of the approved I beam construction, and is forged of nickel steel in a single piece, the spring saddles and ends being integral. The steering arms and wheel spindles are also forged in one piece. The steering links and connections all have adjustable ball and socket joints. The cross link is in front of the axle. The front wheels run on Timken roller bearings. The steering gear is of the worm and sector type, both the worm F and the sector G being made of bronze; the sector is set in eccentric bearings for taking up the wear. The housing is a bronze casting rigidly supported on the rear engine supporting arm.

CONTROL AND BRAKES.

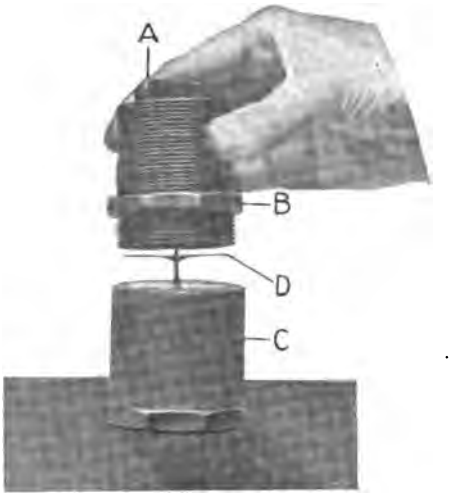
The spark and throttle levers A and B are placed on a stationary notched arc on the steering wheel. A small accelerator pedal, the motion of which is independent of the wheel setting, projects from the dashboard. Of the two foot pedals, the left operates the clutch, while the right one, C, controls the rear wheel contracting band brakes, which are metal to metal. On the right of the car is the shifting gear lever, working in an H slot on the selective principle, and also a pull lever working on a ratchet quadrant, which controls the emergency brake, which is a steel band expending inside the rear wheel drums. Both of these brakes disengage the clutch. The connections to these brakes are by flexible cable.

The Philadelphia Grease Cup.

This cup, made by the Philadelphia Lubricator and Manufacturing Company, 1525 Land Title Building, Philadelphia, is specially adapted for use on automobiles. The feeding force is compressed air, for which is claimed a truly automatic action, with reliability in operation and economy in time, attention and lubricant. One feature about this cup that makes it desirable for automobile service is that it can be filled and "set" at any time most convenient, and when the machinery starts (whether right after filling or days thereafter) the cup at once begins its action. When the journal stops the cup stops feeding without further attention, there being no spring or other mechanism to release.

In operation the lower part of the cup C is filled with grease; the upper part A is screwed down into the part C one-fourth of its length and secured with the lock nut B, the cup then having what is called the first set. The disc D is so connected that it moves freely without friction, turns with the part A and keeps the grease level in the cup without exerting any pressure thereon other than its own weight, which is comparatively small. In screwing down the upper part into the grease the enclosed air is compressed sufficiently to feed the grease for a considerable time, varying according to the nature of the place and condition of the journal, after which a turn of the part A every day or two suffices to maintain the feed until the cup is empty.

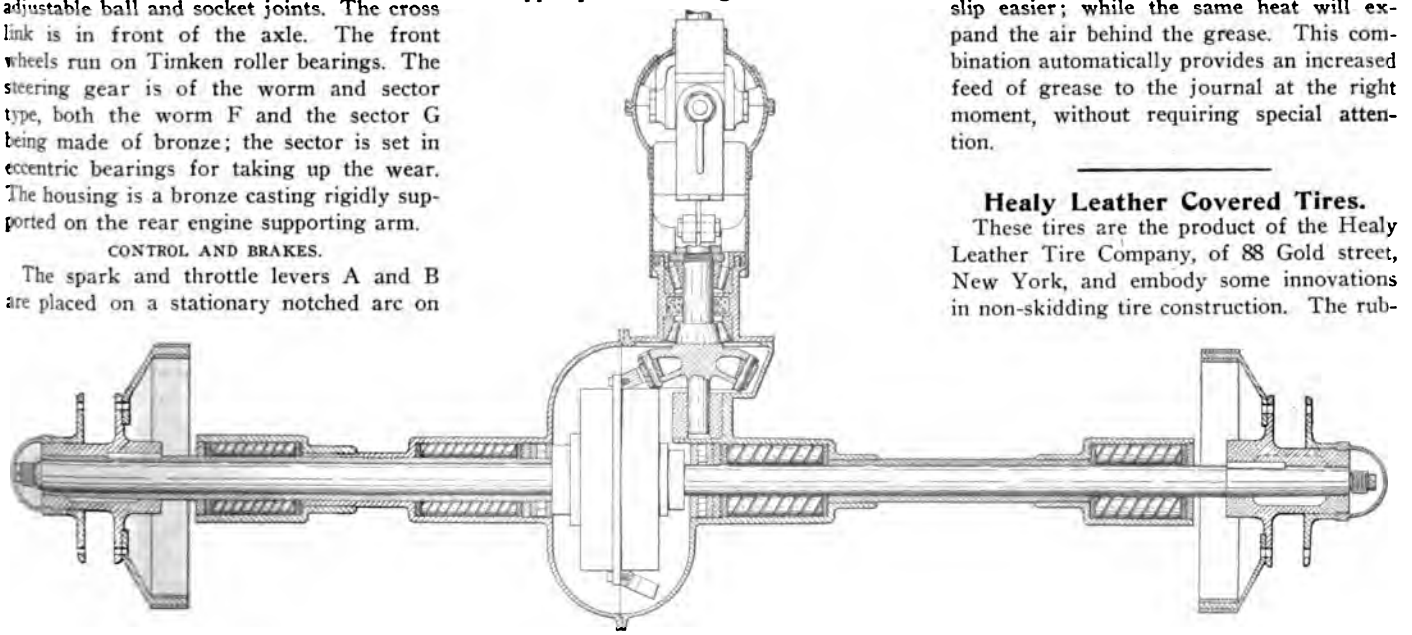
In the bottom of the cup is a funnel which draws the grease by an easy incline to the centre. The neck of this funnel is perforated, so that when the part A is screwed all the way down and the disc D rests on the top of the funnel, thus sealing it from the air pressure, the grease around the funnel will continue to feed by pressure through the perforations to the central outlet, leaving in the funnel a surplus of grease that cannot be fed out by pressure, but must be drawn out by gravity or heat, or a combination of both, the object being that if from any cause the cup cannot be at once refilled, the surplus grease in the funnel will be amply sufficient to properly lubricate the journal until the refilling is done. Should heat generate, it will follow up the funnel in the cup, thus making a warm incline down which the grease will slip easier; while the same heat will expand the air behind the grease. This combination automatically provides an increased feed of grease to the journal at the right moment, without requiring special attention.



THE PHILADELPHIA GREASE CUP.

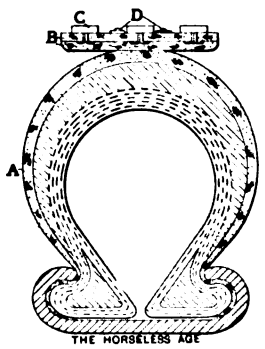
Healy Leather Covered Tires.

These tires are the product of the Healy Leather Tire Company, of 88 Gold street, New York, and embody some innovations in non-skidding tire construction. The rub-



HAYNES ROLLER PINION DRIVE AND REAR AXLE.

ber shoe is entirely covered by a piece of leather A, clinching under the rim, which is claimed to prevent any peeling, rim cutting or blow-outs, and to prolong the life of the tire. To this cover are fastened, by means of copper rivets D, two flat leather strips B, forming the tread of the tire and which contain steel buttons C, similar in appear-

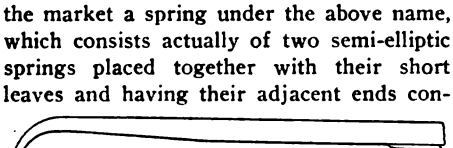


HEALY LEATHER COVERED TIRES.

ance to those generally used in anti-skid tires. The construction, however, is quite different, for the buttons are only contained in the upper half of the tread, and therefore do not touch the rubber nor injure it by conducting to it the heat produced by friction when going at a fast pace. Another important feature of the Healy covering is said to be that it can be applied to an old and practically useless tire of any make, making it almost equal to new.

The Napoleon Counteracting Auto Spring.

The Oil Tempering Spring Company, of Chicopee Falls, Mass., have placed upon the market a spring under the above name, which consists actually of two semi-elliptic springs placed together with their short leaves and having their adjacent ends con-



NAPOLEON SPRING.

nected by adjustable links. It is obvious that such an arrangement tends to prevent the breaking of the main leaf of the main spring. The design is due to Napoleon St. Francis, manager of the company, and a patent on it has been applied for.

New Book.

We have received a copy of the Handbook of the Automobile, by Chas. E. Duryea, published by the American Motor League, New York. It contains chapters on the selection and care of cars, and is specially written for the benefit of amateurs. Practically no illustrations are used. The book is written in plain, direct style, and is free from unnecessary technicalities. It is bound in cloth, of convenient size for the pocket, and contains 135 pages of text.

OUR FOREIGN EXCHANGES.

Motor Buses in Berlin.

The first service of motor omnibuses to be established in the German capital runs through the heart of the city and is owned by the Berliner Allgemeine Omnibus-Gesellschaft, which formerly conducted it by horse traction. The line was opened only a few weeks ago, and already the Gesellschaft has applied for permission to run similar buses over seven other important lines. So rapid a conversion of its system was certainly never contemplated originally by the omnibus company, but the directors found themselves suddenly confronted with a powerful competitor in the Grosse Berliner Strassenbahn-Gesellschaft, which proposes to supplement and consolidate its existing system of electric cars by motor omnibuses, and therefore decided to get the advantage of a start on the steel railway company.

Agreement Between the A. C. G. B. and I. and the Motor Union.

A couple of years ago the Automobile Club of Great Britain and Ireland founded the Motor Union, for all those motorists of the United Kingdom who wished to enjoy the benefits of membership in a strong body of automobilists, but who did not care for the social features of the club. Since that time the Motor Union has become a very large organization, with a membership extending throughout the British Isles, and troubles have occasionally arisen regarding the relationship of the club to the union. An attempt has now been made to settle these troubles once for all by entering into an agreement according to which the relations of the two bodies will be regulated by a standing joint committee consisting of five members nominated by each, with the chairman, while the secretaries of the club and of the union will be joint secretaries of this committee.

The club will contribute every year to the union such a sum as may be determined by the committee of the club on the recommendation of the joint committee, and the club will also make a yearly grant to the Legal and Legislative Defense Fund of the union. Every member of the club will be a full member of the union, and on every member the club will pay to the union a yearly capitation grant. The union will uphold and assist the club in any disciplinary measures which the club may think desirable for dealing with the conduct of automobilists as such, and the club will refer cases of prosecution to the union and shall support its action. The union will uphold the authority of the club in all matters affecting trials and competitions of mechanically propelled vehicles, and the club undertakes that the members of the union shal in open trials and competitions have th same right to compete and on the sam terms as the members of the club, if thes can be secured. In order to secure th efficient organization of all motorists, al agreements with provincial and local clubs or any other organization of motorists, fo affiliation to and membership of the unio and for affiliation to the club, will be nego tiated by the union in the names of bot bodies. This arrangement, however, wil not limit the right of the Automobile Clu to make independent supplementary agree ments with the national clubs of Scotlan and Ireland on any matters which are no assigned to the union or the joint commit tee. The present agreement may be ter minated by either party on giving si months' notice, to expire at the end of an year subsequent to 1906.

Regulation of Automobiles in France.

In consequence of the number of automobile accidents in France, the Home Office and the Ministry of Public Works have decided to submit to the Conseil d'Etat a new scheme for the regulation of motor cars and their drivers. The chief feature of the proposed regulations relates to the drivers, who will be placed under certain restrictions as to qualification and age, according to the horse power of the machine. Each applicant must also produce a certificate from a doctor to the effect that he is not suffering from any disease that might make it dangerous for the public safety that he should be intrusted with the conduct of an automobile. Each motor car must show, where it can be easily seen, a plate bearing the name and address of the constructor and the type and power of the engine, and another plate showing the name of the owner and the number assigned to him by the licensing authority. This latter number must be shown in front and at the back of the machine, and be visible both by day and night. Infringements of the rules are punishable by fine or imprisonment, and also by the withdrawal of the certificates of the offending drivers.

British Exhibits at Canadian Shows.

Recently a delegate for the two automobile shows to be held in Canada this spring visited England to induce English firms to exhibit. As a result quite a number of English cars will be shown at these Canadian exhibitions, but the only way to secure the exhibits was to purchase them outright.

A strike is on at the Bollée automobile factory in Le Mans, France. Every day, at the usual hour for beginning work, the strikers parade with red flags before the doors of the works and sing "L'Internationale," with accompaniment of trumpet and drum.

COMMUNICATIONS

Garage Practice.

ditor HORSELESS AGE:

I was much interested in your editorial n co-operative garages. Theoretically the -operative scheme looks good, but some- w the American people don't seem to ke kindly to it. The evils you speak of, vercharging and incompetence, certainly exist, but a great deal of what might be nsidered incompetence is simply bad anagement. In almost every large repair op there are some good men who can ork anywhere or on any machine, and if foreman thoroughly understands his busi- ss and the handling of men he can so ace his men that each one is fitted for the b. I do not believe in charging the same ice for all machinists' work done on a g, as some get more pay than others, but ually each man's time goes in at the same te per hour, whether he gets 30, 35 or 40 nts per hour, and I have known lots of ses where the helper's and washer's time as charged for at the same rate per hour that of the highest paid machinist. An- ther thing that doesn't seem right is to arge the regular rate per hour where a an has his machine given general repairs r a complete overhauling, as it usually kes several days and sometimes weeks.

There are lots of owners who don't know good mechanic when they see one, and I ave frequently known them to send for ne of the helpers or the washer, thinking ey were getting the best man in the shop, ecause he put on a lot of wise looks when e scarcely knew a spark plug from a ton- eau door latch.

What seems strange to me is that, with e large number of cars sold on the Pa- ific Coast, so few parts are carried in tock by the agencies. It is a serious mis- ake, and causes much inconvenience to ourists who are on the Coast for a limited me for pleasure. O. V. H.

Against Retaliative Measures.

Editor HORSELESS AGE:

The enclosed clipping from the *Farm ournal*, of Philadelphia, shows that the ampaign is still active. In a communica- ion in your paper one of your subscribers uggests a campaign of retaliation by insist- ng that the laws regulating horse driven ehicles be enforced; that they carry lights, se wide tires, etc. It does not seem to he writer that this kind of a campaign ould be the best thing under the circum- tances. It seems to me that as automo- ilists are in the minority so far as num- ers are concerned, the best campaign would e to insist that our own people observe he laws and go out of their way to favor he other side. In other words, "more flies re caught by molasses than vinegar."

THE HORSELESS AGE has always been on this side of the question, but I think the great importance of the matter has not been brought home to operators as it should have been, and as it certainly will be if our reckless drivers are not kept within bounds by some means or other.

FRANK R. MILLER.

An English Method of Cylinder Finishing.

Editor HORSELESS AGE:

The accompanying photo shows a cylinder grinding and polishing machine used in the Napier Works for grinding and polishing. The main point in connection with this arrangement is that the cylinders are polished and ground while subjected to the action of heat; this is a small matter, but a very important one, for the idea is to grind and polish the cylinders when under the conditions they will be in actual usage.

In the left hand corner of the photo are cylinders A waiting to be ground and polished. B is a tank filled with water and heated to the boiling point by burner C, which will be noticed protruding from under the tank. D is a circulating pump, which drives the hot water through pipe E to the water jacket of the cylinder F, which is secured in position on the machine, ready for being ground and polished. G is a pipe that leads the hot water back to the tank. When the machine is in operation the water in the tank is heated to the boiling point, is pumped along the pipe to the bottom of the water jacket, and is then led back into the tank, being kept in constant circulation, and the temperature of the cylinder being thus maintained at the boiling point.

Referring now more particularly to the machine itself, the arm H is set eccentrically to, but takes a path concentric with, the walls of the cylinder. There is a revolving shaft inside this arm carrying the polishing wheel, which revolves with a peripheral speed of 3,700 feet per minute. The arm itself traverses slowly round the walls, and at the same time is automatically fed into the cylinders.

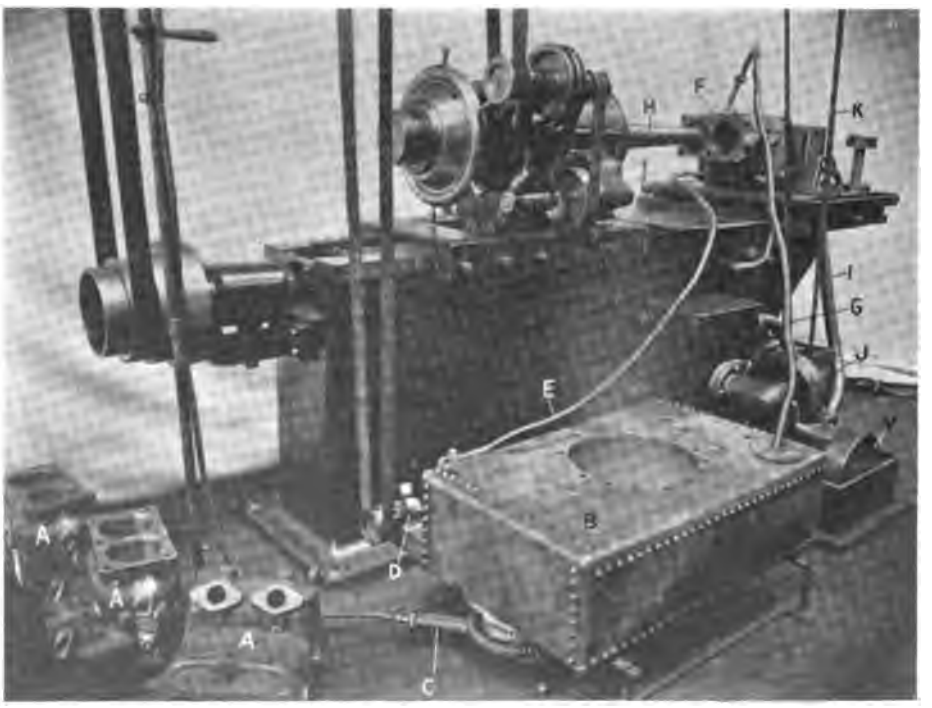
Emery wheels are not used for polishing the cylinders, as particles of emery are apt to become embodied in the walls of the cylinder, which would be bad for the piston. "Corundum" wheels are used with the very best results. [What becomes of the particles of "corundum"?—ED.]

Leading from the top of the cylinder to the fan J is a pipe I. The fan is driven by the belt K at great speed and sucks all the particles of dust and metal that are given off in the process of polishing out of the cylinder. This is important, as, unless these particles are cleared away as formed, the result is not nearly as good. The air and dust delivered from the fan are led to a water bath L, so that dust is not allowed to float about the shop and thus be harmful to other machinery and the men. The general haziness of the middle of the photograph is caused by steam rising from the water bath. S. F. EDGE.

Spark Plugs in Series—Recharging Storage Batteries from House Lighting.

Editor HORSELESS AGE:

I was rather surprised to read the statement recently in THE HORSELESS AGE that it was not good practice to use one coil to spark a double opposed gasoline engine. My first car, purchased in 1901, had a double opposed engine and two spark coils, and one or the other of these coils would al-



NAPIER CYLINDER GRINDING METHOD.

ways give a weaker spark than the other, and cause some trouble when the plugs were more or less covered with soot. Each of these coils was grounded on one side of the secondary to the engine frame, and one day when some distance from home one of these ground wires broke and was too short to splice again, so I simply cut that coil out and by removing the other ground wire had sufficient insulated cable to connect one coil in series with the two plugs. That engine never ran better than it did after that change, and while I had intended to repair the wiring on my return home, the results indicated that it was best to let well enough alone. That engine was operated on one coil until last spring, when I disposed of it. My present car has a double opposed engine, and shortly after receiving it I changed its ignition system so that one coil would spark both cylinders. I have noted that with good spark plugs, thus operated in series, it is not necessary to clean the porcelains or lava ends. Mine have been used for months without any care, and rarely miss an explosion, and when they do, it is due to weak battery or poor mixture.

After using all of the various makes of dry cells on the market, and having the usual luck with them, I at last purchased a six volt storage battery, and my troubles are at an end, so far as a supply of current is concerned. My home is lighted with electricity, and when the battery begins to show signs of weakness I attach it in series with a 32 candle power lamp and leave it in the circuit overnight. As it may puzzle some to know which wire to connect to each pole of the battery, I will state a simple rule or experiment that will always enable one to put the battery correctly in circuit. If you cut one of the wires leading to an electric lamp and dip the ends into a vessel of water, many bubbles will be seen to form about one terminal and few about the other; now connect the wire showing the most bubbles to the pole of the battery marked N and the other wire to the pole marked P, and the lamp will not burn as brightly as before, showing that some of the energy is being forced into the storage cell. Of course, it is understood that storage cells can only be thus charged by direct current lighting systems.

ALBERT BARNES, M. M. E.

Low Tension and High Tension Magnetos.

Editor HORSELESS AGE:

Will you kindly inform me through the columns of your paper the difference in the wiring of the armature of a low tension and a high tension magneto? Generally speaking, what is the difference between a high and low tension magneto? Does a high tension magneto generate a high tension current? Would a low tension magneto be changed to a high tension one if a commutator and distributer was added?

R. T. ALCUTT.

[All so called high tension magnetos generate a low tension current in their armature winding, which is then transformed into a high tension current by means of a coil. In the Simms-Bosch high tension magneto the coil is placed right on the armature, the regular armature winding serving as the primary, and a secondary, fine wire winding being wound on top of it. With all other high tension magnetos a plain coil is used—that is, one without vibrator. The armature winding, primary of the coil and interrupter are connected in circuit, and the secondary of the coil is connected through the high tension distributer to the plugs. The winding of a high tension and low tension magneto armature is practically the same, and by adding to a low tension magneto an interrupter, a half speed shaft with high tension distributer, and a condenser, you have a high tension magneto, which is used in connection with a single plain coil.—ED.]

Tire Repair Articles.

Editor HORSELESS AGE:

Will you kindly publish the following questions in your magazine, to be answered by either you or your readers?

1. What experience have you had, if any, with tire vulcanizers of the type advertised to be suitable for use by owners or those not equipped with full facilities for tire repairing? In your judgment would they be a satisfactory proposition? I refer, of course, to the small appliance for repairing small cuts in the shoe, inner tube, etc.

2. What is your opinion of the "acid cure" preparations advertised for vulcanizing without heat? Has anyone had experience with this sort of thing? H. R. S.

Wear and Tear Due to Hill Climbing.

Editor HORSELESS AGE:

I have driven a light automobile for three years, and have traveled many miles in a section of New York State where the grades run as high as 22 per cent., and where long grades of 15 per cent are not uncommon, but I have never been able to decide whether, for an automobile that is properly designed and managed, hill climbing is more injurious than running on the level. Suppose a certain car that is adequately cooled under all circumstances can develop 10 horse power, and is able when using its full power to run 30 miles an hour on the high speed on the level, and when using its full power can run 10 miles an hour on its low speed on a certain hill. Suppose such a car, having the throttle and spark so set as to run 20 miles an hour on the high speed on the level, climbs a hill where it makes a little less than 7 miles an hour on the low speed, with the spark somewhat retarded and the throttle unchanged. Under such circumstances I should think the car would receive less injury in climbing the hill at 7 miles an hour than in running 20 miles an hour on the level; for the retarding of the spark on the hill would tend to relieve the engine of the larger number of revolutions per minute of tires and wheels and the increased jolting due to the higher speed on the level would cause additional wear. Furthermore, if the driver would resist his desire to advance the spark and open the throttle I do not see how the automobile would receive unusual wear however steep the hill climbed, unless the speed of the engine became greatly reduced. Excepting for the wear on the low speed mechanism, I should think a car would receive greater benefit from being run to its limit on the level than on a hill.

Is the low speed mechanism from the point of view of hill climbing the weakest member of the up to date car? When the grades are very steep is the slide or friction transmission better than the planetary for a light runabout? What is the shaft drive and chains to do with this problem? Is the chief injury in hill climbing due to engine racing? Is there any difficulty in designing a water cooled car that it will not overheat on long hills? With good roads are not tires injured more in a given time on hills than on the level if in both cases the same amount of power is used? Need there be an essential difference in wear and tear in climbing a 10 per cent. and a 20 per cent. hill if the motor has power enough? Where are the greatest strains in hill climbing? R. P. St. J.

[Such comparisons as you ask for are absolutely impossible, as the wear on the different parts is different under the different conditions, and there is no way of summing them up. For instance, when running on the high gear there is no wear on the change speed gear at all, but owing to the higher speed the springs, frame, wheels and other supporting parts are subjected to extra stresses, and we do not see how the different things can be balanced against each other, or compared in any way. Of course, it is obvious that with the same engine speed and throttle and ignition setting the wear on the engine and transmission gear is less when driving on the level than when driving up a hill than when driving on the high gear on the level. We believe that the above example does not furnish a fair comparison between the wear and tear due to driving up hills and on the level respectively. The average man will hardly drive his car up to its limit on the level; on the contrary, the motor will mostly be run on part throttle, in other words, light. In climbing a hill, on the other hand, the motor is often slowed down to a very low speed, and a large part of it is subjected to exceptional strains. The chains and driving gears, moreover, are also loaded much heavier than normal.

If the engine has plenty of power and the transmission parts are sufficiently strong, hill climbing ought not to cause any unusual wear.

The change speed and driving gears are probably the weakest members of

le cars so far as hill climbing is con-ned. Which is the best type of change ed gear for hilly country has not yet n decided. The type of drive used is of consequence. There is no difficulty in king the cooling facilities sufficient for worst possible case of hill climbing. It es practically twice the effort to move ar up a 20 per cent. grade as up a 10 per t grade, and as the driving force has to transmitted by the tires, they are nat-lly submitted to greater stresses on the per grade. Where the chief strains are hill climbing depends somewhat on the ign of the car, but in general they are the parts which transmit the power—nk shaft, clutch, change gear, drive ft, chains and wheels.—ED.]

Cars for Country Use.

itor HORSELESS AGE:

have often wondered why manufactur-insisted on using such small wheels and ting the body of the car so near the und. That may do very well in cities, in the country, where the roads are r, as in the Southern States, it is an im-sibility to run a car with only 6 to 8 hes clearance under the differential and er low parts of the frame. Extended ntry touring can never be popular in this tion (Mississippi) until cars are built th larger wheels. Only recently I saw o well known cars with the rear axles lly twisted and bent by coming in con-t with large stones and other obstruc-ns in the roads. To meet the conditions these roads I have recently constructed eral cars, with 34 inch wheels fitted with inch solid rubber tires, and supplied th 10 horse power engines of the double posed type. By the use of side springs feet long I have secured a very easy ing car and a very flexible gear. These n do not weigh over 1,100 pounds, and reason of the large engine power can n on high gear all of the time, as their erage speed is only 15 miles per hour. some of the new cars on the market uld discard their 28 inch bicycle wheels, d use a carriage wheel of some reason-le height, they would come nearer meet-g the needs of the people of the country stricts, who desire a moderate priced car sensible construction.

ALBERT BARNES, M. M. E.

A Mistake Corrected.

itor HORSELESS AGE:

Seeing in your issue of March 28 a iticism of my article "Winter Driving tisfactorily Solved," I wish to state at there was a mistake in the last para-aph of the article, to which my critic fers, viz., that the distance covered in ree hours, which was given as 38 miles, as only 18 miles. As to the number of lls made, it was not stated that the car d been stopped that number of times, r as many as three calls were made ring one stop. Fifteen of the 18 miles was made on country roads where the "mile in fifteen minutes" ordinance of our town does not apply. I hope that this explanation may be satisfactory to "M. D." The greater part of the drive was in two long runs, and, beside, it is well known that the time consumed in stopping and starting a car is only a fraction of that required for stopping and starting with a horse and buggy. The mistake in the article had escaped my notice until my atention was called to it by "M. D.'s" letter. It may also be pointed out that unnecessary social prolongation of professional calls greatly reduces the amount of work that may be accomplished in a given time, and seriously upsets the advantages of the more rapid vehicle. ALFRED C. SMITH, M. D.

Distance and Efficiency Test.

The board of governors of the A. C. A., at a meeting on March 27, decided to hold an automobile test for distance and efficiency, allowing 2 gallons of gasoline to each car. This will be the first of a series of tests now being arranged by the club for the coming season.

A system of award is to be devised whereby points will be allowed for the weight of car, piston displacement, distance traveled, efficiency shown and other such factors as may be deemed advisable. The committee on policy submitted a report outlining plans for testing the comparative efficiency of alcohol motors, carburetors, dust preventives and other automobile parts.

An effort will be made to give all competing machines an equal chance to show their good points, the main object of the competition being to determine the varying efficiency of the different makes of motor cars. Cars of any size and horse power may enter the competition, but the large cars will not be unduly handicapped by the smaller ones, because weight and piston displacement will be taken into consideration. The competition is open to all stock cars in the world.

Every car will carry an impartial technical observer, who will submit a detailed report. These expert reports, it is thought, will be of unusual value.

In order to stimulate an interest in the competition the club has decided to award prizes as follows: First prize, a gold cup valued at $500; second prize, a silver cup valued at $100; third prize, a medal. Certificates of efficiency will also in all probability be awarded.

The special committee in charge of the competition consists of Dr. Schuyler Skaats Wheeler, Charles G. Curtis and George F. Chamberlin. They are now at work formulating the rules and conditions governing the contest, and will also decide upon the place and date.

The contest will be held the first or second week in May. The cars will start from the clubhouse, and be driven up to Pelham Parkway and along the shore road. The 2 gallons of gasoline will not take the cars very far, and they will be strung out all along the line as the gasoline gives out. It will not, therefore, be necessary to go out in the country to hold the contest.

New York Registrations.

During the first three months of the year 1,580 cars, 180 of which are of foreign construction, were registered in New York State. In March alone 806 new machines were entered in the lists at Albany, as against 453 for the preceding month. Of these 742 were American built cars, while 64 were imported machines. In New Jersey there were 322 registrations for March, giving a total of 15,203 machines. In Massachusetts the March registrations were 371, giving a total of 12,208 automobiles. Though New Jersey has issued more licenses than Massachusetts, there are many more automobiles in the latter State, which does not require tourists to register. The Pennsylvania total registration is 3,168. New York State easily leads all, with a total registration to March 31 of 25,452 automobiles.

Of American machines the leaders in registration for the month are Cadillac, 62; Packard, 42; Autocar, 35; Pope (all makes), 34; Maxwell, 33; Franklin, 32; Locomobile, 29; Winton, 29; Rainier, 26; White, 26; Oldsmobile, 21; Peerless, 19; Stevens-Duryea, 19; E. V. C. (electric), 19; Ford, 18; Reo, 18; Pierce, 18; Royal, 18; Thomas, 15, and Rambler, 13. Among imported cars the Panhard leads with 9 registrations, the Fiat has 7, Martini and Berliet each 5, Rochet-Schneider, Renault, Mercedes and Decauville, each 4, and Clement, De Dietrich, Mors and Hotchkiss, each 3. Eighteen foreign makes are represented in the month's registrations.

Three Cylinder Patent Litigation in France.

An official of a prominent French manufacturer building three cylinder cars writes us asking us for the earliest copy of THE HORSELESS AGE containing a description of a three cylinder gasoline motor, with cranks at 120 degrees, and to state whether such motors were not already in common use in this country prior to 1901, and by which firms. He informs us that an inventor, "one of the sort who discover the sun in broad daylight," decided to take out a French patent in 1901 on a three cylinder motor, with cranks at 120 degrees, in spite of the fact that such motors were already known and exploited at that time. This inventor is now threatening our correspondent's firm with suit.

The Society of Motor Manufacturers and Traders (of Great Britain) have decided to hold two shows next season in the Olympia (London) building, one for pleasure cars and the other for commercial vehicles, the first to be held in November, 1906. and the second, April, 1907.

COMMERCIAL APPLICATIONS

Commercial Vehicles in Buffalo.

There is an excellent outlook for commercial vehicle business at Buffalo the coming season. Business men are waking up to its possibilities and are giving the question serious attention.

The cars in use have generally given satisfaction in regular transfer and delivery work in all kinds of weather the past winter. Some of the trucks were kept in constant service under the most adverse conditions, covering their routes regularly, without intermission, during the recent heavy snow fall.

In this connection it is interesting to note that the big 5 ton electric truck that has been operated several months by the National Battery Company made its regular trips daily through the deep snow, carrying full loads, without the use of chains to prevent slipping. This truck is fitted with 7 inch solid rubber tires, and with a 5 ton load can cover a distance of 2½ miles in twelve minutes, it is claimed. This company has also had a smaller truck in constant service during the past five months.

The local department stores have not yet substituted motor driven delivery wagons for the horse drawn vehicles. Wm. Hengerer Company made a beginning at Christmas time by renting a half ton wagon to relieve the strain of heavy Christmas traffic in connection with suburban deliveries, and we are informed that it gave very satisfactory results. It made three trips daily, and the experiment tended to prove that motor trucks can be used advantageously for light delivery service.

This trial is of special interest to Buffalonians, in view of the fact that some tentative efforts to use light delivery motor trucks have been made heretofore by J. N. Adam & Co., Anderson, Meldrum & Anderson, and the H. A. Meldrum Company. It appears that in each of these instances small vehicles of light capacity were used, and as the cars were not especiallly adapted to the work required of them the results were more or less unsatisfactory.

The Adams Express Company now has nineteen electric trucks in regular service in Buffalo, two new trucks having been installed in December. W. G. Moore, E. E., who has charge of the garage, says that since the company has operated its own plant and furnished its own power for charging the batteries the trucks have been kept in efficient working order at a comparatively small cost. With the exception of one small, closed wagon used for special deliveries, these cars are all of the same type used by the company in other cities, viz., 2,500 pounds capacity. One of these cars is estimated to take the place of five single horses. Since the company has generated its own current the cost of power for each wagon has been reduced to about $6 per month.

The Larkin Soap Company has several gasoline trucks in regular use, besides the electric motor trucks adopted last year, and has obtained good service from them. This concern has found it advisable to establish its own garage, and finds it economical to employ competent help, both in the garage and to drive the trucks. John Larkin, Jr., who has supervision of this part of the company's interests, is an enthusiastic student of the problem of commercial motor development, and is taking special pains to compile reliable figures relating to the cost of up-keep, from the company's experience. He has devised a simple card system for the purpose of obtaining accurate data regarding the actual work done by each truck and its cost of maintenance. The cards are about the size of an ordinary business card, and are ruled uniformly with spaces on one side to record the amount and cost of supplies or repairs charged to the car, and on the other side spaces for the driver's name, the route to be covered by him, the time he leaves the barn and the time he returns, with space to note the cause and length of any unusual delay. Drivers are given a card every time they leave on a trip, one for each trip, and are required to turn the card in, properly filled out upon each return. This system also shows the comparative efficiency of the driver, as indicated by the time occupied in making trips, repairs charged to the account of his truck, etc.

Mr. Larkin attributes the satisfactory experience of his company to the careful selection of trucks adapted to the work to be done, and the efficient provisions made for keeping the cars in first class condition at the company's own garage. They have also made it a point to employ only reliable men, who have been carefully instructed in their duties. He estimates that each of his trucks gives the equivalent in service of at least two teams.

Mr. Larkin recently sent a letter of inquiry to users of commercial motor trucks in various parts of the country asking for information regarding their experience as to the utility and economy of the motor truck for commercial purposes. Out of 135 replies more than 125 were favorable, only five expressing themselves adverse to the use of the motor truck.

Among the local business houses now experimenting with motor vehicles, besides the larger concerns already mentioned, are: W. H. Walker & Co. (shoes), the Hard Manufacturing Company (metallic bedsteads), Keystone Transfer Company (draying), A. W. Case & Sons Manufacturing Company (plumbers' supplies), Buffalo *Times* (newspaper delivery). John K. Walker, of W. H. Walker & Co., has given the closest attention to every detail in connection with the gasoline truck which the firm has had in constant service since last June. It is a two cylinder, 20 horse power, air cooled truck. During the first five months it traveled 2,998 miles, at an average cost of about 2 1-6th cents per [illegible] for fuel and repairs. The figures [illegible] are as follows:

	Month [illegible]
Fire insurance, $2,500; $55 per annum	$4.58 [illegible]
Liability insurance, $2,500; $62.50 per annum	5.21 [illegible]
Garage	10.00 [illegible]
Other expense (except labor), fuel, supplies, repairs, etc.	12.98 [illegible]
Total	$32.77 [illegible]

Average expense per month, less [illegible] insurance, $12.98.

Buffalo is undoubtedly somewhat [illegible] other cities of its size in the adop[illegible] motor vehicles for commercial p[illegible] Although the city's smooth roadway [illegible] few heavy grades, are especially ad[illegible] the economical use of motor trucks, notwithstanding the large number of [illegible] ure cars in use, the business portion [illegible] community has been slow to substitute motor for horse power. A man who [illegible] stands the situation thoroughly [illegible] up as follows:

"More trucks would probably be seen [illegible] Buffalo's streets had the earlier [illegible] business cars been more ruggedly built. [illegible] idea of readily converting a pleasure [illegible] into a business car was a pleasing [illegible] the average business man buying [illegible] pleasure car, but it was a mistake. [illegible] Just as soon as the business interests [illegible] satisfied that they can buy trucks that [illegible] stand up and do the work required, [illegible] motor trucks will be bought, but the [illegible] comings of the first arrivals made [illegible] ness interests exceedingly careful.

"Business wagons for delivery [illegible] must be built for the work they are [illegible] signed to do; even for the solicitor [illegible] or person requiring a car for the [illegible] of routine daily calls, the car should [illegible] special car, simple, strong and reliable [illegible] for the harder service involved in the [illegible] delivery of goods an especially strong [illegible] ple car is needed.

"Strong it must be, because it must [illegible] heavy loads at high speeds (that [illegible] speeds as compared with horses). It [illegible] be simple, because it will not be [illegible] the hands of an expert mechanic.

The Motor Vehicle Garage Co. [illegible] have announced their intention to [illegible] fit out a garage in the heart of the [illegible] sale district of the city, for the [illegible] care of electric commercial vehicles, [illegible] ticipation of a considerable demand [illegible] service in the near future.

Stage Lines from Urbana.

The Jenkins Auto and Trans[illegible] pany, Urbana, Ohio, will estab[illegible] more automobile stage lines th[illegible] one to King's Creek, Kennard [illegible] and North Lewisburg, and the [illegible] Westville and St. Paris. The line [illegible] tual and Mechanicsburg will be [illegible] as last year. A two hours' s[illegible] least will be maintained, and [illegible]

will be more frequent, if the business warrants it. These lines are through a rich farming country where the railroad gives only one train each way daily. By means of the auto buses passengers will be able to connect with trolley cars for Dayton, Springfield, Columbus and other points. A garage will be equipped at Urbana and a general livery business transacted.

Three Buses for Winchendon Stage Line.

The members of the new Winchendon (Mass.) Auto Transit Company are: John P. Bartlett, president; Chas. A. Andrews, general manager; Harry O. McColly and Fred. H. Brunell, stockholders. They have ordered two eighteen passenger buses and one twelve passenger bus for use between Winchendon Springs, Winchendon, Waterville and Glenallen, a distance of 3 miles on good roads. A 5 cent fare will be charged between each village. It is possible that a fourth bus may be bought to run to Lake Monomonack and Baldwinville by way of Dennison Lakes.

Sightseeing Vehicles in Denver.

The Denver Omnibus and Cab Company, who operate an automobile sightseeing business in Denver, have ordered six twenty passenger electric vehicles, which will be added to their present equipment of four vehicles, three of which have a capacity of twenty passengers and one of forty passengers. The seats on the forty passenger vehicle are now being terraced. Twenty-five thousand passengers were carried in these four vehicles from May 1, 1905, to January 1, 1906. Business has been transacted all winter, but at small profit.

The Negro Auto Bus Line.

The Union Transportation Company, of Nashville, Tenn., which is also known as the "Jim Crow" automobile line, are no longer dependent on the plant of their competitor, the Nashville Street Railway Company, for electric current to charge their new electric buses. A dynamo and generating apparatus of sufficient power are being installed, and President Preston Taylor says fourteen buses will be placed in commission at once. The company have built a park known as Greenwood, 3 miles out of town on the Lebanon Pike, to which place a regular schedule will be maintained.

An automobile stage line is being planned between Goldfield and Palmetto, Cal. The run can be made in four hours on a good road.

The Allegheny County commissioners have decided to buy the automobile conveyance for the Pittsburg morgue, as suggested by Coroner Armstrong.

An automobile stage line is to be established between Los Angeles and Downey, Cal.

Colonel Laidlaw, of Paso Robles, Cal., is arranging for an automobile stage line from that town to the San Joaquin country.

Charles Floyd, of Manchester, N. H., has bought a Thomas car to help him in his canvass for the nomination for Governor of New Hampshire.

F. E. Gillette, of Tonopah, Nev., has purchased eight Heine-Velox automobiles, which he will use as passenger carriers on the desert.

The Aply Transfer Company, of White Lake, Sullivan County, N. Y., proposes to establish an automobile line between Milford, Pa., and Port Jervis, N. Y.

Jones & Puckett, Murfreesboro, Tenn., are planning for an automobile stage and mail line to Woodbury, 19 miles. Similar lines from Paris, Tenn., to nearby towns are being planned.

The proprietor of the Fairmont Hotel on Nob Hill, San Francisco, wants to buy a hill climbing automobile omnibus which will make a minimum speed of 15 miles per hour carrying ten people on the steep grades leading up to the hotel.

Perhaps farmers will feel differently toward the automobile when they use the machines to go to market. There are some good auto truck wagons made now, and some time the price of them may descend within reach.—*American Cultivator.*

Sidney Newell, of Stockton, is planning to establish an automobile passenger and freight line between Milton, Angels Camp and the Big Trees, Cal. He has also under consideration the establishment of a line between Angels Camp and Stockton.

The Fitchburg (Mass.) Transit Company will operate two sixteen passenger automobile buses to Ashby the coming summer, the same as last year. The distance is 9 miles over a straight road with no hard grades. A 25 cent fare each way is charged.

It is reported that the Ontario and Western Railroad is about to build an automobile road from Liberty to White Lake in Sullivan County, N. Y. Eight machines are to be employed for carrying passengers from Liberty to the various summer resorts in the neighborhood.

The St. Louis Automobile Service Company has been organized with a capital of $5,000 to operate a bus line from the terminus of the Broadway trolley line to the Field Club grounds, 3½ miles, and probably to other points in St. Louis County. Two fourteen passenger buses have been ordered, and a twenty minute schedule will be maintained. By June 1 buses will be run as far as Spanish Lake.

The sightseeing automobile will make its appearance at St. Paul, Minn., this spring. An order has been placed for a twenty passenger vehicle for use in Como Park, and the Commercial Club is planning to buy several vehicles for sightseeing service in all parts of the city and suburbs.

An auto bus line is promised between Hollywood and Toluca, Cal.

The Milwaukee Auto Transit Company has been incorporated for the purpose of operating an automobile stage line between Milwaukee and several inland lake resorts the coming season.

The Maysville-Flemingsburg Company, Lexington, Ky., have begun the operation of an automobile bus line between Lexington and Richmond, 27 miles. A line between Lexington and Nicholasville will be started soon. This company is now operating a line between Maysville and Flemingsburg.

The Rochester (N. Y.) Civil Service Board has appointed Harry S. Woodworth, president of the Rochester Automobile Club; John A. Barhite, vice president of the club, and Joseph E. Mandery, a former vice president, a committee of three to judge the candidates for chauffeurs for the two electric police patrol wagons purchased by the city. The test will be held April 15.

February Exports and Imports.

The value of the exports of automobiles and parts from the United States for February, 1906, amounted to $332,713, as against $280,137 for the same month last year, thus showing an increase of $52,576. The value of the exports for the eight months ending February 28, 1906, amounted to $1,771,313, as against $1,402,775 for the corresponding period last year, and $1,141,371 for the corresponding period of the year before. The distribution of exports among the different countries was as follows:

	Feb., 1906.	Eight Months Ending Feb. 28, 1906.
United Kingdom	$49,035	$471,017
France	9,495	123,191
Germany	4,505	35,329
Italy	69,116	131,210
Other Europe	22,655	89,252
British North America	34,507	284,623
Mexico	21,331	166,510
West Indies and Bermuda	105,535	210,428
South America	7,551	49,041
British East Indies	4,215	28,364
British Australasia	1,481	118,846
Other Asia and Oceania	1,164	30,910
Africa	695	20,875
Other countries	1,428	11,717
Totals	$332,713	$1,771,313

Forty-eight automobiles, valued at $160,787, and automobile parts valued at $30,765, were imported during February. For the eight months ending February 28, 1906, 664 automobiles, valued at $2,430,165, were imported. Automobile parts, valued at $235,570, were imported during the same period, as against values of $50,582 and $10,662 for automobile parts imported during the corresponding periods last year and the year before.

LEGISLATIVE and LEGAL

Automobilists Retaliating.

TRENTON, N. J.—A measure that appears to be a retaliatory bill against horse owners, on account of the drastic Frelinghuysen automobile bill, was introduced in the New Jersey General Assembly last week by Mr. Perkins, of the Judiciary Committee, which has charge of the automobile bill in the House. This bill provides that two lamps, one on either side, shall be used on all vehicles on public highways from one hour after sunset to one hour before sunrise. It is understood that this is the first of a series of retaliatory measures that will be urged upon the Legislature should the Frelinghuysen bill be pressed through in an unamended form.

Senator Frelinghuysen has prepared a new substitute bill, striking out many of the radical features of the old measure, and which is said to be acceptable to autoists.

Damages for a Frightened Horse.

NEW YORK CITY.—Reginald Rives was awarded a verdict of $250 against St. John Wood in the City Court on March 27 for injuries sustained by one of the plaintiff's horses which was run into by the defendant's automobile on the East Drive in Central Park. The horse was one of the leaders on the Pioneer coach. While the injuries appeared to be slight at first, the horse shortly afterward developed symptoms indicating nervous prostration. Chas. H. Wilson, a coaching expert, said that he had driven the horse after the accident, and found it hard to drive, as he said, "It seemed to be always thinking of the auto and was as timid as a woman." Rives had to sell the horse at a loss of $250 on the purchase price.

Senate Committee Hearing on Sims Bill.

WASHINGTON, D. C.—The Sims bill regulating the use of automobiles in the District of Columbia, which passed the House of Representatives on March 12, will probably be subjected to considerable amendment before it is reported to the Senate. The Senate District Committee held a hearing on the bill last Friday, at which much opposition to its provisions developed.

J. M. Stoddard, of the Cook & Stoddard Company, was the principal speaker, urging that some of the features of the bill be eliminated before it should be put to final passage. Senator Gallinger, who had been making some practical experiments with a motor car to test the practicability of the measure, also presented facts to show that automobiling under such a statute would be practically prohibited.

Mr. Stoddard described two classes of offenders against the speed regulations, which he thought it was desirable to reach through legislation. These were the wealthy, reckless driver, who pays his fine and forgets it in five minutes, and the daredevil chauffeur who seeks to make his operation of the machine spectacular. These two classes he declared represented about 10 per cent. of automobile owners or operators, while the other 90 per cent. were careful and needed no such legislation as that proposed.

The main provisions of the Sims bill are the limiting of speed within the fire limits of the city of Washington to 12 miles an hour, slowing up at street car crossings to 8 miles an hour, checking the run to 6 miles an hour at the intersections of all avenues and streets in the crowded parts of the city, and a maximum of 4 miles at certain points where pedestrian traffic is large.

Mr. Stoddard argued that the slowing down of a heavy car from 12 miles to 6 on Pennsylvania and other avenues meant the destruction of the car. He declared that obedience to the provisions of the bill meant in practice the running of all cars at 8 miles an hour.

The Sims bill is a brief document and is an enabling act to guide the municipal authorities in framing a set of regulations to govern the police. Its penalties are of the picturesque kind, and Mr. Stoddard especially attacked the cumulative fine and imprisonment features, claiming that the withdrawal of permit to operate from the rich driver and the reckless chauffeur would be twice as effective as fine and imprisonment.

It is understood here that the imprisonment feature and the cumulative fines will be cut out of the bill by the Senate District Commitee.

The New Virginia Law.

RICHMOND, Va.—Secretary of the Commonwealth Eggleston is having the automobile law recently enacted by the General Assembly printed for distribution. The law goes into effect June 13 next, but is simply permissive in that it provides that counties, cities, towns and villages may enact measures in accordance with its terms. Four miles an hour is the limit of speed in the built up portions of cities, towns and villages, around curves and bends, over rises and acclivities, at all prominent crossroads and at crowded places on the highways. Elsewhere 12 miles an hour is allowed. Drivers must keep a careful look ahead for the approach of horseback riders or vehicles drawn by horses or other animals, and he shall immediately slow up and stop if signalled to.

The penalty for violation is a fine of not less than $10 nor more than $100, or imprisonment for not less than five or more than thirty days, or both. In case any damage is wrought by a machine it may be seized anywhere in the State. Upon second conviction the automobilist's registration certificate will be cancelled and another not issued thereafter. Any person who witnesses a violation of the law may arrest the offender.

An Ontario Automobile Bill.

TORONTO, Ont.—Herbert Lennox has introduced an automobile bill providing for a registration fee of $10 for a motor vehicle of 10 horse power or less and $15 when above. A permit must be issued by the Provincial Secretary and be conspicuously exposed. The maximum speed limit in cities and villages is fixed at 10 miles an hour and 15 miles an hour in the open country. Municipal councils are given the right to limit the highways, and should an autoist cause injury and fail to give his name and address it will cause permanent cancellation of his permit. For first offense autoists would be fined $25; $50 for a second; $100 for a third, with costs in each case, and for a third offense he might be imprisoned.

Creditors File Bankruptcy Petition.

LONG ISLAND CITY.—A petition in involuntary bankruptcy was filed against the Vehicle Equipment Company, of this city, in the United States Court for the Second District March 28. The petitioning creditors are Kerr, Page & Cooper, Geo. Endicott and Smith & Mabley, with claims ranging from $195 to $869. Chas. O. Dewey, of Brooklyn, was appointed receiver, and filed a bond for $10,000. The officers and stockholders of the company were cited to appear April 6 to show cause why the company should not be declared a bankrupt.

When the petition was filed a reorganization of the company was in progress, and it was proposed to change the name to the General Vehicle Company. The Vehicle Equipment Company was originally incorporated under New Jersey laws in December, 1900, with a capital stock of $400,000, and was reorganized under New York laws in July, 1903, and the capital stock has been increased to $3,000,000, of which $2,000,000 is common stock and $1,000,000 preferred stock. There is also a bond issue of $1,000,000. Robert McA. Lloyd was president, Hector H. Havemeyer vice president and Arthur H. Havemeyer secretary. They are sons of William F. Havemeyer, the sugar refiner. As we go to press we learn that reorganization as the General Vehicle Company has been decided upon, and the business will be carried on as heretofore.

New York Automobile Bills.

ALBANY, N. Y.—The L'Hommedieu bill prescribing a tax of $1 per 500 pounds weight upon motor vehicles was reported last week, with some minor amendments, by the Senate Committee on Taxation and Retrenchment. The Assembly Ways and Means Committee will give a hearing this week Wednesday on the Stanley bill creat-

ing a State motor vehicle commission, which is favored by Jefferson De Mont Thompson, chairman of the racing committee of the A. A. A.

At a conference held here March 29 representatives of the principal automobile clubs decided that they should support the L'Hommedieu bill. The clubs want the existing law in regard to penalties changed so that all fines collected for violating any ordinance or speed regulation shall be paid into the State Treasury to be used for highway improvement purposes.

The clubs will support an amendment compelling the automobile association to print a list of all automobiles, with the name and number of the machine opposite, to be posted in conspicuous places, so that it will not be necessary to go to the Secretary of State every time information concerning an automobile and its owner is wanted.

The New Ohio Automobile Law.

COLUMBUS, Ohio.—The Ohio Legislature, which adjourned Monday, passed the automobile bill framed by Mr. Sawicki, the Senate acting on it at a night session Saturday. The Bowers bill, requiring county registration, came up in the House early last week for passage, but was postponed so the members might choose between the two. The Sawicki bill was decided upon. An effort was made to reduce the speed limit to 8 miles, but this was defeated. The auto men succeeded in passing an amendment providing that all fees and licenses should go to the fund for good roads. The principal provisions of the bill are as follows:

Registration with the Secretary of State, fee $5 for first 30 horse power, $3 for each additional 10 horse power. Dealers must register one of each type of car handled; duplicates, 50 cents each.

Speed must be "reasonable" and never so great as to be "dangerous." In business districts, 10 miles an hour. In approaching sharp curves, crossing bridges, descending sharp grades, 4 miles. All local speed regulations are invalidated. No local laws shall be passed more stringent than State laws unless they apply equally to all other vehicles. In no village may an ordinance be passed limiting speed to less than 6 miles. Local authorities have the right, however, to exclude autos entirely from cemeteries or drives provided particularly for horses. Power is also given to regulate speed in any degree in parks and on parkways.

When local laws more stringent than State laws are in force, at corporation line a sign must be conspicuously displayed: "Slow down to .... miles." Similar signs must be displayed in parks, on parkways and streets where change of speed is required.

If the driver of a restive horse raises his hand the auto must come to a stop to give the horse a reasonable time to get past. Caution must be used in passing a restive horse from the rear.

Autos must carry two white lights and one red visible from rear. License tag must be visible. Lights from one hour after sundown to within one hour of sunrise. Effective brakes and bell or horn must also be provided.

Chauffeurs (for hire) must pay $2 fee for registration and receive tag to wear whenever driving, which tag may not be loaned. This rule does not apply to owner driving his own machine.

Vehicles properly licensed in other States may pass through Ohio without paying the Ohio license. Penalties are as follows:

A person owning or operating an auto which he does not register may be punished as follows: First offense, not more than $100 fine; second, not less than $50 nor more than $100, or thirty days' imprisonment, or both; third, $100 to $150, or thirty days, or both.

Violation of any other provision: First offense, $25; second, $25 to $50; third, $50 to $100, or ten days' imprisonment, or both.

The law goes into effect June 1, 1906.

Good Roads Appropriations.

COLUMBUS.—The Finance Committee was persuaded by the friends of good roads in preparing the second general appropriation bill to increase by $50,000 the appropriation for 1907 $50,000 in excess of that allowed for 1906, making it $200,000, to make an appropriation of $200,000 for State aid in 1907, an increase of $50,000 over the sum allowed for 1906. This passed the House, but the Senate Finance Committee switched the additional $50,000 to the State Agricultural Department to build a grand stand on the State Fair Grounds, and the House concurred in the change. The total for the two years is thus $300,000. The State Highway Commission was given an appropriation to fit up offices in the Judiciary Building on the State Capitol grounds. Both houses passed the Hayes bill, making slight changes in the good roads law required in order that the appropriation for 1906 might be immediately available.

NEW ORLEANS.—Mayor Behrman, of New Orleans, has declined to sign the city ordinance prohibiting the fast driving of automobiles. He fails to see the necessity for the measure, as there have been no accidents in that town.

ALBANY, N. Y.—Senator Gardner has introduced a bill which will permit the English Lloyds insurance companies to solicit business in this State, because domestic companies do not insure automobiles which may be used all over the world.

ANNAPOLIS, Md.—The Hastings bill provides that in Dorchester County, where Tuesdays and Saturdays are market days, automobiles shall not be allowed the use of the roads. A physician hurrying to the bedside of a patient is alone exempt.

BOSTON.—The Massachusetts Highway Commission has suspended the automobile license of Earle G. Greenleaf, Cambridge, until July 1, on account of reckless driving. This is the first case brought by the Massachusetts Automobile Owners' Association, of which Francis Hurtibus is the counsel.

Fatal Accident at New Rochelle, N. Y.

Mrs. Betty Kuchler, aged seventy years, and her sister, Miss Albina Stein, aged seventy-three years, were run over by an automobile and killed on Main street, New Rochelle, last Sunday evening while walking home from church. The automobile was driven away rapidly after the accident, those in it not stopping to see what injury had been done. A crowd of men and boys chased the vehicle, but it was soon out of sight. Several people in the crowd succeeded in reading the number, which was New York license No. 24,984, and in this way traced the machine to its owner, John C. Rodgers, Jr., of 10 St. Nicholas place, New York, a son of John C. Rodgers, the Subway contractor.

Witnesses say the the machine was going at the rate of about 30 miles an hour. It was driven by John Johnston, of White Plains, a chauffeur employed by young Rodgers. In the car at the time of the accident were Mr. and Mrs. Rodgers, Jr., Mr. and Mrs. C. W. Collins and George McNabb. Johnston gave himself up to the New Rochelle authorities Monday morning and was held for the grand jury under $10,000 Tuesday morning at White Plains.

The accused chauffeur says that he saw two wagons just ahead of him coming in the opposite direction near the foot of a steep hill at the bottom of which is a railroad bridge. As the drivers of the wagons saw the automobile approaching they pulled to one side to make room, and Johnston says he put on speed to get a start on the hill. As he did so, he claims, the women stepped out from behind one of the wagons, and he ran them down before he had time to stop. He claims the accident was entirely unavoidable.

Coroner's Decision in Craig Fatality.

In the inquest into the cause of the death of Mrs. Jane Craig, in an automobile accident in the Bronx (New York city) on March 9, the coroner's jury, at the hearing on April 3, found "that the said Jane Craig came to her death on the 9th day of March, 1906, at Fordham Hospital, from compound fracture frontal bone, extending to base; cerebral hemorrhage, caused in an automobile accident, caused by an error of judgment on the part of the chauffeur of the Welch car, Mr. Fred S. Welch, and we exonerate both prisoners."

The prisoners referred to were Fred S. Welch, who was driving the car which was said to have collided with that in which Mrs. Craig was riding, and Alexander T. Cummings, the chauffeur of the wrecked car.

MINOR MENTION



An automobile and motor show will be held in Auditorium Hall, New Orleans, May 14 to 19.

George Arbuckle is making a trip through Mexico in the interests of the Winton Motor Carriage Company.

The Morris Auto Company, Saginaw, Mich., have increased their capital stock from $12,000 to $25,000.

The Murillo Manufacturing Company is planning to establish an automobile factory and garage at Marion, Ind.

F. E. Dayton, of Hartford, has been appointed the manager of the Chicago branch of the Electric Vehicle Company.

Clarence B. Brokaw delivered a lecture at the A. C. A. March 27 on "Ignition: Magnetos, Dynamos and Batteries."

The Muncie Auto Parts Company, Muncie, Ind., will occupy a new factory, 217 North Walnut street, in that city.

Frank Lake, an American dentist of Guadalajara, Mexico, has leased a building for the manufacture of automobiles.

Every automobile in Cincinnati has been invited to enter the mechanical parade April 9 during the clean streets convention.

The garage of the Thompson-Schoeffel Company, 26 Plymouth avenue, Rochester, N. Y., was destroyed by fire March 23, with a loss of $75,000.

The Bennett-Bird Company are building a two story garage at 1470 Michigan avenue, Chicago, which they expect to occupy May 1. They handle the Corbin and Dolan cars.

The Pittsburg automobile dealers have organized with the following officers: President, W. M. Murray; vice president, W. A. Richwine; secretary and treasurer, Arthur L. Banker.

Bert Morley, for three years past sales manager of the parts department of the Briscoe Manufacturing Company, of Detroit, is now representing Hayden Eames, of Cleveland.

President John Farson and Secretary Sidney S. Gorham, of the A. A. A., spoke at the annual dinner of the Peoria (Ill.) Automobile Club March 26.

Richard Bacon, Jr., for the past two years manager of the Chicago branch of the Studebaker Automobile Company, is now with the Pardee-Johnson-Hamell Company, 1220 Michigan avenue.

Aron Asen, a Yiddish blacksmith, of New York's lower east side, has started a sightseeing automobile for the purpose of showing the fashionable districts to the east siders at 25 cents a head.

The White Sewing Machine Company have filed an application for a permit for the erection of their new plant at Cleveland. The building will cover 20,000 square feet, and will cost $250,000. The contractors agree to have the building ready by August 1.

The village of Eden on Mt. Desert Island, Me., has again barred motor cars from its limits.

Fire destroyed one of the shops at the plant of the Whitlock Coil Pipe Company, Hartford, Conn., March 25. Loss, $25,000. Insured.

The C. H. Blomstrom Motor Company, Detroit, have completed an addition to their factory, affording 20,000 square feet of additional floor space.

The Stevens-Duryea automobile factory at Chicopee Falls, Mass., have declared for an open shop, as the result of the strike recently declared in the attempt to unionize their polishing department.

The increase in the price of gasoline by the Standard Oil Company went into effect March 29. Automobile gasoline, which has been selling in bulk for 12 cents per gallon, now sells for 13 cents.

J. W. McAlman, for some time past the manager of the Locomobile branch in Boston, is now manager of the Electric Vehicle Company's branch in that city, W. W. Burke having been transferred to New York.

Philip W. Blake has resigned as purchasing agent of the Corbin Motor Vehicle Corporation to become assistant manager of the American Electric Novelty and Manufacturing Works, New York city.

An automobile hill climbing contest will be held at Wilkesbarre, Pa., in connection with the centennial jubilee May 10-12. The course will be a mountain road known as Giant Despair, where the average grades are 24 per cent.

Sixteen automobiles have been blacklisted by the military authorities of the Presidio, San Francisco, and are not permitted to enter the gates of the enclosure. This is due to the failure of the automobilists to observe the rules.

The Automobile Cover and Top Manufacturing Company is moving into larger quarters at 154 East Fifty-seventh street, New York city, where 20,000 square feet of floor space will be available. W. Irvine Fickling and Geo. R. Spinning have purchased the interest of Percy Owen and Robert E. Fulton.

Inspector Murray, of the Bureau of Combustibles, of New York city, recently closed Hartog's garage, 304 West Fifty-fourth street, and ordered all cars and gasoline to be removed within five days from William Schreiber's garage, 308 West Fifty-ninth street, because they had not complied with the regulations.

E. O. Gowing, of Linewood avenue and Simpson road, Ardmore, Pa., was killed and his wife mortally injured in an automobile smash-up in Penn street, Haverford, Monday afternoon. The automobile ran into a rope that had been stretched across the street in front of a building operation. Mr. Gowing was startled and turned the steering wheel sharply. This caused the vehicle to swerve, and it crashed into a telegraph pole, overturned and crushed Mr. and Mrs. Gowing beneath it.

It is planned to have a garage in the new church the First Presbyterian congregation will erect in Cincinnati. The garage will be for the exclusive use of the church members.

The Tacoma (Wash.) Automobile Club has declared vigorously against fast driving. The following officers have been elected: President, W. W. Pickerill; vice president, W. O. Williams; secretary, Dell Young; treasurer, A. G. Prichard.

Coroner Cameron, of Cincinnati, has exonerated John W. Tarbill, of that city, from any blame for causing the death of a gypsy woman, who was killed by an automobile that he was driving. The coroner found that the machine was within the speed limit, and every effort was made to save the deceased.

We have received from the New Hampshire Bureau of Labor the second special report of the summer boarding business and resorts of New Hampshire. It contains much information of interest to automobilists, as well as two excellent road maps of the regions about Lake Sunapee and Lake Winnipesaukee.

Policeman John Dillon, of the New York police department, known as the "auto cop," because he has been very alert in checking speed violations in the Bronx, was thrown headlong from a wheel while chasing an automobile on March 28. The fall broke his left kneecap, and he will probably never be able to ride a wheel again.

The Ohio State Automobile Association was organized at Columbus, March 24, with the following officers: President, Mr. Scholes, of Cleveland; vice presidents, Mr. Baker, of Cleveland; A. Auble, of Akron; F. E. Avery, of Columbus; Mr. Duttonhoffer, of Cincinnati; secretary and treasurer, R. H. Cox, of Cincinnati.

Jefferson De Mont Thompson, the new chairman of the A. A. A. racing board, believes that the National Guard or Federal troops should be employed to police the course at the next Vanderbilt Cup race. He makes use of the argument that the United States Government exercises police control over the international yacht races.

The New York salesrooms of the Welch Motor Car Company, Broadway and Sixty-second street, were opened last Saturday afternoon, when about 400 people visited the rooms, which were handsomely decorated. An orchestra furnished music, and refreshments were served. Burgoyne Hamilton is the New York manager.

At the monthly meeting of the committee of management of the American Motor Car Manufacturers' Association, held March 30 at Chicago, a resolution was adopted favoring the holding of dealers' automobile shows, both in New York and Chicago, to be managed exclusively by the dealers' associations in those cities. The place for holding the open air show in the fall will be decided on at the regular meeting of the association April 20.

Agency and Garage Notes.

W. D. Grow, Marysville, Cal., will open garage this spring.

Paul Behrendt will erect a garage at Billings, Mont., this spring.

A. A. Eastman will erect a garage at Kenomowoc, Wis., this spring.

Walter Glenny, West Chester, Pa., will open a garage and repair shop this spring.

Ennor & Sibley have opened the Mission Garage at 757 West Seventh street, Riverside, Cal.

N. J. Bergman will build a garage at Alder and Fifteenth streets, Portland, Ore., this spring.

The Minot Machine Shop and Repair Company, Minot, N. Dak., are erecting a garage which will be ready for business by April 20.

A branch garage is being fitted up at Cheango and Utica streets, Buffalo, N. Y., by W. F. Polson, proprietor of the Utica Street Automobile Station.

The Linscott Motor Company, 163 Columbus avenue, Boston, has leased the entire building at 41 Stanhope street to accommodate additional business.

The newly incorporated Oliver Electric Vehicle Company, 1737 Twelfth street, N. E., Cleveland, Ohio, will operate a garage exclusively for electric vehicles.

H. N. Price has succeeded L. D. Fisher as manager of the Joliet Auto and Garage Company, 100 Cass street, Joliet, Ill. They handle the Knox, Buick, Cadillac and Winton cars.

The Pond Auto Station, Plymouth and Assonet streets, Worcester, Mass., was opened March 24. They handle the Pope-Toledo, Pope-Hartford, Pope-Tribune and Winton cars.

The Motor Vehicle Garage Company, 133 Main street, Buffalo, N. Y., is making extensive alterations and additions to its garage for the care and repair of both electric and gasoline cars.

A permanent injunction has been issued restraining the Chicago municipal authorities from interfering with the erection of the new Stoddard-Dayton garage, Fortieth street and Grand Boulevard.

The Euclid Auto Exchange, Cleveland, Ohio, of which W. A. Mayer and W. H. Lynon are the proprietors, have recently leased a building at 5017 Euclid avenue, where they will handle the Compound cars and conduct a general garage and livery business.

Garage Versus Tailor Shop.

Englewood, N. J.—J. William Van Wart, of this town, has been summoned to appear before Vice Chancellor Garrison, of Jersey City, to show cause why an injunction should not be issued restraining him from operating a garage at 44 Palisade avenue. Patrick L. Kenny says that the odor of the garage is driving customers away from his ladies' tailoring establishment next door.

New Incorporations.

C. A. Coey & Co., Chicago.—Capital, $5,000; dealing in automobiles. Incorporators, Benjamin Levering, G. N. Beckford and A. A. Boone.

Coey Automobile Livery Company, Chicago.—Capital $2,500; renting automobiles. Incorporators, Benjamin Levering, G. N. Beckford and A. A. Boone.

Darracq Motor Car Company, Boston, Mass.—Capital, $25,000; to deal in automobiles. Incorporators, A. A. Hastings and F. W. Clark, both of Boston.

Acme Automobile Company Waterford, N. Y.—Capital, $1,000. Directors, F. W. Kavanaugh, Waterford; D. M. McDermott Troy; E. P. Chapman, Jr., Albany.

Chicago Automobile Club Auxiliary Association, Chicago.—Capital, $150,000; maintaining a clubhouse. Incorporators, John Farson, Ira M. Cobe, Sidney S. Gorham.

Tileston Pickard Company, Chicago.—Capital, $30,000; manufacturing atuomobiles. Incorporators, Charles F. Tehune, Jeremiah B. O'Connell and William C. Asay.

Holdrege Automobile Company, Holdrege, Neb.—Capital, $10,000; to deal in automobiles and accessories. Incorporators, W. H. Paddock, A. F. Larson and W. A. Shreck.

Phillips Motor Car Company, Los Angeles, Cal.—Capital stock, $25,000 and $400 paid in. Directors, L. E. Phillips, Anna B. Phillips L. A. Phillips and R. W. Phillips.

Wakeman Motor Company, New York City.—Capital, $100,000. Incorporators, Harry G. Wakeman, Haskell C. Billings and John C. Billings, all of New York city.

Washington Automobile Company, Chicago.—Capital, $10,000; manufacturing and repairing automobiles. Incorporators, Albert J. Brockman, Wilbur J. Wilkins, Leona Barth.

St. Louis Automobile Service Company, St. Louis, Mo.—Capital, $5,000; to operate motor stage lines. Incorporators, Lee Meriweather, Robert J. Bowman and Frank S. Reel.

Charles Gate Engineering Company, East Orange, N. J.—Capital, $5,000; to manufacture automobiles, motor cars, etc. Incorporators, A. R. Bangs, H. A. Bangs, H. B. Hollings, G. H. Bauman and H. H. Puking, all of East Orange.

Berkshire Cycle and Automobile Company, North Adams, Mass.—Capital, $5,000. Incorporators, Walter Parker, Anson Williams and Milton L. Fero. Object, to buy, sell and repair bicycles and automobiles.

John S. Mathews Motor Company, Portland, Ore.—Capital stock, $100,000; to manufacture and sell motors, water wheels, etc. Incorporators, John S. Mathews, W. P. Evans, W. C. Minnis and Clarence Penland.

Oliver Electric Vehicle Company, 1737 Twelfth street, N. E., Cleveland, Ohio.—Capital, $10,000 ($7,000 paid in). President, W. O. De Mars; vice president, A. M. Barnes; secretary and treasurer, W. M. Fitch; directors, the officers and O. P. De Mars and R. G. Fitch. Object, to operate a garage for electric vehicles.

New Agencies.

Shreveport, La.—Foster Carter, Maxwell cars.

Detroit.—J. P. Schneider, Stevens-Duryea cars.

Worcester, Mass.—A. E. Flint, Compound cars.

Lawrence, Mass.—Charles A. Frank, Compound cars.

Springfield, Mass.—Woodward & Reopell, Crawford cars.

Reno, Nev.—Carter & McKenzie, Dorris cars (State of Nevada).

Toledo.—Cooney Automobile Company, for Aerocar automobiles.

Buffalo, N. Y.—Babcock Electric Carriage Company, National cars.

Cleveland, Ohio.—Euclid Auto Exchange, Compound cars of E. H. V. Company, Middletown, Conn.

Boston, Mass.—Concord Motor Company, of Concord, Compound cars (Boston and northeastern Massachusetts).

Chicago.—Aerocar Company, of Detroit, at 347 Wabash avenue.

Chicago, Ill.—Geyler & Levy, 390 Wabash avenue, Lozier cars (general Western agency).

Chicago, Ill.—C. P. Warner & Co., 1220 Michigan avenue, Crawford cars (Illinois, Wisconsin and Indiana).

Joliet, Ill.—The Steinhart & Jenson Auto Company, 631 Jefferson street, Rambler & Holsman cars (Grundy and La Salle counties).

Trade Literature Received.

Garvin Machine Company, New York.—1906 catalogue, 214 pages.

Acme Motor Car Company, Reading, Pa.—Catalogue of 1906 models.

Four Wheel Drive Wagon Company, Milwaukee, Wis.—Catalogue of their trucks.

Fischer & Kuehner, Providence, R. I.—Folder describing the Providence motor.

Neustadt Automobile and Supply Company, St. Louis, Mo.—1906 catalogue, 112 pages.

H. H. Franklin Manufacturing Company, Syracuse, N. Y.—Booklet entitled "Luxury."

P. M. Hotchkin, 4021 Lake avenue, Chicago, Ill.—Catalogue of the Hotchkin anti-jolt device.

The Forest City Motor Car Company, Massillon, Ohio.—Folder descriptive of Jewell Model B runabout.

The Levens & Dyer Manufacturing Company, Providence, R. I.—Circular describing Friend's new dry vapor carburetor.

Gisholt Machine Company, Madison, Wis.—Leaflet describing the Gisholt 30 inch vertical boring mill; also power moving device for the rapid traversing of turret slide on Gisholt lathes.

The Hess-Bright Manufacturing Company, 245 North Broad Street, Philadelphia.—Card illustrating ball bearings for automobile change gear, as used in the Daimler (Coventry) 18-28 horse power 1905 car.

Patents Issued March 6, 1906.

814,132. Clutch Mechanism.—Henry S. Hele-Shaw, Liverpool, England. Filed December 16, 1903. Serial No. 185,444.

814,133. Starting, Stopping, Speed Controlling and Reversing Gear.—Henry S. Hele-Shaw, Liverpool, England. Filed December 16, 1903. Renewed January 9, 1906. Serial No. 295,321.

814,164. Resilient Vehicle Tire.—John F. Rau, Chicago, Ill., assignor of one-half to John F. Cordes, Chicago, Ill. Filed September 19, 1904. Serial No. 224,993.

814,171. Buffer for Use on Motor Vehicles.—Frederick R. Simms, London, England. Filed September 26, 1905. Serial No. 280,200.

814,268. Power Transmitting Mechanism.—Alexander T. Brown, Syracuse, N. Y., assignor to the Brown-Lipe Gear Company, Syracuse, N. Y., a copartnership. Filed December 7, 1905. Serial No. 290,685.

814,479. Resilient Vehicle Wheel.—John W. Roddy, Washington, D. C. Filed October 21, 1905. Serial No. 283,755.

814,580. Vehicle Wheel.—George H. Williams, Los Angeles, Cal. Filed August 31, 1905. Serial No. 276,489.

814,586. Safety Steering Mechanism for Automobile Carriages.—Emile D. Cahen, Paris, France, assignor to Société Anonyme d'Electricité et d'Automobiles Mors, Paris, France. Filed June 15, 1905. Serial No. 265,364.

Patents Issued March 13, 1906.

814,737. Tire.—Benjamin C. Seaton, St. Louis, Mo. Filed May 26, 1905.

814,780. Vehicle.—Charles C. Grosshauser, Shakopee, Minn. Filed April 28, 1905.

814,823. Vehicle Body.—Harry E. Bradner, Lansing, Mich. Filed August 7, 1905.

814,824. Vehicle Body.—Harry E. Bradner, Lansing, Mich. Filed August 7, 1905.

814,905. Speed Indicator.—Charles O. Ericson, Helmetta, N. J. Filed March 24. 1905.

814,930. Vehicle Fender or Obstruction Remover for Road Vehicles.—Pedro Arrieta y Sanz, Pamplona, Spain. Filed October 9, 1903.

814,964. Motor Cutter.—Frank P. Jordan, New York, N. Y. Filed June 13, 1905.

814,991. Automobile Engine Suspension.—Alfred C. Stewart, Los Angeles, Cal. Filed March 1, 1905.

815,045. Automobile.—Charles Schmidt, Cleveland, Ohio. Filed October 9, 1905.

815,108. Speed Indicator.—Ernest J. Loring, Somerville, Mass. Filed August 16, 1905.

815,137. Safety Starting Mechanism for Motors.—Adolphus H. Beecher, Mason City, Ia. Filed October 24, 1904.

815,279. Vehicle Tire.—Henry C. Folger, West Somerville, Mass. Filed May 19, 1905.

815,303. Recording Apparatus for Motor Vehicles.—David Mason, New York, N. Y. Original application filed August 25, 1903. Divided and this application filed November 21, 1903.

815,319. Tire Case.—Howard R. Teel, Medford, Mass. Continuation of application filed November 6, 1905. This application filed January 6, 1906.

Patents Issued March 20, 1906.

815,360. Device for Recharging the Storage Batteries of Automobiles.—Lamar Lyndon, New York, N. Y. Filed May 4, 1904. Renewed March 23, 1905.

815,386. Change Speed Gearing.—Eugen Soller, Basel, and Friedrich Hottinger, Berne, Switzerland. Filed April 29, 1904.

815,430. Pneumatic Tired Wheel.—Thomas B. Jeffery, Kenosha, Wis. Filed November 21, 1904.

815,572. Vehicle Tire.—John K. Williams, Akron, Ohio. Filed September 5, 1905.

815,573. Vehicle Wheel.—Charles C. Wilson, Dayton, Ohio. Filed November 1, 1905.

815,708. Speed Indicator.—Gustav Ihle, Berlin, Germany. Filed May 13, 1905.

815,712. Carburetor for Explosive Engines.—John H. Johnston, Paris, France. Filed June 24, 1905.

815,734. Grease Cup.—Thomas E. Peters, Moberly, Mo. Filed November 23, 1905.

815,735. Automobile.—François Pilain, Lyons, France. Filed August 15, 1905.

815,909. Friction Clutch.—Talbot C. Dexter, Pearl River, N. Y. Filed August 29, 1905.

815,910. Automobile Sleighing Attachment.—Christopher C. Dolan, Lockport, N. Y. Filed June 13, 1905.

815,918. Frame for Motor Propelled Vehicles.—George H. Jones, Philadelphia, Pa. Filed July 14, 1905.

Patents Issued March 27, 1906.

816,006. Tire Valve.—Charles E. Duryea, Reading, Pa. Filed April 3, 1905.

816,013. Storm Shield for Vehicles.—Matthew R. Hull, Connersville, Ind. Filed September 8, 1905.

816,047. Valve Mechanism for Gas Engines.—Cassius M. Smith and Solon B. Welcome, Los Angeles, Cal. Filed January 12, 1905.

816,062. Gas Engine.—Ira S. Barnett, Louisville, Ky. Filed February 6, 1904.

816,182. Tire Armor.—Homer E. Prouty, Genoa, Ill. Filed June 26, 1905.

816,250. Motor Vehicle.—Charles M. J. Petiet, Villeneuve-la-Garenne, France. Filed January 10, 1905.

816,282. Motor Vehicle Running Gear.—Ralph B. Vaughn, Kingston, Pa. Filed October 2, 1905.

816,354. Vehicle Tire Tool.—Charles McCarthy and Millroy M. Phenice, Columbus, Ohio. Filed March 18, 1905.

816,396. Bearing Spring for Motor Vehicles.—Thomas G. Stevens, Greenhithe, England. Filed December 17, 1904.

816,397. Vehicle Heater.—John F. Swengel and Dennis Byrne, Jr., Clyde, Kan. Filed April 18, 1905.

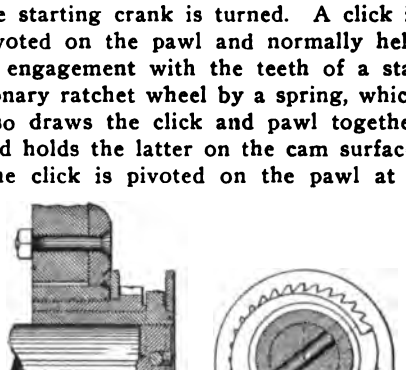
816,472. Sparking Ignition Mechanism.—John F. Johnson, Chester, Pa. Filed October 19, 1904.

816,477. Carburetor.—George W. Kellogg, Rochester, N. Y. Filed February 3, 1905.

Review of Specifications.

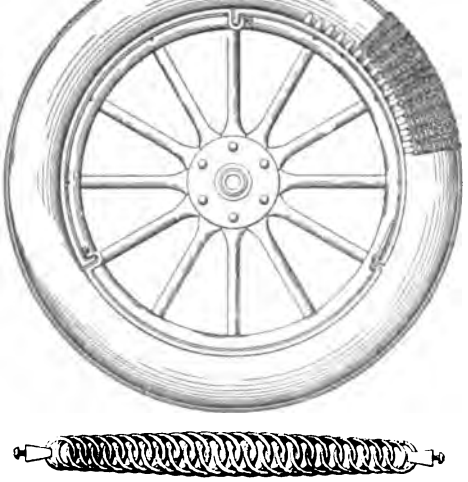
811,928. Safety Starting Device for Gas Engines.—Alvin S. Johnson, of Minneapolis, Minn. February 6, 1906. Filed May 14, 1904.

The starting crank is provided with a pawl adapted to engage with a cam disc fast upon the end of crank shaft when the starting crank is turned. A click is pivoted on the pawl and normally held in engagement with the teeth of a stationary ratchet wheel by a spring, which also draws the click and pawl together and holds the latter on the cam surface. The click is pivoted on the pawl at a



No. 811,928.

point intermediate to its pivot and the end that engages the shoulder of the cam disc, and the ratchet teeth are so formed that when the crank is turned toward the right to revolve the crank shaft and start the engine the click will slide over the ratchet teeth. If the crank shaft starts backward and transmits its movement to the crank, the pressure on the pawl will be transmitted to the click, and as it cannot move backward over the ratchet teeth it will throw the pawl out of engagement with the shoulder with which it may be in contact, and the crank shaft can then be revolved backward without affecting the hand crank or endangering the limbs of the operator.



No. 811,732.

811,732. Armor for Pneumatic Tires.—A. A. Moore, of Detroit, Mich. February 6, 1906. Filed February 5, 1905.

The armor is made of a multiplicity of independent chains peculiarly formed and closely woven and extending transversely of the tire, each chain being attached at each end by adjusting screws to the wheel rim or to detachable bands secured thereto. The chains are formed of two sets of links so interwoven as to make a flat chain in which the interstices between the links are very small, and thus when these chains are secured as described, extending transversely of the tire with their edges in contact, an almost impenetrable armor is formed. The central portion of the chain, which extends across the face or tread of the tire, is formed straight or with parallel edges, so that as the tire is flattened by the weight at its point of contact with the ground the chains will lie closely in contact across that portion, and the end portions of each chain, which extend radially inward at each side of the tire, are tapered slightly to conform to radial lines drawn from the axis of the wheel, and thus lie in contact with each other at their edges throughout their lengths. The chains are formed very strong, and being securely attached they form a continuous shield inclosing the tire to effectually prevent its coming off, splitting, tearing, or exploding, and the armor being formed of entirely separate and independent chains does not hinder the tire from yielding freely and forms a roughened traction tread to prevent the wheel from slipping or skidding. To prevent the chains from wearing the tire and also to insure the tire against becoming punctured by a spike or other sharp instrument which might be forced through the chains, a strip of leather or other suitable material is laid on the tread of the tire, and to this strip are secured transverse flexible metal plates upon its outer surface beneath the chains.

811,630. Bearing.—Charles Glover, of New Britain, Conn. February 6, 1906. Filed October 10, 1905.

This bearing is of the annular ball type, the feature of novelty being trough shaped pieces of sheet metal for separating the balls. In assembling the balls are all put between the bearing ring and shaft ring, and then the separators are placed between the balls one at a time. Being formed of spring metal they will readily slip in place, but may be as easily removed.

In connection with a recent accident to the Count de Sonis, whose automobile overturned while touring in Algiers, it is reported many natives who passed by and saw the count and his mechanic pinned under the machine refused to give any help.

...THE...

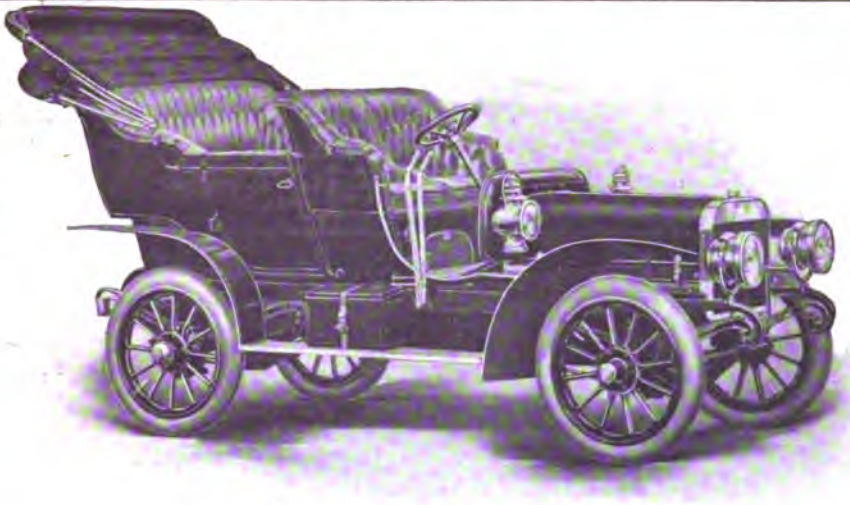
Horseless Age

VOLUME 17 APRIL 11, 1906 NUMBER 15

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WINTON MODEL-K

PRAISED AT HOME AND ABROAD



Mrs. J. S. Craig, of Woodland, Calif., who drives her own Winton Model K, writes:

"I have run my car more than 1,000 miles and have had no repairs whatever. I always have the secure feeling that my car has the strength and durability to stand its great horse-power and speed and the control is so perfect and simple that the Winton Model K can be run by a child. Beauty always appeals to a woman, and this feature, combined with strength and simplicity, makes the Winton Model K the ideal car for a woman."

Major-General Sir Henry Colvile, K. C. M. G., C. B., who owns two Winton cars, one of them a Model K, has an article in the "Car," of London, in which he says:

"All Winton cars have two distinctive features in common, which, in my opinion, render them superior to all other makes. These are the individual clutches and the air control. The Winton clutches are a revelation, and cause a feeling of wonder that the other methods can be tolerated; while of all systems of control I know of none so beautifully simple and effective as the Winton air valve."

Compare the $2,500 Winton Model K with any Car on the Market Selling at $3,500 or Higher.

Full information can be obtained at Winton Branches in New York, Pittsburg, Boston, Philadelphia, Chicago and London, at Winton Sales Agencies in all important places, or by writing for "The Motor Car Dissected" to

***The* WINTON MOTOR CARRIAGE CO.**

Licensed under Selden Patent.

CLEVELAND, OHIO, U. S. A.

Mention HORSELESS AGE.

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NOT MERELY A LARGE BUGGY TIRE.



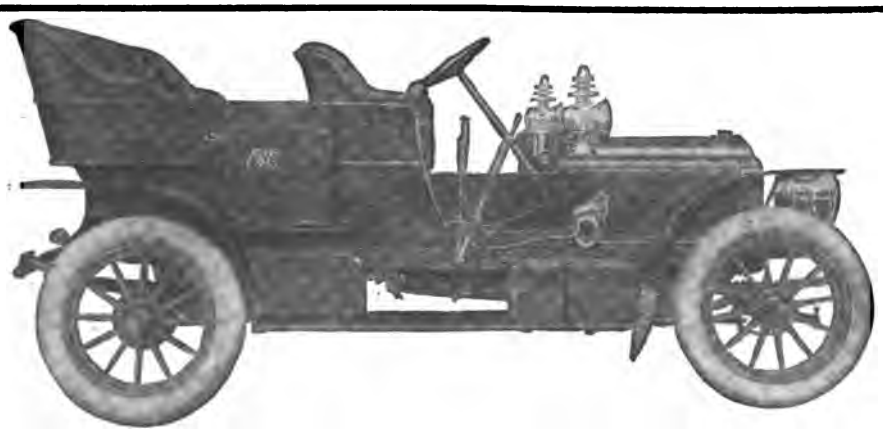
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FOR MOTOR TRUCKS AND COMMERCIAL CARS.

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It is not in the experimental stage. It has proved itself a world beater.
Made in single and, above 5 inch, in twin types.
Can be applied by anyone without the use of machinery.
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CHICAGO—167-169 Lake St.
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Less Cylinders== Yet More Power!

Making one cylinder do the work of two.

That's the briefest possible summary of the ***Elmore*** two-cycle engine system.

But even that doesn't tell the whole story. It doesn't tell you how much is saved in the elements that make for trouble, which are always present in the four-cycle engine.

The ***Elmore*** is the limit when it comes to simplicity. Each cylinder contains a piston that has power behind it at every stroke.

The four-cycle engines—all of them—have cylinders whose pistons are only energized at every other stroke.

Moreover, there are ***no*** outer valves or small parts to think about if you own an ***Elmore***.

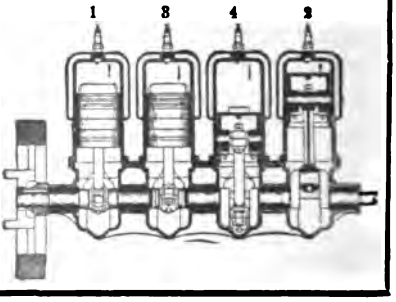
This is a tremendous advantage which you will appreciate when you realize that every four-cylinder has sixteen to twenty essentials of that sort—delicate parts that must always be in perfect adjustment.

Now let's get ready for the moral. An ***Elmore*** cylinder furnishes more power than any four-cycle cylinder can give. Four of them assembled give ***four powerful impulses with every revolution of the shaft.***

You must buy twice the number of four-cycle cylinders to get that number of explosions.

And after you have them bought, you have vastly increased your chances for trouble, of course. The moral? We will leave it for you to apply.

We should like to send you some interesting ***Elmore*** literature. Better write for it to-day.



THEY START FROM THE SEAT

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Model 14. Three Cylinder, Two-Cycle Elmore..... $1,500

The Elmore Manufacturing Co., 1004 Amanda Street, CLYDE, OHIO

Members Association Licensed Automobile Manufacturers.

Spring Overhauling.

By Albert L. Clough.

(Concluded.)

After a long period of service, or after standing idle for some time, the cooling system of a car may require some looking over. It is a good plan thoroughly to wash out the system with water from the city service. By breaking a joint in the piping and attaching a hose to one end, water under pressure may be forced through the radiator and the engine jacket and piping. A considerable amount of rust and fine mud will usually be washed out. During this operation the car should be placed on the washstand, and the draw-off cock in the bottom of the radiator and in the engine jacket or at the pump (if such are supplied) should be opened. If the engine is in condition to be run it may be a satisfaction to disconnect the piping, supply the system with water, and see that the pump will force a powerful stream of water out of one end of the pipe.

After the system is cleaned out and the piping reconnected one should look for leaks. If the radiator proves to be leaky and is of the cellular or flattened tube type it will, on the whole, be best to send it to the factory for repairs, unless the leak is one very easily reached. A radiator of the finned tubular type is more easily repaired by the ordinary workman, and a good soldering job can usually be done upon it in a repair shop.

PUMP.

If the pump leaks around its shaft a new hot water packing is needed in its stuffing box. The pump should be demonstrated to turn freely, and its grease cup should be filled. If rubber hose connections are used anywhere in the system they had best be renewed at the beginning of each season, as they deteriorate rapidly, and sometimes the inside layer of fabric separates from the rest and impedes the circulation, without the defect being apparent from the outside. No kinks should be allowed in rubber hose connections, and the clamp fasteners should be secure. The unions in the brass piping should be set up firmly.

It is quite likely that the driving belt of the exhaust fan may require to be "taken up" or perhaps replaced by a new one. Its ends should be secured together by a good belt fastener. Fan supports should be inspected and tightened, and the fan blades seen to be fast and free from bends, which might cause noise in running. One should not be satisfied unless the cooling system is perfectly tight, as it will prove a constant annoyance, during the driving season, to have to fill the radiator every time the car has stood for a few days. The test for tightness should be made with the engine running, and the radiator should become perceptibly heated as soon as the motor has run for a few minutes.

FUEL SYSTEM.

The fuel system may next be overhauled. With the draw-off plug removed from the bottom of the carburetor float chamber any stale gasoline which the tank contains may be allowed to pass off through it, and will wash out foreign particles from the tank, pipe and carburetor. If there is a pocket in the bottom of the tank, designed to collect water and dirt, its plug should be removed and some of the gasoline allowed to flush throughout it. Some clean gasoline may be washed through the system after the stale liquid has all passed out. If there is a screen in the bottom of the gasoline tank or in the entrance to the float chamber it should be removed and cleansed. The gasoline pipe should be carefuly inspected for leaks, as should be unions connecting it to the tank, and when the tank is refilled and the gasoline turned on the carburetor the float chamber should fill properly, but allow no drip of gasoline. If fuel does drip from the carburetor there is probably some foreign matter caught in the needle valve of the float, and this should be removed. Sometimes this needle valve requires to be slightly ground into its seat in order to make it tight. If a hollow metal float is used it is always in order to make sure that it does not leak, thus losing its buoyancy and causing the carburetor to flood. If the top of the vaporizing chamber be removed no gasoline ought to be seen escaping from the spraying nozzle until the carburetor is primed slightly, when it should flow freely from it, thus demonstrating that the spraying passage is unobstructed.

The throttle valve should work freely; if it does not its surfaces should be touched with vaseline. The automatic air valve ought to move freely under the action of its spring. All adjustments should be firm, and all nuts about the carburetor and intake pipe should be set up properly. If a screen is used at the mouth of the air intake it should be cleaned.

IGNITION SYSTEM.

It is quite probable that the car's ignition system can be improved by a thorough overhauling. If primary batteries have hitherto been used as the source of current it may be well to consider the advisability of replacing them with accumulators, which would probably prove decidedly more constant and reliable and perfectly convenient, if charging facilities are available. A pair of six volt accumulators, of fairly large size, will be found the best equipment to purchase. They may be installed in place of the dry batteries without change of wiring.

PURCHASING DRY CELLS.

If dry cells are to be adhered to the old ones in the car might as well be thrown away and new cells bought of a reliable electrical supply dealer who handles them extensively and is thus likely to have recently received a fresh consignment. The dealer ought to be willing to allow the purchaser to test the cells he buys with his own ammeter. The writer has found it the best plan to take quite a large number of cells from the dealer's shelves and test, say, twenty of them with the ammeter. If they vary very much in strength among themselves, ranging from almost no current to 18 or 20 amperes, the lot is not a very good one to select from, and some other dealer should be tried. If the cells are fairly uniform among themselves, as regards amperage, a sufficient number which test at least 15 amperes (in the 2½x6 inch size) should be selected. Only those having firm connections and which show no signs of corrosion should be chosen. Extremely high initial amperage is not the most important point, but rather constancy of output. Cells which give a very high initial throw of the ammeter needle, but allow the index to fall back toward zero more than usually fast, are not desirable. If there is any possibility of dampness entering the battery box it is recommended that the paper cartons of the cells be soaked in melted paraffin in order to render them more insulating. If cells fitted with spring clip terminals, instead of screw posts, can be obtained they will prove much easier to connect and perfectly free from the danger of accidental disconnection, which often occurs by the working loose of ordinary binding screws. Special attention should be paid to tightly packing the cells in their box, so that they may not shift and break the connecting wires.

If accumulators are installed on the car they should be freshly charged, the height and specific gravity of the electrolyte seen to be normal and the contacts cleaned. In case any trouble has been experienced with an accumulator's losing its charge unduly fast it may be that it contains slight internal short circuits. It is not, as a rule, best to try to repair an accumulator, but rather to send it to the manufacturer for renovation.

TIMER.

One should carefully examine the timer to see that it is not worn out so that it is "wobbly" upon the shaft. If it has deteriorated into this condition and cannot readily be put in shape it is as well to purchase a new one—preferably one of the adjustable ball bearing type. A "wobbly" timer is almost sure to make poor contacts and cause missing, especially at high speeds, and, as the cost of a timer is not great in comparison with the annoyance which a defective one causes, it pays to invest in a new one of the latest type. In case the timer is found in good condition it should be thoroughly cleaned and the set screws securing the rotating portions to the shaft seen to be tight. The springs which press the contacts together should act to give a firm connection, and if the contacts are much burned they should be smoothed up. If intended to be lubricated in this manner the timer case should be packed with grease. The wires which are connected to the timer case should make firm connections in their binding posts, and should be bent to and fro slightly to see that they have not become broken. These timer wires are the most likely portion of the electrical wiring

system to give trouble, as they are constantly being bent by the rotation of the timer. They should be examined most carefully and replaced if they are at all suspected.

COIL ADJUSTMENT.

The coils may very likely require adjustment. Quite recently coil manufacturers have begun to furnish with their product detailed directions as to vibrator adjustment and the amperage which their vibrators should pass in service, and every user of a car should have one of these instruction sheets. He is thus enabled to use the apparatus intelligently and secure economy in current. It is of importance to have all coils of a set adjusted alike, and to facilitate this a special coil testing ammeter has been put upon the market, which is provided with a split plug terminal by which it may be "plugged into" the primary circuit by inserting the terminal into the plug hole of the battery switch. By cranking the engine the coils may successively be brought into action, and their current consumptions measured and adjusted by their vibrator screws. The platinum contacts should be cleaned and smoothed, and care should be taken that the battery is "poled" as the coilmaker prescribes. All adjusting and binding screws should be permanently set up when the adjustments seem satisfactory.

LUBRICATOR.

The mechanical lubricator and its oil delivering tubes may properly be cleaned out. It should be emptied of oil and a quantity of gasoline put into it. This should be forced through the pumps and tubes by running the lubricator mechanism briskly by hand, with the feed screws open widely. This treatment tends to clean out gummed oil and foreign particles, and free the action of the ball check valves, if any are used. If any one of the individual pumps fails to act properly it should be dissected and the cause located and rectified. Special care should be taken that the oil pipes are not split or otherwise leaky, and that they are tight at their unions with the lubricator and their points of delivery, as bearings not infrequently run dry, although the sight feeds show a delivery of lubricant, simply because a delivery tube, through some disarrangement, does not conduct the oil to the bearing. The lubricator belt will probably be found to require taking up after a season's use, or a new one may be considered advisable.

After the lubricator is again filled with oil it may be operated by hand until all the tubes are filled with lubricant, the sight feeds having been filled with glycerine or water, if they are the kind which require it. The engine may then be started and the feed adjusting screws set to give the proper rate of flow to all bearings.

GEAR BOX.

The stale oil from the change speed gear case should be drawn off through its drain plug, and the gears, shafts and inside of the case should be washed out with gasoline, an oil gum filled with gasoline being used to squirt the bearings and to reach inaccessible parts. The condition of the gear teeth and high speed clutch jaws should be noted, as the car is moved about a little by cranking the engine with the clutch in, and the condition of the bearings can be determined by attempting to work the shafts up and down, by hand, in their journals. If plain bearings are used there may be need of taking up a little wear by removing shims and setting the caps down. All bearing cap nuts should be left perfectly tight, and the nuts which secure gears to shaft flanges, if there are any, should be tested for tightness. The gear shifting mechanism should be demonstrated to be secure in every respect and to work freely. After everything seems in good order fresh oil should be supplied to the case, the shaft bearings squirted with oil and the cover securely fastened on.

One should take a look at the universal joints in the drive shaft and see that everything about them is secure. If they are not already so protected leather grease bags can be obtained, which can be strapped around them and filled with non-fluid oil, thus not only excluding dust but affording continuous lubrication.

CLUTCH.

The clutch operating mechanism should be carefully inspected to be sure that everything is secure and operating freely. Under this head come automatic interlocking devices connected with the brakes. Speaking of operating devices in general, the average motorist pays too little attention to inspecting their fastenings and joints, upon which his safety so largely depends. There is always a possibility that a pin may drop out from some important joint, which may perhaps render him helpless, so far as controlling his car is concerned. Check nuts and cotter pins are performing very responsible offices in holding together operating devices, and their condition should be most carefully observed. If the clutch is of the leather lined cone type it is likely that its band will require treatment with castor or olive oil, especially in case the car has stood idle in a warm room for a long time. The thrust bearing and spring should be inspected. In case the clutch is of the metallic type it may require adjustment, and the frictional surfaces should be cleaned of stale oil and all grit which may have reached them. Fresh oil should be supplied to the frictional surfaces and their operating mechanism.

If the car is equipped with a planetary change speed gear the low speed and reverse bands may require to be adjusted, or even relined with vulcanized fibre if greatly worn. The high clutch, if metallic, will most likely require cleaning and adjustment. If the gear grinds or rattles noticeably, when on the low speed or reverse, it may be well to remove and dissemble it. Perhaps the pinions have worn on their studs, or something may be loose. Some improvement can perhaps be made when the trouble is known. The gear should finally be carefully packed with non-fluid lubricant.

The foregoing suggestions by no means cover all the points which may be attended to when a general overhauling is undertaken, and necessarily do not apply to cars of all types. Every motorist knows, by experience, what parts of his car are most likely to require thorough overhauling, and will act accordingly. The time that he spends upon his car in "going over" it will be well invested, as it will in all probability prevent its being "laid up" during its period of greatest usefulness—"the good old summer time"—to which every automobile user is now ardently looking forward.

A Few Suggestions on Housing an Automobile.

By C. E. T.

The housing of an automobile is an important problem, and has a bearing on the cost of maintenance and the life of the car. It is often thought that any shed will answer the purpose, but generally such a place is too dark and unclean for the housing of delicate and expensive machinery. A dry, well lighted and ventilated stable or barn will answer, but on the whole a house specially built for the purpose is money well invested.

It is well known that dampness tends to corrode and rust machinery, thus not only roughening the surface but causing the valves and working parts of the engine to stick and become troublesome. Good light and ventilation are important requirements; good ventilation insures the escape of all fumes and gases from the gasoline, and also reduces the dampness, while with good light the car will be more carefully and thoroughly cleaned and inspected.

If a small house is deemed necessary one constructed of corrugated iron or wood will be sufficient, but it must be substantially built. The house should have at least one large skylight in the roof. The floor should be of tile or concrete, and sloping slightly from the centre. In the centre of the floor a pit should be built, about 6 feet long, 4 feet wide and 5 feet deep, with a wooden cover made to fit over it when not in use. This pit should be well drained, and, if electricity is at hand, one or two portable lights would be found convenient.

Some arrangement should be made for washing the automobile, either on a washstand outside the house or on a well drained one inside. The outside stand is preferable, for the reason that washing inside the house adds to the danger of corrosion and rust, due to excessive dampness. There should be in every house a bench, vise and drawers for tools and a cupboard with shelves for storing supplies, oils, etc. Arrangements should also be made for jacking up the car, either with hand jacks or some of the newer devices. This is a very important matter, for the reason that if a heavy car is allowed to stand any great length of time in one place

upon a hard floor the tires will deteriorate in spots and give out much quicker.

The storage of gasoline is also of great importance, for the reason that there is much danger connected with gasoline when it is handled in a careless manner. The ideal method of storing gasoline is in an iron tank placed below the ground, from which the gasoline can be pumped in such quantities as required for immediate use. For a less expensive method of storing gasoline a small house or box can be built outside the garage, but in no way connected with it. In this house or small box a small quantity can be kept in perfectly tight and well sealed tanks or cans, but in no case should it be kept in wooden vessels. This box should be well ventilated and always kept locked. The last method of storage will without doubt serve almost any ordinary purpose where gasoline is easily obtained, and it is not necessary to keep any great amount on hand at one time.

The matter of fire protection may appear slight, but it should be considered. At least one chemical fire extinguisher should be placed in the house, and a liberal amount of sand should also be stored near at hand for use in case of a gasoline fire. One or more blankets for smothering a small fire may be found convenient.

The warming of a house is one of the difficult problems that must be dealt with, because there is an element of danger of the gases arising from the gasoline coming in contact with an open fire or highly heated pipes or radiators. One of the safest and most satisfactory methods of heating is by the hot water system, with the heater placed outside the building or in the cellar of the house. The house should be kept as near 50° Fahr. as possible.

Foreign Die Forging Practice.

By Thos. J. Fay, E. E.

In the construction of motor cars there is no scheme of design more meritorious than that which provides for die forging of important and intricate shapes. This process saves the labor of forging by hand, and avoids the necessity for finishing all over, while the requirement of high quality of material need not be lost sight of. Parts made by the die forging method may either consist of several pieces welded together, or they may be forged in a single piece. Axles, for instance, are often die forged in two halves and thereafter welded, but, as the writer pointed out in his recent article on welds, axles so made are far from reliable, or heavier than they need be; for, as welded sections are not nearly so strong as solid sections, either the member will part at the weld or the section is overstrong. Die forgings entirely without welds are the most costly, owing to the greater cost of dies, but are the least expensive when the cost of dies is neglected.

In America, up to the present time, all die forgings (more generally known as drop forgings) have been of carbon steel, generally quite low in carbon, and as a result the use of such forgings has been limited to parts requiring a moderate strength only, unless, of course, the total weight was sufficiently augmented to give the desired factor of safety. With a view to showing just why foreign automobile builders have been in a position of decided advantage, an attempt will be made to clearly set forth the extent to which die forging of alloy steel is carried on abroad.

Some of the illustrations here given are made from photographs of Krupp die forged parts, but all the forgings were not made from alloy steel. Any piece that can be die forged can be made of special nickel or nickel-chrome steel, as the case may be, but failure might result from attempting to employ some one grade of nickel steel for all purposes.

For work involving much upsetting nickel steel and some grades of nickel-chrome steel are not suitable, and any high phosphorous product of either of the grades of steel is likely to show much evidence of unsoundness after drop forging, although high phosphorous steel is unsafe, even if there are no surface evidences.

Fig. 1 shows a nickel-chrome steel rear axle, which is one of the most difficult automobile pieces to die forge, because of the great length of the piece if made without a weld, and also because the material is of great hardness and strength. Besides the steel can be easily spoiled either by "soaking" or by forging at an improper temperature. Rear axles, if of the plain artillery type, are also troublesome, because they must be hardened, and the material must therefore be capable of being hardened without being damaged in the process. The material in question serves the purpose very well, and may be had in die forged axles, even of the most intricate shapes.

Fig. 2 represents a front axle of special steel, the merit of which lies in the fact that the forging is in one piece, and the metal will withstand die forging heats without being "burnt," as the deformed axle readily indicates, in that it shows no evidence of cracks or other imperfections after bending.

Fig. 3 is an illustration of an I section nickel-chrome steel rear axle in one piece, the cost of which, if a hand forging, would be excessive. This axle is used in one of the finest German cars, and is known to be thoroughly good in every way. Axles of this material cannot be welded at all.

Fig. 4 is a die forging of special carbon steel, and represents a German product much used abroad. Fig. 5 is a die forging made (in Germany) of a grade of steel that can be case hardened. In this case the member is not to be worked so hard as to require the use of alloy steel, but the finer grades of steel would stand the process perfectly. Fig. 6, of the same material as Fig. 5, shows how nicely the part may be fashioned, thus avoiding much roughing out, which would be necessary if hand forging was resorted to. This figure represents a part in one of the best German cars, and shows quite conclusively the ease with which intricate shapes may be produced.



Figs. 1-11.

Fig. 7, representing a specimen of special side frame stock, shows the extent to which bending may be resorted to without any evidence of cracking or other undesirable imperfections. Fig. 8 shows an intricate structural shape for a cross member in a chassis frame, flattened out without a sign of distress. Fig. 9 shows again the finest results from the use of special side frame stock.

Fig. 10 shows a fracture of a case hardened nickel-chrome steel bar, and brings out very plainly the long core fibre resulting from reannealing after case hardening, which process does not soften the glass

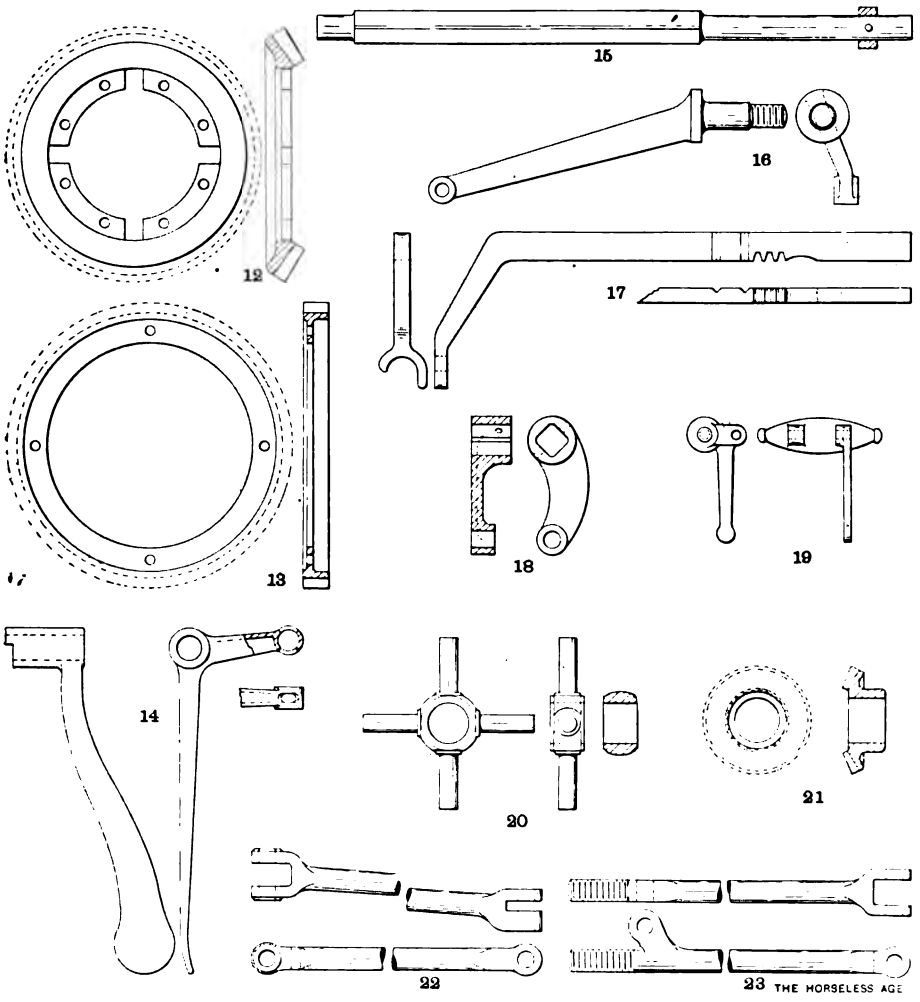
hard armor. Fig. 11 illustrates a die forged nickel-chrome steel case hardened gear, which was purposely disrupted to show the depth of armor and the long core fibre.

Fig. 12 shows a die forged nickel-chrome steel bevel gear. The material is a French product running about 0.60 per cent. chromium and 2 per cent. nickel, and not far from 0.30 per cent. carbon. This gear is very much cheaper to produce than any nickel-chrome steel hand forging can be, because the unimportant faces are to size. The first cost of the forging is also much lower than that of hand forgings of the same quality of material. Fig. 13 shows a large square cut low speed gear which, if a hand forging of nickel-chrome steel, would cost about 60 cents per pound. By die forging the cost is reduced about one-half, and, besides, in die forgings there is only the finish to remove, whereas hand forgings are over three times the weight of the finished gear.

Fig. 14 shows a piece rather difficult to forge in dies, but very costly to hand forge. The die forging is made of steel, with physical properties as follows: Tensile strength, 78,000 pounds; elastic limit, 44,000 pounds; elongation (in 2 inches), 26.5 per cent.; contraction, 60 per cent. These characteristics are evidence of a fine low carbon steel, which, with low sulphur and phosphorus, will permit of die forgings. This piece illustrates fully the desirability of using appropriate grades of steel, rather than a single grade throughout.

Fig. 15 shows a gear shaft of nickel-chrome steel as used on a French car. By die forging this piece the extra material is saved, and the extra cutting is eliminated. The results attained are satisfactory, although the writer does not approve of the square shaft. The nickel-chrome steel steering knuckle lever, shown in Fig. 16, is a very important part in a car, and hard to produce by any hand process. Fig. 17 is an illustration of a very crooked shaped member, usually made in two parts. When made by die forging greater uniformity in shape is attained, as well as greater strength, since welds are avoided.

Die forging is certainly the best process by which to make a lever in an irregular shape, like that shown in Fig. 18, and have all the same levers on the respective cars look alike. Fig. 19, a flywheel ball governor weight, is a piece that is very convenient to produce in dies, because machining such surfaces would be very difficult. The steel is of an ordinary grade. Fig. 20, the differential gear spider in a French car, is a piece which combines lightness with an adequate factor of safety, as a result of the use of a nickel-chrome steel die forging. The cost of this part is far less than a hand forging in the most ordinary grade of carbon steel. Fig. 21 shows a nickel-chrome steel die forging of a differential gear side member. In this part the high cost of material is offset by the low cost of the manufacturing process.



FIGS. 12-23.



FIG. 24. FIG. 25.

Fig. 22 shows a poorly designed French distance rod, and serves to illustrate that quality of material is more important than quality of design. However, the use of fine material does not license bad design. Fig. 23 shows a shape which is very easy to forge, but if hand forged the part will be most uncertain in use, because the weld will not be reliable.

Fig. 24 illustrates the effect of case hardening 20 point carbon steel, which is to give the metal a dangerous crystalline structure, and results in chipping off of the armor. Such a gear will become disintegrated with the first 500 miles travel of the car. This shows that in die forging an appropriate grade of steel must be selected, else good result will not be secured. Fig. 25 is an illustration of a die forged nickel-chrome steel gear which, though very small, served well in the differential of a German car of great power and high speed for two years, and was removed because the end thrust wore the hub until it became too short to use with safety. The gear teeth did not fail, but were broken out to show the fibre structure.

In conclusion it may be said that by the use of the die forging process the cost of manufacture may be reduced without reducing quality. Indeed, the quality should be enhanced, because uniformity must result from the process.

The European Tour.

This endurance contest does not appear to have met the approval of any great number of manufacturers, for, according to the latest reports, only twelve cars have so far been entered, four of which are German and one is English. The De Dion firm has offered to furnish metal road signs for the contest gratuitously. Count Liedekerke has begun negotiations to facilitate the passage of the Belgian frontier by the contestants. M. Chaix, president of the sub-committee for the French portion of the route, started on a trip over the course on March 19 to gather material for the road maps, and select places for controls and parks.

Evidence and Proof of Speed.

By Xenophon P. Huddy, LL.B.

Of all the annoyances to which an automobilist may be subjected none is so inexcusable as an unwarranted arrest for overspeeding when there was no actual violation of the law. Overspeeding is probably the cause of more arrests than any other alleged violation of automobile regulations. Many arrests for violating speed regulations are, no doubt, authorized, but there have been numerous cases where the stopping of an automobile and the taking of the operator into custody for exceeding the speed limit was unlawful. In case an arrest is unauthorized the motorist ordinarily must be content with a discharge by the magistrate, after having suffered the annoyance of being interrupted in driving; there is no redress which he cares to pursue.

The question whether an automobilist has exceeded a certain speed limit is one of fact, to be determined by all the evidence given. But more important still is it to know what kind of evidence may be offered and received to prove that the speed of an automobile was more or less than a given number of miles per hour.

Let us take a common case. The officer who arrests the operator of an automobile for overspeeding swears in court that the defendant was driving at a rate of 22 miles an hour. The defendant testifies that the speed of his automobile was only 19 miles an hour. Who is to be believed, and which testimony has most weight? There may be other witnesses who give evidence as to the speed as they observed it at the time, and there may be testimony given concerning the speed as determined from a stop watch or speed indicator; but where there is a conflict in the evidence, as is usually the case, the testimony must be carefully weighed by the court in order to determine the truth. Very likely no witness would attempt to color his testimony, but even so the task of weighing the evidence given by witnesses regarding the rate of speed of a moving object is one of difficulty.

For the purpose of facilitating a proper understanding of what evidence may be used in proving or disproving the speed of an automobile, and of the weight of the evidence, the writer presents in convenient form the rules which have been announced by the courts. A proper use of this matter may prove of service to the automobilist who becomes involved in a controversy over the rate of speed at which his car traveled at a particular time, either in a civil or criminal proceeding.

In considering the speed of an automobile two things arise for determination—distance and time. The estimate which the ordinary individual is capable of making of distances, as observed by the naked eye, is apt to be very uncertain. Human judgment of distances, unless the individual is specially trained, is apt to be weak, and testimony to the effect that one object is so many feet distant from another object, based upon casual observation, is not of much weight, especially if put against evidence of a certain nature, based upon mathematical calculation or instrumental indication.

Time also is a matter incapable of exact estimation, so far as the ordinary individual is concerned. The statement by an individual that it took an automobile so many minutes to run the length of a block, the evidence being the mere opinion of the witness, is apt to be unreliable and should be given little weight in a court of law as against evidence based on the indication of either a speed indicator or a stop watch.

Mathematical estimation of speed, however, is not always available at the time the controversy arose. The opinion of witnesses must be relied upon to a great extent, and it is this kind of evidence and the weight thereof which requires special study.

According to all the rules for weighing evidence the chauffeur, or the operator of the automobile, should be regarded as the best witness to the speed of his machine. (See Bowes vs. Hopkins, 84 Fed. Rep., 767-769.) He is the custodian, so to speak, of the speed. His testimony should be specially valuable if it consists not merely of an expression of his judgment but of what he actually did in the way of regulating the speed, for the reason that in the latter case, if his testimony is not to be credited, the judge may pronounce him guilty of perjury, and very strong proof is always required to justify that severity.

An observer of a passing automobile may testify to his estimate of its speed without qualifying as an expert, although his testimony may not be of so much weight as that of one who has been accustomed to make and verify such estimates. (Louisville, etc., R. Co. vs. Jones, 108 Ind., 551, 9 N. E. Rep., 476; Kansas, etc., R. Co. vs. Crocker, 95 Ala., 412, 11 So. Rep., 262; Detroit, etc., R. Co. vs. Steinburg, 17 Mich., 99.) But it has been held, and is probably the correct view, that he must qualify to the extent of showing a measure of experience and observation which will make his opinion fairly reliable. (Grand Rapids, etc., R. Co. vs. Huntley, 38 Mich., 537.) His testimony that the automobile was running "fast" or "slow" cannot, it is said, be excluded merely because of its indefiniteness. (Illinois Cent. R. Co. vs. Ashline, 171 Ill., 313, 49 N. E. Rep., 521.) On the other hand it has been declared that such testimony "is altogether too uncertain for judicial action, and most especially so when there was no collision." (Yingst vs. Lebanon, etc., R. Co., 167 Pa. St., 438; 31 Atl. Rep., 687, per Green, J.) It was observed by Chief Justice Campbell in Grand Rapids, etc., R. Co. vs. Huntley, 38 Mich., 540, that "opinions on relative speed, without some standard of rapidity, are of no value by themselves."

The witness may be permitted to testify that the machine was moving at a snail's pace, or no faster than a man walks, or faster than a man could run. (Kansas City, etc., R. Co. vs. Crocker, 95 Ala., 412, 11 So. Rep., 262.)

Testimony of a witness who estimates speed at a stated number of miles per hour will not be struck out because on cross-examination he confesses that he does not know how many feet or rods there are in a mile. (Ward vs. Chicago, etc., R. Co., 85 Wis., 601, 55 N. W. Rep., 771.)

Estimates of speed, as in the case of all other kinds of "opinion" evidence, must give way to testimony to cold matters of fact and legitimate inferences therefrom. (Muster vs. Chicago, etc., R. Co., 61 Wis., 325, 50 Am. Rep., 141; Retterstrom vs. Brainard, etc., R. Co. (Minn., 1903), 94 N. W. Rep., 882.) For example, if testimony to a high rate of speed conflicts with the proved fact that the machine was stopped within a few feet the latter evidence must prevail. (Graham vs. Consol. T. Co., 64 N. J. L., 10, 44 Atl. Rep., 964; Vogler vs. Central, etc., R. Co., 83 N. Y., App. Div., 101, 82 N. Y. Supp., 485.)

Undoubtedly the converse proposition is also true, that an estimate of a low rate of speed must be overruled by indubitable proof of facts reconcilable only with high speed, such as the force of the impact of the machine (Brennan vs. Metropolitan St. Ry. Co., 60 N. Y., App. Div., 264, 69 N. Y., Supp., 1025), or the considerable distance traversed by the machine, despite the efforts to bring it to a standstill. (R. Co. vs. Bordenchecker (Ind. App.), 70 N. E. Rep., 995; Hoppe vs. Chicago, etc., R. Co., 61 Wis., 357-364; Zolpher vs. Camden, etc., R. Co. (N. J., Err. & App.), 55 Atl. Rep., 249.)

It may be here remarked that estimates of distance are perhaps even less trustworthy, in point of absolute accuracy, than estimates of speed. In the New Jersey case last cited estimates of the various witnesses ranged all the way from 3 feet to 40 feet, and in Cannon vs. Pittsburg & B. T. Co., 194 Pa. St., 159, 44 Atl. Rep., 1089, the extreme estimates were 60 feet and 140 feet.

Is testimony to speed of the automobile at one place admissible on the question of its speed at another place on the same route? It is safe to say that ordinarily it would not be relevant. If, however, it were conceded—by the chauffeur, for instance—that the speed had not been accelerated or diminished, as the case may be, between the two points, such testimony would be clearly admissible. (Louisville, etc., R. Co. vs. Jones, 108 Ind., 551, 9 N. E. Rep., 476.)

A pedestrian crossing a street would be quite likely to erroneously estimate the speed of an approaching automobile, and if run down by it he would easily imagine that its speed was suddenly increased or that it had been in no degree slackened (See remarks of Collins, J., in analogous case, Schmidt vs. New Jersey St. R. Co. (N. J. Sup., 1901), 48 Atl. Rep., 438, and of Dean, J., in Gangawer vs. Phila., etc., R. Co., 168 Pa. St., 265; 32 Alt. Rep., 21.)

It would be impossible for an observer facing an automobile approaching or moving away from him on a straight course to determine its speed with anything like the degree of accuracy he could attain if his line of vision were transverse to the direction in which the machine was moving. (See Colo., etc., R. Co. vs. Robbins (Colo., 1902), 71 Pac. Rep., 371; Muster vs. Chicago, etc., R. Co., 61 Wis., 325, 50 Am. Rep., 141; Huntress vs. Boston, etc., R. Co., 66 N. H., 185, 34 Atl. Rep., 154.)

Bias of witnesses is one of the most troublesome factors with which courts have to deal in weighing testimony. Where it is sought to prove that an automobile was running at an unreasonable speed or at a speed prohibited by statute or ordinance, it is highly probable that witnesses who voluntarily testify against the motorist will be biased, considering the present state of public opinion in some localities. Very recently a New Jersey grange adopted resolutions condemning expenditure of money in improving highways whereby automobiles would be accommodated, and denouncing the latter as public enemies. Courts frequently take judicial notice of prejudice that usually exists against corporations, and we presume they would take like cognizance of the animosity against automobilists. At any rate the partisanship of witnesses testifying to excessive rates of speed is likely to crop out in their testimony, so as to justify the trier of fact in putting them in the category of biased witnesses. Now, what is the rule in weighing the testimony of such witnesses? So far as it pertains to the present discussion the rule is this: In matters of opinion the witness is to be distrusted (Lockwood vs. Lockwood, 2 Curt. Eccel., 281-289, per Dr. Lushington), and the term opinion includes estimates of time, distance, speed, etc. In practice judges should give very little weight to the opinions of biased witnesses; for, besides the unconscious operation of bias in warping the judgment of an honest witness, an effect universally conceded, bias may readily have a more sinister influence, in view of the fact that it is virtually impossible to obtain a conviction for perjury in falsely testifying to an opinion.

But, it may be replied, if witnesses are biased in favor of the prosecution, it is also certain that the chauffeur or occupants of the automobile are decidedly interested in their own behalf, and that their testimony is equally unreliable—that all are "in the same boat," as the phrase goes. We concede it. The burden of proof, however, is on the prosecution, and if it can do no better than to leave the evidence in equipoise—if it cannot produce a preponderance at least of credible evidence, or evidence beyond a reasonable doubt, as is required for a conviction in criminal cases—then according to the familiar rule the prosecution fails to establish its contention.

When a witness gives his estimate of the time consumed by the automobile in passing from one point to another and the distance between the points is ascertained by measurement the testimony is not of much weight. No experienced judge ever leans upon a witness' estimates of a short period of time further than to believe that it was a brief period. Cases on this point are numerous and emphatic. "Nothing is more uncertain or unreliable than the testimony of witnesses as to the time occupied in a transaction," said Vice Chancellor Green in McGrail vs. McGrail, 48 N. J. Eq., 532, 22 Atl. Rep., 582. "There is no matter upon which witnesses are so likely to be mistaken as a question of time," said Bruce, J., in the Wega, Prob. Div. (1895), 156, 159. "People differ widely as to the estimation of passing time—particularly is that so in naming the minutes or seconds that may be thought to expire on any particular occasion," said Gill, J., in Culberson vs. Chicago, etc., R. Co., 50 Mo. App., 556, 562.

Bias of a witness, when he speaks of minutes or seconds not measured by a time piece, is always certain to perturb his judgment. Ridge vs. Penn. R. Co., 58 N. J. Eq., 172, 53 Atl. Rep., 275, furnishes an excellent illustration. There an injunction was sought against a railroad company to restrain it from maintaining a nuisance at a city crossing by suffering its freight trains to block the highway for an unreasonable time. Many witnesses on each side testified to the length of time which they were compelled to wait on various occasions. One witness swore by his watch. That was very good evidence. Vice Chancellor Reed intimated that other witnesses in the service of the company or related to some one in such service would be disposed to overlook any discomfort from obstruction by trains, and would underestimate the delay. On the other side angry pedestrians who were in a hurry to get to their business or other destination would exaggerate the time of waiting.

The conclusion is that evidence of speed, consisting of mere opinions of witnesses, is very unsatisfactory where accurate knowledge is essential, especially if the witnesses are biased; that it is inferior in weight to inferences derived from significant and well established facts; and that the best evidence is the testimony of a witness who made use of a speed indicator or a stop watch on a measured course. Where the speed indicator of an automobile and the stop watch of an officer are at variance, assuming that both instruments are accurate, it would seem that the speed indicated should control the determination of the speed, since it is purely mechanical and involves no judgment, while the stop watch is not automatic, so to speak, but requires action on the part of the officer and some judgment in using the watch.

Interesting Legal Case.

An interesting automobile case has just been decided in Paris. One day in April, 1904, a certain motorist took out his mechanic on a trial spin on his new car from Paris to Auxerre. En route, when approaching the village of Appaquy, some children by the roadside saluted the occupants of the car with a shower of stones. The latter were well aimed, and the mechanic was badly cut about the face. Whereupon the car owner, throwing on the brakes, called to his mechanic to deal out summary justice on the youngsters, who were then in full flight. Nothing loath, the mechanic jumped to the footboard, or rather to where the footboard should be, and fell out with a crash upon the road. The footboards had not been fitted, as the car was only in the rough condition, and the mechanic thereupon sued his master, alleging that the suddenness of the action of the brakes contributed to his injuries. The court, on the grounds that the owner of the car had, by his speech, led the mechanic to jump off, decided that the former should pay for half the damages done to his servant. On appeal a higher tribunal determined the responsibility as follows: Car owner, one-third; mechanic, two-thirds.

Book Reviews.

Jahrbuch der Automobil und Motorboot Industrie, III Jahrgang. (Year book of the Automobile and Motor Boat Industry, third year.) Published at the request of the German Automobile Association by Ernst Neuberg, C. E. Sold by Boll & Pickard, Berlin.

The third edition of the German Automobile Association's year book covers essentially the same ground as the two former editions. It contains special articles on recent advances in the different branches of automobile construction, a review of automobile patents issued in Germany, Austria, England and the United States, an index to current automobile technical literature, and several articles relating to recent automobile events. A most complete article is devoted to motor cycles. Among the most interesting special articles is one on speedmeters and signaling devices.

Krausz's Practical Automobile Dictionary—English-French-German, French-English-German, German-French-English. By Sigmund Krausz. Published by Frederick A. Stokes, New York.

The book contains 12,000 technical and other words employed in connection with motor cars, and as it is in three parts, with the terms in each language arranged alphabetically in one of the parts, it ought to be quite convenient to those who have occasion to read or translate automobile matter in any of the three languages with which they are not perfectly familiar. The author, we learn, compiled the work while he was in charge of the H. H. Franklin Company's foreign department, and the dictionary is intended for all those who have occasion to correspond on automobile matters in foreign languages, to read foreign automobile publications or to travel by automobile in foreign countries. A glance through the book shows it to possess a very fair degree of accuracy.

THE HORSELESS AGE

...EVERY WEDNESDAY...

Devoted to Motor Interests

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A Word of Caution.

In the development of the commercial vehicle field a conservative policy must be pursued; the boom methods which have to a great extent been applied in the pleasure vehicle business will not succeed. It will not be possible to induce business men to invest in motor trucks by instilling enthusiasm, which is often successful in selling a pleasure car. The substitution of mechanical for animal motive power in commercial trucking and delivery work is a plain dollar and cents proposition, and it is for this reason that commercial vehicle manufacturers almost invariably find it necessary to give extended demonstrations to prospective customers, sometimes as much as a month in duration.

In marketing a commercial vehicle model due prudence must be observed. Prospective purchasers may object to the comparatively high price, but it would be suicidal for a manufacturer in the commercial vehicle field to concede too much to the clamor for cheapness. After a car has been delivered it does not take long to determine the quality of its construction, and the reports of success or failure generally spread very rapidly, so that after a short period the further demand for the manufacturer's product is very largely influenced by the behavior of his cars already in use. Conservatism must also be shown in the matter of speed. The customer may accompany the demonstrating car watch in hand and express himself highly satisfied with any saving in time shown, but his satisfaction is likely to be short lived if the car refuses to stay together in service, as it most likely will if it is geared on a touring car basis.

If conservatism is necessary in the designing department of a commercial vehicle factory it is even more essential in the administrative department. The commercial vehicle is still in the early stage of its development, and up to the present attempts at its adoption have too often ended in failure. The successful operation of a demonstration car for a few months does not warrant an output sufficient to cover the needs of the whole country for vehicles of the class. Weaknesses are apt to develop after a lot of cars have been put through, and if the lot is large it may prove a death blow to the firm. Cars placed in commission should be carefully watched for defects, improvements should be applied whenever they suggest themselves, and the rate of production should be increased gradually, as extended successful service of the product justifies greater confidence in the future demand for them. "Hasten slowly."

The Most Serious Automobile Offense.

A violation of a law prohibiting the driving of an automobile over a certain rate of speed is ordinarily not considered a very grave crime. The infraction of automobile regulations does not stamp the guilty motorist as a criminal, even though it must be admitted that it is as much a technical criminal offense as a case of larceny. In the violation of automobile enactments a moral wrong is lacking, and this distinguishes the offending motorist from the criminal as generally known. The community does not always hold in contempt one who drives an automobile contrary to law, and the offender is in no way damaged in his reputation or character. If there is no moral wrong committed the act is merely mala prohibita. But let us consider the situation in a case where the prohibited act meets public condemnation.

Take a case of negligently killing a human being—manslaughter. In such an instance, if the injury amounts in law to the crime of manslaughter, not only is there a serious infraction of the law but public sentiment is greatly aroused, and there is

also a legal and moral offense committed against all automobilists.

It may be said that no motorist contemplates that he may negligently kill another who is using the highway, but should he not always have in mind the possibility or probability of an accident of this kind? He sees a clear road ahead and puts on speed. Unexpectedly an object appears in his path, which so takes him by surprise that it is all over before a successful effort to avoid a catastrophe can be made. Manslaughter is charged, and the unfortunate operator is held for trial.

Whether the automobilist is guilty of the charge of manslaughter depends upon whether the death was caused by negligence. Was the chauffeur or operator driving faster than the law allows? Did he have proper control of the machine? Was he intoxicated? What was his conduct after the collision? These are some of the important questions which would be asked in determining the guilt or innocence of the accused. If the motorist was exercising due care at the time and was driving lawfully his innocence is clear. There is no criminal responsibility for a pure accident, or a mistake of judgment. But where the operator's conduct at the time of a collision causing death was unlawful, or his act was negligent, the circumstances are very much against him. It may be impossible to lay down a rule so broad that if it is followed it will operate to prevent injuries due to improper management of a machine. However, every operator should be aware that if he has a disposition to overstep the limits defining lawful driving he takes great chances and looks squarely into the face of severe penalties for one of the most serious crimes known to the law. The only safe rule to follow is to take no chances.

Objectionable Automobile Practices.

It is a pleasure to observe that a seat operated muffler cut-out is a feature of comparatively few of the late cars. Like all such objectionable remedies, provided to meet conditions which are removable, it has been largely discarded as soon as the circumstances appearing to warrant its use have been eradicated. As mufflers have been improved, so that they act without undue back pressure, and as engines have come into use which possess a very large surplus of power, the advantage which formerly existed in the use of the cut-out in relieving the choking action of a badly designed muffler and adding slightly to the power of the engine has ceased to be of sufficient importance to warrant the use of this highly objectionable and prejudicial expedient. Almost all State laws have taken unfavorable cognizance of the muffler cut-out, as well they might, and it is believed that the majority of motorists have come to realize the annoyance occasioned to the public by their running with "cut" mufflers, except in the most unfrequented districts. Hardly anything has done more to prejudice people against the automobile than the use of the muffler cut-out, and its employment has seemed all the more wanton an offense against the public nerves, because not even the offender has gained any appreciable advantage by resorting to it.

No owner of a modern car of high ability has the slightest legitimate excuse for the use of the muffler cut-out, so far as enabling him to gain power is concerned, and the only circumstance under which such a person is justified in opening his muffler is in testing the regularity of operation of his motor, which may be obscured by the action of a good silencer. A screw plug in the exhaust pipe or muffler, capable of being removed when a test is required, covers such cases.

A seat operated muffler cut-out on a modern high powered touring car can only be regarded as an instrument of public torture, and it is a matter of congratulation that now it is very seldom supplied. Even on small cars one finds very few cut-outs, and it would seem that the day of this particularly pestilent and really inexcusable device is drawing to its end.

If the use, among traffic, of excessively dazzling and confusing lights—sometimes as many as four in number upon a single car—which give it the appearance of a battleship repelling a torpedo attack and blind all other users of the road, could also become obsolete and be followed into desuetude by the practice of employing, in land travel, unnecessarily startling and hair raising fog horns, automobiling would be freed from much of the ostentatious vulgarity which now too frequently characterizes it.

Bases of Competition.

It appears that the conditions under which the Glidden tour was run last year have not been universally satisfactory, and some changes are in contemplation for the coming contest. However, the N. A. A. M., asked by the organizers for suggestions in this matter, has replied that it is unable to suggest any basis of competition other than absolute speed, which shall give a single winner and bring out the relative merit of the machines. This, in our opinion, is the only reply possible under the circumstances. Reliability, of course, is such an important quality that it might well serve as a measure of general merit, but no method of absolutely determining the reliability of a car is known, and the methods employed in former years in endurance contests are certain to give equal records for a number of cars. It might be suggested that upon the completion of the principal run a contest could be arranged between all those having scored perfect records, and this continued until one car proved the winner, but such a contest might prove extremely tedious and expensive, and the project is hardly practicable. Other bases of competition are fuel economy and brake power, but neither of these features is sufficiently important to serve as a measure of merit of the car. That is to say, brake power, though highly important in one respect, depends upon a very small portion of the car's mechanism, and can therefore not well be taken as a criterion of the whole. Various attempts have been made to combine these bases of competition, as in the Herkomer trial, but in such cases the difficulty always arises of properly comparing the value of the different factors. In the Herkomer trial the factors are reliability in the endurance run, speed in a level and hill race, and appearance and comfort as judged by a committee. Each of these items is undoubtedly of value, but their relative value is a matter of personal opinion, and hence the result of the contest is of no great practical value. But the one object desired, that some one car shall score higher in the final classing than any of the rest, is most likely to be attained, as the probability that two cars should gain the same total maximum number of points is very remote, and can be further guarded against by providing that in such a case the car having scored the highest in any particular competition shall be the winner.

In a practical competition it is not really necessary that there should be a single winner, as it must be admitted that our present methods do not allow of absolutely determining reliability, the chief item in the practical value of a car. It can only be ascertained whether a car attains a certain predetermined standard of reliability.

COMMERCIAL APPLICATIONS

The Motor Omnibus for Hotels.

While the motor omnibus is at present in common use by the hotels of only one city of the United States, the question as to its practicability under suitable conditions is hardly open to discussion. At Atlantic City the experimental stage seems to have been long passed, its general usefulness having been amply demonstrated five years ago. The motor omnibus, of course, is used in other cities, but is often regarded more as a plaything or a luxury, and has not yet become a necessity. The reports in regard to it are generally satisfactory, and its popularity is increasing.

The omnibus is not used by hotels to the same extent it was years ago, especially in cities of the first class. The old horse omnibus was a lumbering affair at best—a relic of stage coach days—and it is little wonder that it was laid up in the barn indefinitely when the street cars brought quick transportation. Consequently many hotel proprietors do not think an omnibus necessary, believing it an avoidable expense. There are many instances, however, where the comfortable, handsome and swiftly driven motor omnibuses of the present day have more than paid for themselves in short periods of time by the additional custom they have attracted.

AT ATLANTIC CITY HOTELS.

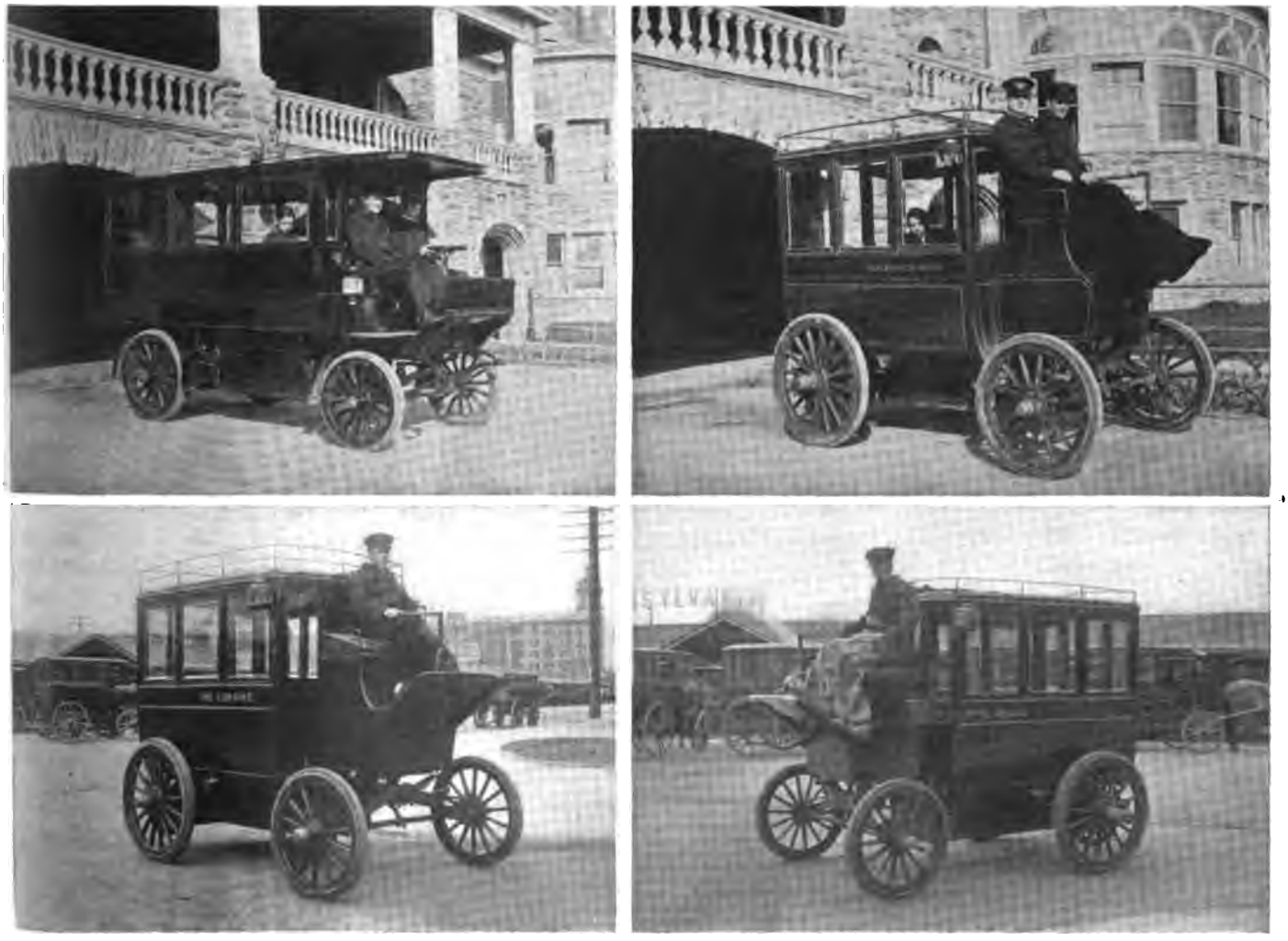
Atlantic City has a permanent population of about 40,000, which swells to 500,000 during the rush days of July and August. Eighteen hundred hotels and boarding houses are required to house this great visiting population. Of these hotels nearly fifty are first class. They are beautiful structures fronting on the beach, with every luxury and convenience that modern wit can devise. Each of them supports from one to four motor omnibuses for the convenience of their guests, and they count them as part of their necessary equipment. The buses are for the most part driven by electric power, and are built in the conventional omnibus style, with a capacity of from eight to fifteen passengers, a space on top for light baggage, and windows that can be raised or lowered at will.

Electric buses are found practicable in Atlantic City, because the streets are generally good and the runs short. The hotel proprietors say they like them because they are noiseless, easy to operate and not liable to accident; also because they do not require the services of an expert machinist to keep in repair. As nearly all the hotels have their own electric plants there is no extra cost for recharging of batteries.

As one stands at the intersections of the streets leading from the railroad stations to the big hotels and watches the long line of buses, just after the arrival of an important train from New York or Philadelphia, he sees a practical demonstration of the hotel motor omnibus which is possible nowhere else. The ease with which the vehicles are handled, the absence of noise and of quarreling among angry drivers, the quickness of their going and coming, the expression of satisfaction on the faces of the passengers themselves, all speak of the superiority of this kind of omnibus over those drawn by horses.

The streets in Atlantic City are for the most part excellent, the greater number of them being macadamized. Atlantic avenue, the main thoroughfare, however, is in very bad condition for motor driven vehicles in wet weather, and is avoided as much as possible. It has only a gravel surface, and during rainy weather there is from 6 to 10 inches of mud on the surface. Ordinances are pending before the city council to asphalt this thoroughfare.

Accidents are infrequent and usually of a trifling nature. They are generally due



ELECTRIC HOTEL BUSES IN USE AT ATLANTIC CITY, N. J.

to the heavy wheels skidding in wet weather. It is almost surprising that accidents of a serious nature have not happened, when one takes into consideration the great amount of traffic for the width of the streets, especially at train times, and the speed at which the buses travel. As they leave their various hotels at the latest possible moment to catch a train the drivers speed them to the limit of the municipal regulation, which permits 20 miles an hour.

The runs made by the buses between the depots and their respective hotels are short, the longest of them being less than twenty-five blocks. But as they are made often the buses are kept going continually from early morning till late at night. The work done by these vehicles in the past few years would have killed dozens of horses.

Among the hotels using motor omnibuses are the Marlborough-Blenheim, the Hotel Chelsea, the Royal Palace, Galen Hall, the Pierrepont, the Loraine, the Chalfonte, the Hotel Islesworth, the Seaside, the Strand, the Ostend, the Garden Hotel and the Brighton. Each of these operates from one to four vehicles, in addition to which the Marlborough-Blenheim and the Brighton each operates a motor truck for the transportation of its guests' baggage. Although the motor truck is an innovation, the hotel proprietors believe that it is the ideal baggage wagon, and there is little doubt that many of them will be in use soon.

The hotel proprietors have nothing but praise for the motor omnibus. As the city is a pleasure resort, novelty is the watchword. Most of the guests of the hotels are pleasure seekers, or vacationists who want to see something different from what they get at home, and when the hotel proprietors gave them motors a few years ago the novelty was a fetching attraction. But now



ELECTRIC BUS OF THE SEASIDE, ATLANTIC CITY, N. J.

they have become so common that the proprietors are looking around for some other change. The Seaside and the Marlborough-Blenheim are planning to discard their old style of buses and have purchased new vehicles somewhat more pretentious in decoration and design. They are designed to carry fourteen passengers each, and are painted black and handsomely trimmed with brass work. The windows are of heavy plate glass, and the seats are luxuriously upholstered with dark leather, the other parts of the interior being treated in light tones.

The Marlborough-Blenheim operates four eight-passenger electrics, which have been in continuous service for about five years. They are painted green and have the words "Marlborough House" on each side. This hotel has purchased two of the handsome new buses.

Some proprietors have abandoned the use of electric omnibuses because they claim they are too common in Atlantic City.

THE YATES HOTEL OMNIBUSES, SYRACUSE, N. Y.

The two automobile omnibuses which are run by the proprietors of the Yates Hotel, Syracuse, N. Y., to meet all trains arriving at the New York Central and D., L. & W. railroads have proved most serviceable conveniences, as well as profitable advertisements for the hotel.

The machines have been in use a little over a year, and have given excellent satisfaction to the traveling public and to Averill & Gregory, the proprietors of the hotel. They were installed after many misgivings and fears that horses would have to be called in frequently to do their work. But we are informed this has never happened, and the four horses which formerly did the work of the machines have been sold, and the two horse buses are now being used by the Judd Express Company at other hotels.

These automobile buses receive about as hard usage as could be given, the trouble being that they are always in use and never stand in a shed or have any protection from the weather. When they are not meeting trains they stand in front of the hotel, no



GASOLINE BUS OF INDIANA SPRINGS COMPANY, ATTICA, IND.

matter what the weather. Owing to the lack of room and the frequency of the trains, the hotel keepers have not been able to make any arrangement whereby the machines could be protected from the weather. Ordinarily automobiles which had to stand out of doors all the time would be in bad shape before this, but these machines seem to be as good as ever and doing business every day.

The cost of repairs during the year in which they have been in commission, we are told, has been about $200 for each vehicle, which is considered small when the heavy and constant work which they do is taken into consideration. The electric light plant in the hotel is utilized in charging the machines. The engineer has kept track of the expense, and says the electric charging does not require a bit more coal, and that the current for the machines, consequently, does not cost anything. The machines are charged out in front of the hotel when the trains are less frequent late at night. A wire is hitched onto the plant in the cellar and is brought up through a hole in the sidewalk. There has been some trouble in the employees going away and leaving the current on, which resulted in overcharging.

Each machine makes thirty trips a day, a total of 15 miles. Twenty-five cents is



ELECTRIC BUS OF ALLYN HOUSE, HARTFORD, CONN.

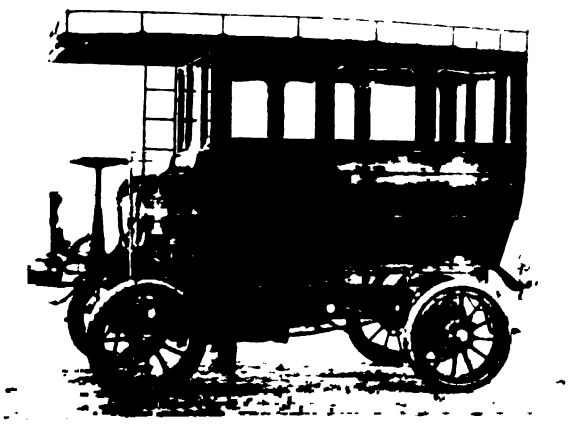
harged for the round trip and 15 cents for me way. Rarely does a passenger object o the charge, although once in a while a nan is found who thinks he should be carried to and from the hotel gratis.

These automobiles are of the regular hotel omnibus type. They are backed up to he sidewalk at the station, and the drivers ise their most persuasive tones to get guests for the Yates. They each have room for ight to ten passengers and places on top for their grips, which are carried free of harge. After they alight at the hotel and while they are registering the drivers take handfuls of tickets and ask them if they want a round trip ticket. Most of them do and pay the 25 cents on the spot. Others have it charged in with their hotel bill and pay it when they depart.

On account of their novelty the automobiles make trade for the hotel. This fact is admitted by all, even the competitors of the Yates. Then there are many people, like members of theatrical troupes, who know the hotel they want to go to, that having been arranged by an advance agent. But they had intended to walk the quarter of a mile or so. They see the automobile and decide to have a ride. This means a few quarter dollars for the landlord that he would not have had without the automobile.

The trip from the hotel to the railway stations takes the machines over some hard roads on account of the multiplicity of street car tracks and railroad tracks which run right through the centre of the city. Of necessity the trips have to be made in slow time or a few axles would be broken. Solid tires are used, doing away with all danger of puncture.

The machines, of course, have the most passengers in the winter, when the warm looking interior, sheltered from all cold. has an inviting appearance. The upholstery is light in color, and there is the useful looking glass by which the ladies may arrange their hats and apparel before appearing at the hotel. At the hotel a footman opens the door and bell boys hustle the grips from the bus inside. Then the driver collects the fares, sells tickets and hurries off to the station again for another load.



GASOLINE BUS OF PALACE HOTEL, SAN FRANCISCO.

POLAND SPRING HOUSE.

An 18 horse power automobile omnibus with seating capacity of seven passengers was operated between Poland Spring House, South Poland, Me., and the railroad station 5 miles distant, last season. The hotel is located at an elevation of 400 feet above the station, and the road leading to it is in excellent condition. Hiram Ricker & Sons, the proprietors of the hotel, were convinced from their experience with this vehicle that it was a profitable investment, and have purchased two omnibuses of higher horse power for the coming season, which opens the middle of May. They found the motor vehicle practicable in every way, and less costly in operation than a horse vehicle.

SAN FRANCISCO HOTELS.

The Palace Hotel, San Francisco, owns a twelve passenger, 18 horse power omnibus; it is driven by a two cylinder gasoline motor, and is geared to 18 miles an hour. It is lighted by electricity, and equipped with a signal bell to the operator. The woodwork is of mahogany and the window sashes are hand carved.

The St. Francis Hotel and the Hotel St. Nicholas in San Francisco also operate good sized motor omnibuses, and have found them perfectly satisfactory. Other hotels in the city are preparing to introduce them.

HOTEL DEL CORONADO, SAN DIEGO, CAL.

Two years ago an electric wagonette was operated between the Hotel del Coronado and the golf links, a distance of about one-half mile, giving half hourly service from 9 a. m. to 5 p. m. The vehicle had a carrying capacity of about twelve passengers. The expense for electricity averaged about $2 per day, but repairs to the motor and the renewal of batteries made the use of the machine prohibitive, consequently its use was discontinued, notwithstanding that it gave excellent satisfaction to the traveling public on account of its comfort and cleanliness.

The proprietors write us that they believe the obstacles they had to contend with two years ago have been largely overcome in the vehicles of this kind now being manufactured.

AT BOSTON HOTELS.

J. Reed Whipple, proprietor of the Hotel Touraine, Boston, has purchased five steam automobiles, which will be immediately put in use for livery purposes. The cars are painted a bright red, with the Touraine coat of arms on the doors. These vehicles will have stands about the hotel in the same manner as the horse vehicles.

Two more Boston hotels have decided to adopt steam automobiles for livery use for their hotels the coming season, displacing some of their cabs and horses.

MOTOR BAGGAGE TRUCK AT MT. WASHINGTON.

Anderson & Price, proprietors of the Hotel Mount Washington at Bretton Woods, in the White Mountains, write us that a gasoline baggage truck was operated for a time last summer from the railroad station to the hotel, a distance of three-quarters of a mile. "We must say," they add, "that the transfer was made so nicely and with such despatch that our porters felt very bad to have to go back to the horse trucks."

HARTFORD (CONN.) HOTELS.

As the hotels at Hartford, Conn., are situated within short running distance of the railroad station, and the streets are of asphalt or macadam, the use of electric omnibuses is practicable. The Allyn House has run an electric bus for the past six years, making eighteen round trips daily to the trains. Manager Dahill says that it is superior to a horse vehicle for his business. It is an 8 horse power machine with solid rubber tires, and has a carrying capacity of twelve passengers. Light baggage can be carried on top. It is painted green, with the Allyn family crest on both sides and the door. The interior is upholstered in drab, and there is a bevel plate glass mirror in front. It is lighted by electricity. Current for charging the battery is obtained at a public garage, and it can be charged to run at a maximum of 50 miles.

The Hotel Heublein uses an 8 horse power electric omnibus, which makes twenty round trips daily to the station. This coach has been in commission five years, and is said to have been off duty less than a week during this time. The management of the hotel regard the motor omnibus as much more practicable for their purposes than horse vehicles. It is painted dark blue, and is lighted with electricity outside and in. It is equipped with solid rubber tires, and is speeded to run 12 miles an hour.

The New Dom Hotel has an eleven passenger electric omnibus for its railroad service. Twenty round trips are made to the trains daily, and Proprietor Geo. R. Hodgdon says that there is considerable saving in the expense of maintenance over the use of horse power. This bus is of somewhat different type from those used by the other hotels in Hartford, being arranged to carry eight passengers outside and three inside. It is lighted by electricity, and has solid rubber tires. The battery is charged to run 35 miles.

AT AN INDIANA HEALTH RESORT.

The Indiana Springs Company have recently begun operating a gasoline omnibus between the railroad station at Attica, Ind., and their sanitarium and hotel, Mudlavia, several miles distant. Up to the present this service has been satisfactory.

The first motor omnibus service in Paris will be inaugurated on April 16 next. Of all the great cities of the world New York was the first to definitely adopt the motor bus, a line having been in continuous operation on Fifth avenue for about four years.

WINTER EXPERIENCES.

Conditions of Winter Use.

By De Forest Lambert, M. D.

At the close of a more than usually mild winter, during which motor cars have been used every day, it should prove interesting to comment on their practicability for all the year round service.

New England motorists well remember the months of January and February in 1904 and 1905, when extremely cold weather and deep snow made motor driving difficult and at times almost impossible.

In the large cities the street departments keep the roads passable for all kinds of traffic; but in the small towns the electric road ploughs are allowed to pile snow from the tracks to the sides of the street and leave it there, greatly interfering with driving. Under such conditions one is obliged to drive in the cleared space between the tracks, taking great care to keep the wheels out of the rails, as once in it is often difficult to get out, and, besides, there is danger of injuring the tires from rail cutting. I have seen many tires ruined by this cause, the edges of the rails wearing deep cuts into the rubber, and in some cases completely through the fabric. There is also some likelihood of puncture from rail splinters, and I have known it to happen twice from involuntarily driving in the rails only a few feet.

The chief trouble encountered during the winter just passed has been from road conditions usually found only in the spring when the frost is coming out of the ground; but it is not greatly to be wondered at, because during the entire season the ground has been frozen to a depth of only a few inches. This, together with the lack of snow, has caused ordinary roads to be alternately soft and treacherous and frozen into deep ruts; the former condition affording very poor traction, and the latter being rather hard on car and tires.

LARGE WHEELS.

Both of these road conditions, as well as deep snow, call imperatively for larger wheels, and I believe it will not be long before intelligent buyers will insist that their cars be equipped with wheels at least 36 inches in diameter. There are three urgent reasons for using larger wheels, viz., to get greater road clearance, to make riding and steering easier on rough and rutty roads, and to make the practicability of solid and cushion tires an undisputed fact.

To those who see no need of more road clearance I would suggest a drive immediately after a 12 or 15 inch fall of snow. This is a common experience to physicians and others who use cars for business purposes, and it seems absurd to build the running gear so low that it must act as a snow plough in addition to its legitimate function. My car is better than the average runabout in this respect, for it has 30 inch wheels and more clearance than usual, but it does not meet the objections referred to; nor does any car built which has smaller than 36 inch wheels. Another reason for more road clearance is found in certain country highways containing huge bowlders in the middle or a high ridge with deep ruts on either side, in which the car must run. I have seen several cars stalled by reason of each of these causes.

That larger wheels make easier riding and steering on rough and rutty roads no one will dispute if he give the question thought or trial. Some may not agree that any improvement is needed in that direction, but I think the majority will agree that a method which accomplishes those purposes and at the same time lessens strain to both car and operator is worthy of adoption. Several times I have been caught in deep frozen ruts, out of which my 30 inch wheels simply could not climb, where a much larger wheel would have come out with ease. And who has not skidded into a wet car track to find it almost impossible to get out again without a kindly switch to aid? All these difficulties and more will be overcome by using larger wheels.

TIRES.

Finally, and perhaps most important of all, the advent of a proper sized wheel will banish the pneumatic tire from the cars of professional and business men, and from all others also where absolute reliability is necessary. The pneumatic tire is a snare and a delusion, a relic of bicycle days, and totally unfit for use on a car designed to take the place of a horse for other than pleasure purposes. For those who drive a car for recreation only, whose time is their own, and who do not mind the inconvenience of flat tires, punctures and blow outs, the pneumatic tire is perhaps well suited, and I would be the last one to deny them the pleasures of a roadside repair, whether the mercury registered zero or 90° in the shade. But for a vehicle which is to be on the road every day in the year, which must start at a moment's notice, and keep going till its destination is reached regardless of tires, the pneumatic is about the poorest makeshift man has devised.

For the utility car, then, let us insist that it be equipped with a resilient solid tire, and with wheels which are large enough to do their duty. Many times on returning from a long drive in deep snow I have noticed that the space between the wheel spokes has been completely filled with ice, thus converting the spoked wheels into solid discs. This increased considerably the labor of cleaning the car, as well as damaging the paint and varnish on its removal.

STEEL DISC WHEELS.

I used to wonder then why someone did not invent a pressed steel double disc wheel, believing that such would be stronger, look better, cause less friction and be very much easier to clean.

Since then another physician has advocated the same idea, and at least one manufacturer has put a similar wheel on the market. I believe the idea has many merits, and I think such construction would look extremely well, especially if finished in aluminum paint.

With the more lightly built wooden bodies I have noticed a strong tendency to crack and split and open at the joints, especially in winter when the temperature ranges are extreme. On this account, and for the sake of strength combined with lightness, it would seem that bodies constructed of galvanized sheet steel would offer many advantages; also because in case of fire they would suffer less. Aluminum appears to be too costly at present for such purposes in moderate priced cars, but may ultimately prove standard practice.

FINISH.

The present method of finishing cars in several colors and many coats of varnish is unnecessary for service or utility vehicles, besides being expensive and laborious to keep looking well. It seems to me that a physician's runabout should be constructed almost entirely of metal, galvanized where possible, and all painted with aluminum composition. Such a finish is easy to keep looking well, shows dirt, dust and snow but little, and is easily touched up here and there when necessary. Above all no harm is done if mud is allowed to dry on and remain a long time, for a little soap and water makes it "look like new" again.

TRACTION DIFFICULTIES

have been slight during the past winter, and I have resorted to grips but little. Tire chains seem to be the most economical and efficient method of preventing slip, but studded casings seem better for both snow and mud. It is unwise to attempt icy hills without some such anti-slip device, for if a car once gets going backward there is no telling where it will bring up, for, of course, the brakes are useless under such circumstances. Much damage may result to the rear tires in such a case where the rear wheels spin around from lack of traction, and if the ice is at all rough or sharp deep cuts will be made in the casings.

HOUSING.

For the past three or four winters I have kept my car in an unheated stable, and can see no serious objection to that method, though, of course, a warm place for washing is desirable. However, in ordinary winter weather it is only after a severe rain that washing is necessary, and I find it very economical and satisfactory to have that done occasionally at a public stable.

CLEANING.

When there is a thaw, with much slush and mud in the streets, it is warm enough to wash in my own stable, and a couple of buckets of warm soapsuds does very well for body and conspicuous parts of the running gear. A rinse off with clear cold water does the rest, but if there is time I wipe the body dry and rub up the brass work. An old rubber coat and a pair of high overshoes give good protection to clothing. In ordinary dry weather washing is unnecessary, for I find that slightly oily waste does just as well for removing

dust, and gasoline for grease. After using this method for some years I feel justified in recommending it for those who take care of their cars, and know that if properly done the paint and varnish will look as well at the end of the year as though water had been used every day.

As my engine and gear mechanism are completely protected by a steel pan which I put on a year ago, there is little cleaning to be done there, and as for the driving chain, I keep it at the proper tension, but otherwise leave it alone, for it gets enough oil from gear case leakage.

I have had good luck with my chains and have never broken one, but some of my friends have had plenty of that trouble, and I am always expecting it. The shaft drive has more arguments for than against it, especially if enclosed in a torsion tube, and my next car will be built that way.

MOTOR STARTING.

Starting the motor in cold weather has no terrors for me now that I know summer methods won't do. The point is to get gasoline vapor into the combustion chamber in some way, and the man who can't find out how ought to drive a horse. Free priming works with my motor even on the coldest day, because the vaporizer is only a few inches away from the inlet valve; but when the inlet pipe is ridiculously long, as it often is, then it is sometimes necessary to squirt some gasoline from a can into the cylinder. With fresh vapor in the combustion space and a good spark, it makes very little difference what the weather is.

OILING.

In cold weather gravity feed for cylinder oilers is very unreliable, splash alone being much more certain and good enough for all ordinary purposes if the oil is kept thin enough by adding kerosene. Crank case pressure oilers are not positive, and mechanical oilers are too complicated for the ideal simple car. With hollow wrist pin and oil hole through to the bushing that bearing gets enough oil from the cylinder walls, and additional means can be provided by holes from below through connecting rod and bushing The crank pin surely can be lubricated in the same way by similar holes through the rod, cap and bushing, and in addition by means of a grease cup on the hollow crank shaft which will also take care of the main bearings.

On a zero morning I find it pays to do a little cranking for about half a minute with the relief open and no spark on, simply to limber up the stiff bearings. By that time the engine can be turned over rapidly and there is a better prospect of its starting when given the spark. This also clears clears out the cylinder of stale vapor and insures a better mixture when fresh gas is admitted.

It would be a distinct advantage for winter work and all slippery road conditions if the differential gear were dispensed with. It has been proved unnecessary and it would often be very convenient to have both rear wheels able to drive. At most a screw and friction device is all that is needed, and I believe it would be possible to use that method in connection with the "floating" rear axle, which has so much to recommend it.

AIR COOLING.

An article on winter use of a motor car would be incomplete without mentioning air cooling. That motor cooling by direct convection through metal and air alone is an unqualified success none but the prejudiced or uninformed will deny, while those who from experience are qualified to judge are quite positive as to the superior service obtained by this simpler method.

The cooling system of the water jacketed motor is a source of care and trouble always, but markedly so in winter, in spite of all the "anti-freeze" solutions so far described. Water cooling is an entirely unnecessary complication of a gasoline engine, and as such should be abandoned in the interests of that simplicity for which we all hope. The modern correctly designed air cooled motor runs as cool as an engine should, for efficiency, as quietly as one cooled by water, and uses no more oil. It is true there are many very noisy air cooled motors offered for sale, but the fault is not with the system of cooling. The excessive noise is the result of either poor design or too high speed or both.

Upon examination it will be found that as a rule the noisy motors are those built to run at very high speed, which is not only entirely unnecessary but very poor practice, from considerations of gearing, repair bills and the horrible clatter. In short, their gasoline economy and gain in power is secured at the expense of public disgust or ridicule and short life.

There are, however, some well designed air cooled motors, which give their maximum efficiency at 1,000 r. p. m. or less, and these are the quiet engines, which perhaps our water cooled friends have not even heard. These motors obtain the desired power from cylinder volume suited to requirements, and not from excessive piston speed.

It is believed that for a four cycle engine the low to moderate speed, air cooled, multi-cylinder type, with all valves mechanically operated, is the one which ought to become standard. But far preferable to that even is the two cycle motor.

TWO CYCLE ENGINES.

It is admitted that the chief causes of noise in a four stroke engine are the exhaust and the valve action. Mufflers are now made which render the sound of the exhaust practically nil, so that source is or should be nearly eliminated. We have left then as a source of noise the valve action. Now, on a two stroke engine of correct design there is no audible valve action; hence all noise is eliminated except the sound of the explosion transmitted by the cylinder walls, which is common to both types and not at all objectionable.

Two stroke engines can now be obtained cooled direct by air, and the cooling is as easily accomplished in this type as in the four stroke, and analysis of times of heat production and heat extraction for both types shows why this is true.

EXPENSE ACCOUNTS.

Expense accounts are of little value for comparison unless they are kept in a similar manner and include the same general items. In mine I include everything pertaining to the car except depreciation, which is an unknown factor, till the car is sold. For twelve months' continuous service ending December 1, 1905, including fuel, oil, grease, batteries and other ignition supplies, repairs, improvements and additions, washing, insurance, and interest on investment, my expenses were $190—for a total distance traveled of about 3,000 miles. The bulk of the expense was for tires, as might be expected from pneumatics.

I do not find winter driving very uncomfortable, at least not more so than with a horse, for with fur cap, gloves and robe and a heavy overcoat it is possible to keep really warm, and the heat from the motor aids materially. With the top pushed half way back so it admits the sun and yet breaks the force of the wind I would not ask for a more pleasant way of travel during the winter months.

Winter Use of the Automobile.

By F. W. Smith, M. D.

On purchasing my first automobile in June last (a four cylinder, air cooled), I sold my horses, being determined to give my car a chance to demonstrate its utility for professional work at all times and under all conditions. It did so in every particular, even beyond my expectations, but as winter came on I had in mind the severe weather and deep snows of the winter of 1904-5, and approached the season with such doubt of the ability of my car to answer my purpose for winter use that I secured a horse about December 1, with the result that during the present winter I have used both horse and automobile. However, most of the time when I have used the horse it has been with a feeling of duty to exercise the animal and with a decided preference for the car. In fact there has not been a single day during the present winter when I could not have satisfactorily used my car, and I have used it quite enough to demonstrate that its winter use in cities is entirely satisfactory and practicable for professional purposes There are many times in winter when the streets are very icy that the car is much more desirable than the horse.

With reasonable care the automobile can be used with perfect safety on icy streets. On grades of any considerable extent where there is smooth ice it is best to use chains on the tires. The only serious obstacle to the winter use of an air cooled car is deep snow, especially if the snow be heavy and damp. On packed snow or on ice it will run with entire satisfaction.

NEW VEHICLES AND PARTS.

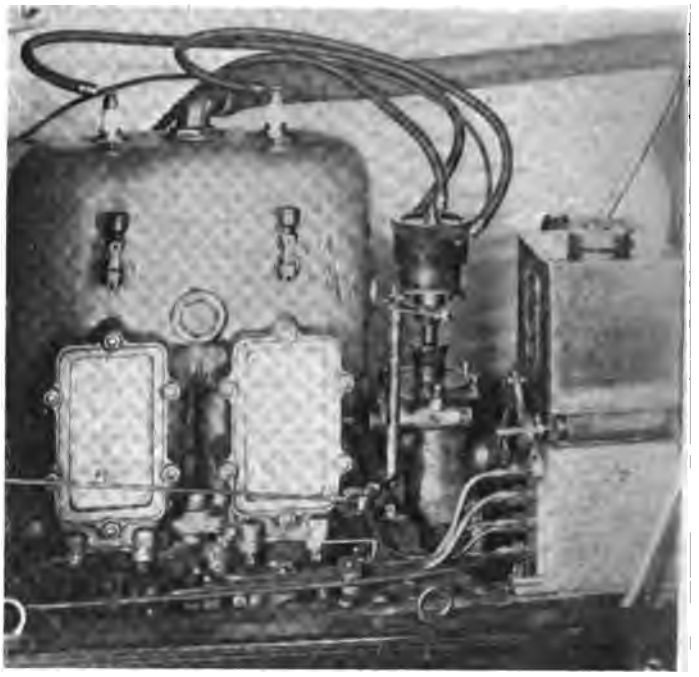
The 40 Horse Power Two Cycle American Simplex Car.

This touring car, designed by E. J. Gulick and built by the Simplex Motor Car Company, of Mishawaka, Ind., is fitted with a two cylinder, vertical, two cycle, water cooled, 5½x5 inch motor, claimed to develop 40 horse power on the brake at 900 revolutions; it has a sliding change gear of three forward speeds and reverse, shaft drive, 106 inch wheel base, 56 inch gauge, and 34 inch wheels with 4 inch tires. The passenger capacity is five, and the weight 2,450 pounds.

Although this car presents many new features, the chief interest centres in its powerful two cylinder, two cycle engine. This engine is claimed to deliver continuously 40 horse power on the brake, although it has only two 5½x5 inch cylinders and weighs only 287 pounds, of which 92 pounds are in the flywheel. The car has a gear reduction of 2½ to 1, which gives approximately 40 miles an hour at 900 revolutions of the engine, and it is claimed the car can do 60 miles if necessary. There is nothing novel in the design of the engine, which is of the three port, crank case compression type, but the method used in arriving at the correct port openings and shape of the cylinder head is unusual in gas engine practice. The engine was built and remodeled until it gave the desired form of indicator card. The cards obtained show very clearly the effect of changing the ports and the time of ignition.

The crank case pressure reaches a maximum of 8 pounds per square inch, as the volume of the case is materially reduced by securing hollow aluminum castings to the crank webs so that complete discs are formed. In the same way hollow castings, slotted to make room for the connecting rods, are fastened into the pistons. There are six ports through the side of the cylinder into the crank case, each 1⅜ inches wide by one-half inch high. The by-pass to the cylinder is covered by a large hand plate, held by six nuts on studs in the cylinder casting, and no gauge is required. There are four inlet ports into the cylinder, each 1⅜ inches wide by five-eighths of an inch in height, giving an area of about 2.75 square inches. Two exhaust ports, divided by a central bridge, 1½ inches wide, for water circulation, are each 2⅛ inches wide by 1⅛ inches in height, which gives an exhaust area of about 3.82 square inches. The two cylinders and their common integral water jacket form a unit. The jacket walls are stiffened by internal vertical partitions, and the water space extends between the cylinders. The cylinders are held to the semi-steel crank case by six nuts on crank case studs. The cylinder heads are domed on the inlet side, and on the opposite side the curve is filled in to form a bevel surface which deflects the gases downward toward the exhaust ports. The exhaust pipe in the photo was only temporary. The regular pipe is a four-ribbed casting joined to a pipe with a long flowing curve, which connects the double muffler.

The crank case is divided horizontally at the centre, the upper half in the new engines comprising the supporting arms.



SIMPLEX TWO CYCLE MOTOR.

The under half forms an oil pan. The case is divided, and its walls fit very closely to the cranks and connecting rods. The crank shaft is a hand forging of nickel steel with a three-quarter inch hole through it and the flywheel flange integral. It is supported in three divided bronze bearings, each of 2 inches diameter by 4½ inches long, except the rear one, which is 5⅜ inches long. With these long bearings and the crank webs fitting snugly against the flanged inner ends of the bushings, no stuffing boxes are deemed necessary. The bottom of each crank pit has a removable plate for inspecting or tightening the connecting rod ends. These rods are H section Parsons bronze castings, with white brass split bushings at the piston pin end, set up on brass shims by a clamping screw. The lower end is of the usual cap construction, the bushing being flanged at each end, set up with shims or liners of thin brass and held by through bolts with round heads flattened on one side to prevent turning. The bolt holes are reamed and the bolts held by a nut and castellated lock nut to make it doubly secure. The pistons are of soft gray iron, flat on top, except for the baffle plate, which is cast hollow and ribbed to allow the cool crank case mixture to aid in keeping down the temperature. They are 8¾ inches long, and fitted with three eccentric, step jointed rings at the top and one at the bottom. These rings are five-sixteenth inch wide, and prevented from turning by three-sixteenth inch pins filed flat on the sides. The hollow, hardened and ground piston pins are 1⅜ inches in diameter; they are fixed in the connecting rod and have their bearing in the piston bases. The 92 pound flywheel is held by six bolts with castellated nuts. A small, vertical shaft



AMERICAN SIMPLEX TOURING CAR.

it the front of the engine, driven by mitre gears from the engine shaft, is covered by an aluminum case, the lower part of which acts as the circulating pump, while the upper end encloses the combined timer and distributer.

The water circulation is so arranged and the screw pump is of such design that if it did not operate, the water would pass through it by thermo-siphon action, the flow being from the bottom of the vertical flanged tube radiator through the pump to the bottom of the jackets, and back to the top of the radiator. The latter, with the piping, holds about 5 gallons of water, and no tank is used. The cooling fan has six aluminum blades, is ball bearing, and mounted on a triangular bracket on the car frame.

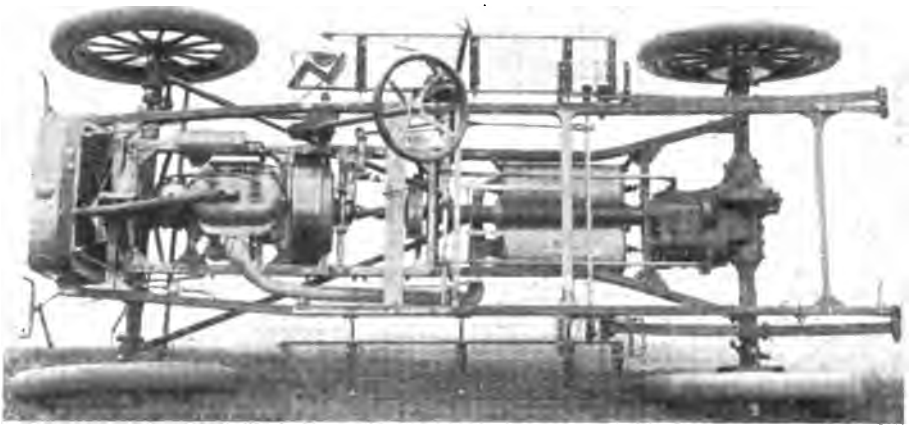
A belt driven Dodge positive oiler supplies oil through seven feeds to each of the main bearings, each of the cylinders and each crank pit. Very little oil is used, especially in the case, where a scoop on the end of the connecting rods carries it to the crank pin. A novel feature of the oiling system all through the car is that no oil grooves or scores are cut in any of the boxes, a little gouge only about one-eighth inch long being made into the bearing at each side of the oil hole.

Jump spark ignition is employed, current being supplied by either dry cells or a storage battery under the right front seat to a single vibrating coil on the dash, the secondary wires of which lead to the distributer at the front of the engine, from which connection is made to the plugs in the heads. The timer is provided with an extra set of contacts, so arranged that no matter in what position the engine stops a contact can always be made. The extra contacts are connected to an ordinary electric push button, which when pushed will fire one of the cylinders, provided it still retains some charge. It is claimed that the engine will hold sufficient charge for starting over 12 hours. When the push button is released the extra contacts in the timer are disconnected.

The carburetor is of the float feed, spray nozzle type, especially designed for this engine. The throttling is all done at the carburetor, just as in a four cycle engine.

FRAMES.

Another notable feature of this car is the supporting of the engine, driving shaft and transmission on a separate channel steel sub-frame, rigidly fastened to brackets cast integral with the rear axle casing. The channel steel sub-frame cross members are fitted to the side members, and held by broad gusset plates, strongly riveted. The greatest depth of the sub-frame, 5½ inches, is at the forward end, where the sub-frame is supported on a pivot in a block rigidly clamped to the centre of the front cross spring, which gives it a three point suspension and a chance for some lateral motion. The pressed steel frame itself carries only the body. The side members are not parallel, but approach each other in front to the width of the radiator. The frame is supported at the rear on two semi-elliptic springs, having six regular leaves and two short reversed leaves to prevent jumping. They are 48 inches long, 1¾ inches wide, set outside of the frame, and supported on the rear axle at a point 2½ inches to the rear of their centre. The front cross member of the frame is supported at two points on the front cross member of the pivoted sub-frame. This construction allows the front axle to be tilted without disturbing the body level; tipping the rear axle, of course, inclines the body, but does not twist or throw out of line the driving mechanism on the sub-frame. The 40x 2½ inch front cross spring has seven leaves and is shackled to the axle end fittings, which are brazed and pinned to the ends of the 2¼ inch tubular front axle, into which the ends fit. These ends also support the front end of two rods which run back to a ball joint fastening on the under side of the middle cross member of the sub-frame. This braces the front axle against road shocks and relieves the spring.



PLAN OF AMERICAN SIMPLEX CHASSIS.

THE CLUTCH.

Inside the flywheel and protected by a dust shield is the large leather faced multiple disc clutch, which runs perfectly dry. The forward end of the squared clutch shaft runs in a H-B bearing in the flywheel, while its enlarged rear end forms a dog clutch engaging a similar one on the front end of the propeller shaft. The flywheel carries three rectangular pins, which drive the three leather faced saw plate steel discs, by engaging their notched rims. These plates in turn drive the unfaced discs on the square clutch shaft. The two middle plates are steel and the end ones soft gray iron. This gives three flywheel driven leather faced plates pinched between four plain plates which drive the clutch shaft. The hub of the rear cast iron plate is enlarged and fits the hole in the dustcap, making a tight fit, and contains inside the usual coiled spring, the rear end of which abuts against a ball thrust washer, which takes the thrust when the clutch is disengaged. The ball washer is held in position and the spring is adjusted by a split clamp collar, screwed onto the shaft. The effective gripping surface of each leather is annular in shape, 3¾ inches wide and 10⅞ inches in outside diameter. There being six of these faces, the spring pressure need not be large and the wear on the leather is consequently small. There is said to be no sudden engagement of the clutch, but ample gripping power and absolute release without adhesion of the plates due to oil. Further, there is no large mass of metal to keep the transmission gears rotating during gear shifts.

The jaw clutch at the rear of the clutch shaft obviates the need for universal joints, as the whole mechanism is supported in the practically rigid frame. The propeller shaft in its large casing, rigidly fastened to the sub-frame, drives direct to the transmission gear case, which is a manganese bronze casing, the rear end of which forms the middle of the rear axle housing. The front end of this casing is rigidly supported on a cross member of the sub-frame. The entire rear axle housing is of manganese bronze, having a tensile strength of about 75,000 to 80,000 pounds per square inch. The cover of the case is fitted with a large hand hole, and all nuts are castellated and locked. Cap screws are also locked by wires which pass through their heads. In the construction of the car, drop forgings, aluminum and steel castings are replaced by manganese bronze.

All the transmission gears are made of nickel steel and run on H-B ball bearings, even the reverse idler. The arrangement of the gears is shown in the accompanying drawing. The forward end of the squared shaft is not supported in the end of the driving shaft from the clutch, which construction does away with a bearing which is hard to oil, and is per-

missible because this shaft, when the high speed or direct drive is in, is supported at the forward end by the clutch jaws, and when the gear on it is in mesh for the intermediate speed this gear is close up to the large supporting ball bearing. The sliding gear pair on the squared lay shaft, when moved toward the front, gives the reverse, and toward the rear the low speed.

The bevel pinion is extremely large, having 22 four pitch teeth of 1¾ inch face. It is held positively in mesh with the 46 tooth bevel gear, by ball bearings on each side of it. The sliding gears are six pitch, and have 1 5-16 to 1⅜ inch faces. The differential is composed of four large bevel gears with five pitch teeth.

THE CHANGE SPEED LEVER.

The gear shifting lever at the side of the car works in a peculiar shaped quadrant slot on the selective system. The slot is not an H, although it gives the same results; it is practically a rectangular opening at the centre, with a forward slot from its right side and a slot to the rear from its left side. This lever can move to the right and left, forward and back, and is in its neutral position (in which it is automatically retained) when at the widened middle portion of the slot. From this position a motion to the left and slightly forward engages the reverse gear, which cannot be entered without first raising a latch, by means of a hand grip at the top of the lever. Moving the lever to the rear from this position gives the low. From neutral to the right and slightly forward gives the intermediate, and to the rear the high.

The lower end of the change speed lever engages arms, which rotate a shaft and an enclosing sleeve respectively, each of which is connected to one of the sliding pinion sets. No interlocking device of any kind is used.

STEERING GEAR.

A 16 inch steering wheel operates the case hardened steel worm and sector. The worm has a quadruple thread, and the sector and its shaft are made integral and adjustable by having eccentric bronze bearings with a ratchet retained adjustment. The housing is of gun metal, and is rigidly fastened to the side frame member. The lower end of the column is provided with a cupped adjustment, and above the worm is a hardened steel thrust washer. The drag link to the steering arm has ball and socket ends, and the cross link is behind the front axle. The steering knuckles are steel drop forgings fitted with oil cups at the top. The I & C steel steps are used, a small raised one being arranged for entrance to the tonneau.

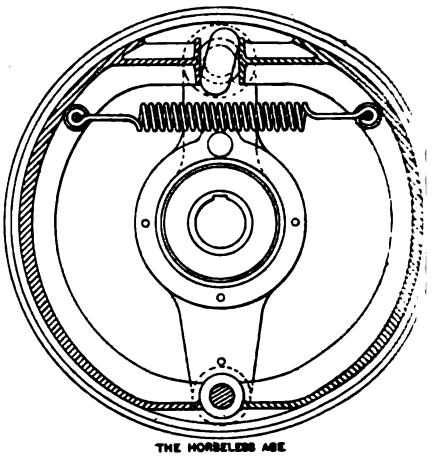
CONTROL AND BRAKES.

Spark and throttle levers are now placed on the steering column just under the wheel, although not so shown in the illustration. The connection is through a sleeve and rod on the front of the column. The rods to the combined timer and distributer and to throttle are fitted with small universal joints. An accelerator pedal is used for quickly opening the throttle, but does not affect the wheel setting. At the bottom of the steering column is a small cam, operated by the wheel throttle lever. This cam acts against a roller on the same shaft as the accelerator pedal, so that moving the pedal operates the arm, and cam, and moving the cam moves the pedal and through it the throttle.

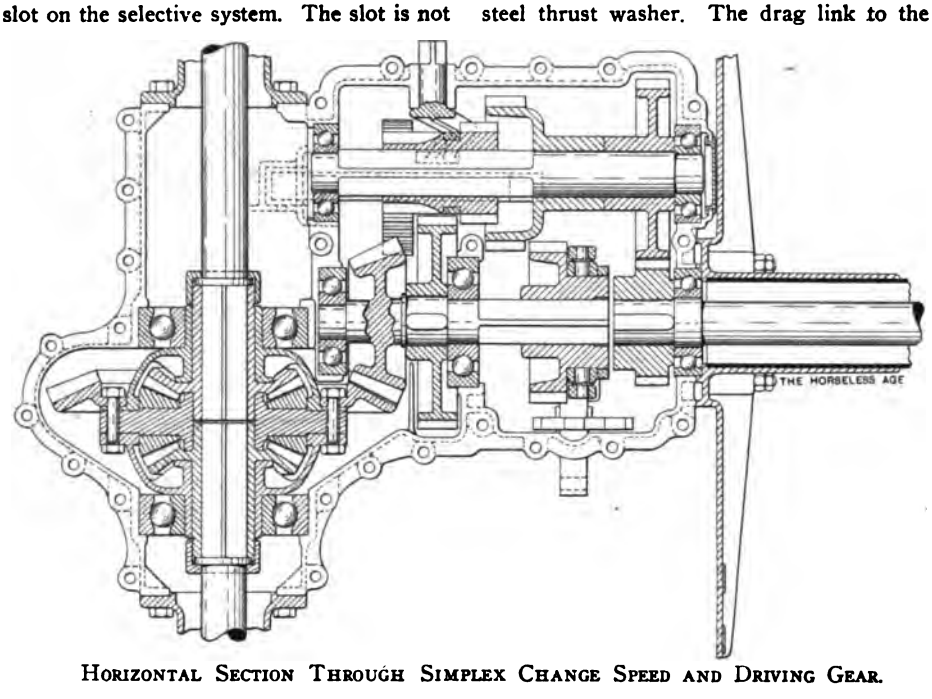
There are two sets of brakes, both of which release the clutch. A single foot pedal, by a cam action, first disengages the clutch, and by the use of a cam rest the further motion holds out the clutch and applies contracting bronze shoes to a 7 inch malleable iron drum on the forward end of the propeller shaft. The rear hub emergency brakes are also bronze shoes, expanded against malleable iron drums, by the action of two small hardened steel rollers, carried on pins at the extremities of the cross arm of the T shaped brake rockers. These brakes are 11½x2 inches, and are operated by the usual side lever working on a ratchet quadrant.

The rear wheels are keyed to the tapered ends of the live axle and nut retained. The divided axle runs on Hyatt bearings at the outer ends and Hess-Brights at the inner ends. The front wheels are on Timken bearings.

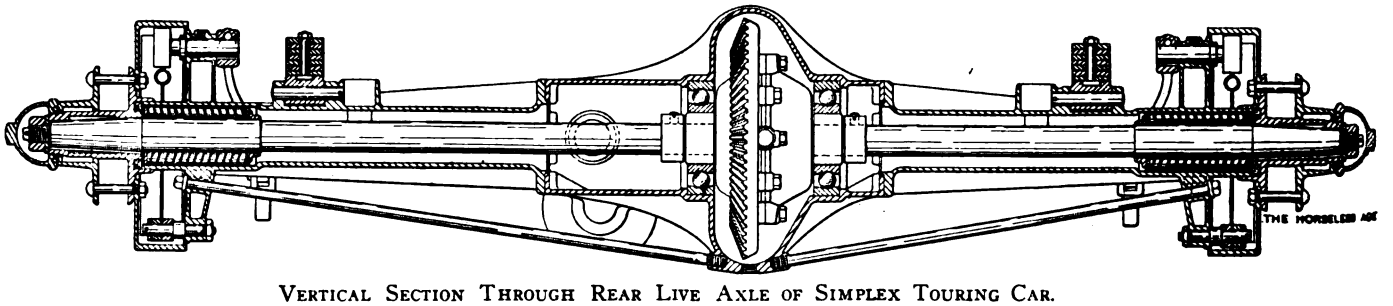
The entire body is of wood. Under the front seats at the left end is carried the 16 gallon gasoline tank, which has gravity feed to the carburetor, with a strainer interposed. A new body design somewhat on Mercedes lines is now being carried out. The dash is of laminated wood, and the hood and fenders are of sheet iron.



SIMPLEX REAR AXLE BRAKE.



HORIZONTAL SECTION THROUGH SIMPLEX CHANGE SPEED AND DRIVING GEAR.



VERTICAL SECTION THROUGH REAR LIVE AXLE OF SIMPLEX TOURING CAR.

Smith Automobile Company 1906 Models.

The Smith Automobile Company, of Topeka, Kan., are building two models for 1906, both of which have four cylinder engines, which differ only in horse power. The smaller car is a surrey with removable rear seat, easily convertible into a runabout; the other is a side door touring car, of 90 inch wheel base and standard tread.

DISTINGUISHING FEATURES.

Among the distinguishing features may be mentioned the following: The frame is of second growth ash and trussed; the propeller shaft housing is carried forward and expanded into the transmission case, the front end of which is supported on a ball in a socket on the cross frame, forming the only universal joint used. The sliding gear is controlled by a single lever, which, when moved for the gear shifts, automatically disengages the clutch before engaging the gears, and after their engagement allows the clutch to act, thus doing away with the necessity for a clutch pedal. Other features are a special vertical flanged tube radiator of their own make; a peculiar rolling contact timer which runs in oil; a new worm and internal sector type of steering gear; a telescoping steering column which allows the wheel to be placed at any height; metal to metal cone brakes; foot throttle control, and the use of large wheels and standard nuts and bolts throughout the car.

MOTOR.

The four cylinder engine, 4½x4½ inches, is rated at 24 horse power. The cylinders are cast separately, with integral heads and water jackets, but the top of the water jacket is open and is covered by a thin aluminum plate, under which an asbestos gasket is used. This construction is used to facilitate removing the core and cleaning the water jacket of scale and incrustation, caused by the use of Western alkali water. It also acts as an expansion plate in case of freezing. After roughing the cylinders with high speed tools, which leaves them in a heated condition, they are allowed to stand for two weeks, which relieves the strains in the casting; then the finishing cut is taken and the bores are ground. The cylinders are held to the aluminum crank case by four cap screws, which are screwed through special bosses from the under side and have nuts at the top. The valve chambers are on one side, the inlet valves being automatic and placed over the exhaust valves. The inlets are arranged, however, to be operated mechanically if desired. The inlet valve cage is set screwed to the top of the valve chamber, and can be easily removed. The valve is

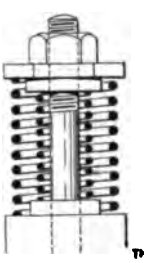


FIG. 1.

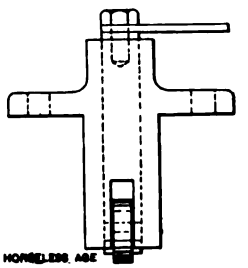


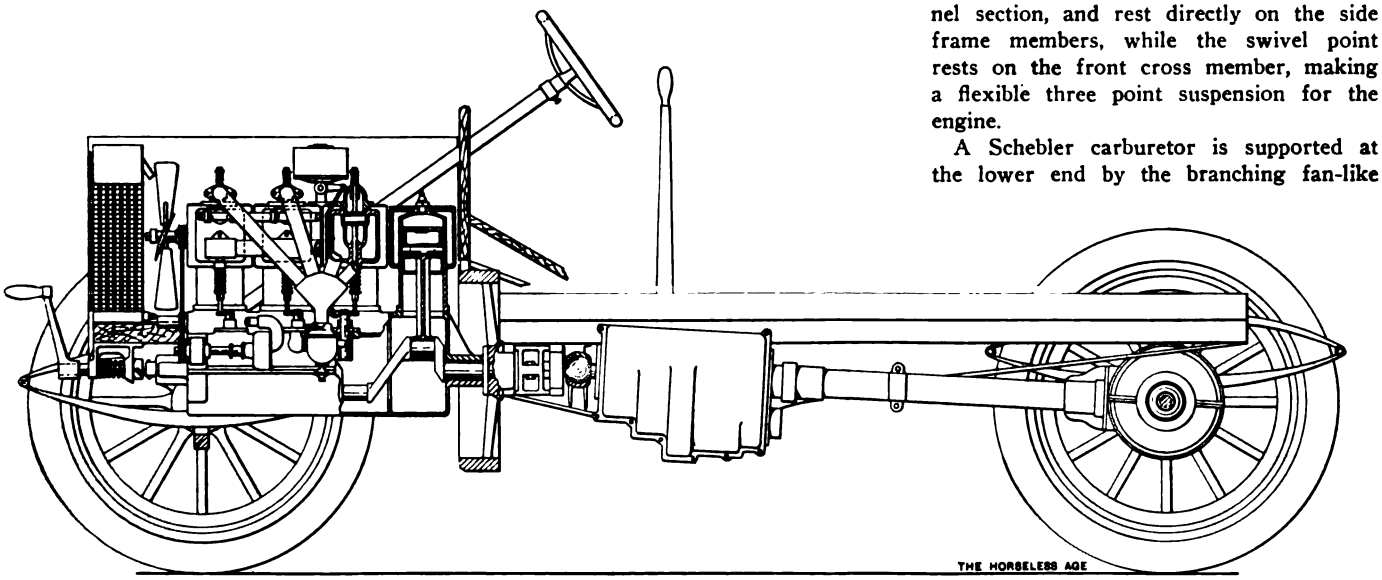
FIG. 2.

fitted with two springs, one for closing it and the other to prevent hammering. The arrangement is shown in the accompanying drawing, Fig. 1. The inner spring is somewhat compressed when the valve is closed. Both valves are made in one piece of open hearth steel, have 30 degree seats, and the inlet valve is made as light as possible. The exhaust valve spring is retained by a combination nut and cup washer, which screws on to the end of the valve stem, and also provides a means for adjusting the length. The lower end of this part is extended into a rod, and is in contact with the push rod. The exhaust valve seat is in the cylinder casting and not in the cage. In Fig. 2 is shown the arrangement of the round steel push rod and its cast iron guide. The lower end of the rod carries a hardened steel wheel, which by sliding in the slot in the guide casting prevents the rod from rotating. At its upper end is carried an offset arm upon which the valve stem rests; this can be swung to one side, facilitating the removal of the valve and springs.

The cam shaft is also of open hearth steel, with hardened and tempered tool steel cams secured to it. After the rough cams are secured to the shaft it is placed in a milling machine, and by the use of the index head the cams are shaped by milling. The cam shaft is on a level with the middle parting line of the crank case, and is mounted in three split babbitt bushed bearings.

The crank shaft is a drop forging, with an integral flywheel flange, and runs in three divided babbitt bearings, which are held to the upper half of the case, the lower half being simply an oil pan; these bearings are peculiar, in that the babbitt is expanded into its bronze shell by an instrument similar to a roller tube expander, which is claimed to make the babbitt much denser, to give it longer life and to insure better anchorage and a closer contact with the shell. The connecting rods are of I section cast steel, which can be bent cold and welded. The lower end carries a split expanded babbitt bushing, and the upper end a non-adjustable bushing. Its cap is held by castellated cap screws, the castellated heads being countersunk into the caps and held by split pins. The hollow wrist pin is made of Shelby steel tubing, and is held by set screws through the bosses and one of its walls. The pistons are the usual gray iron casting, with flat tops, and carry three diagonal cut, eccentric rings above the wrist pin. These pistons are arranged with a threaded hole in their head for screwing them on to an arbor for machining. This hole is afterward plugged and turned flush. The usual divided aluminum crank case is supported by two arms from the upper half of the case at the rear, and by a single swivel point in front. The supporting arms are deep channel section, and rest directly on the side frame members, while the swivel point rests on the front cross member, making a flexible three point suspension for the engine.

A Schebler carburetor is supported at the lower end by the branching fan-like

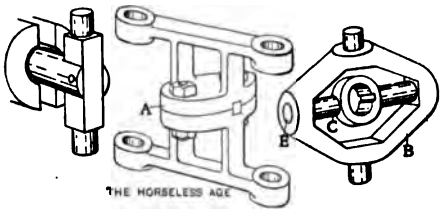


ELEVATION OF SMITH CHASSIS.

inlet pipes of brass. The muffler is a plain cylinder, the end plate of which has a ring of holes, and at the middle a large hole covered by a flat disc and stem, held in position over the hole by a small lever. A cut-out button removes the pressure of the spring and allows a free exhaust. This arrangement acts like a safety valve, and if there is a muffler explosion or too much pressure it opens a little and relieves it. The cam gears are inside of the case at the front end, the small one being steel and the large one bronze. On the side of the case is an auxiliary shaft running lengthwise of the engine and driven by a gear meshing with the cam shaft gear, and covered by an aluminum housing; the forward end of this shaft carries an aluminum pulley for the fan belt, and the rear end carries the aluminum encased rotary circulating pump. This shaft is divided and united by a sleeve with split pins through the ends and shaft, which construction allows a certain freedom of motion, and in case of a freeze up the pins will shear and prevent damage to the pump and gears. The radiator is of their own design and make, and consists of a series of vertical flanged tubes, six deep from front to rear, ending in headers at the top and bottom, which constitute the tank. A single strip of copper forms the flange for the six tubes from front to rear, whereby the rear tubes are rendered more effective than they would be with separate flanges. It is claimed that this radiator will positively drain, and a cock is placed on the bottom of the pump housing, the lowest point in the water system. The usual circulation is employed. The inlet water pipes into the cylinders are of brass and connected by unions with wick packing to four aluminum fittings fastened to the four cylinders.

OILING.

A force feed oiler of their own construction is supported on the top over the two middle cylinder heads, and driven by an arm and ratchet from one of the cylinder



SMITH UNIVERSAL JOINT.

push rods. This oiler consists of a cylindrical tank, the bottom of which is formed into a tapered sleeve in which is rotated a taper plug carrying four depressions on one side; as the plug rotates these depressions come under four openings at the bottom of the tank and are filled by gravity, and the continued rotation of the plug causes these four oil cavities to register with four feed pipes from the bottom into which their imprisoned oil is deposited. These four pipes supply the cylinders near their base. The surplus oil supplies splash lubrication in the case, the lower half of which is divided by the usual partitions. The cylinder has six grooves cut around it to carry the oil, and upon the upper side of each of the main bearings are cut V shaped grooves or pockets, which carry the oil to the bearing surfaces. The middle bearing and the connecting rod ends are also grooved and provided with oil holes. The oil is always kept in a fluid condition by the location of the tank. Circular inspection holes whose covers are held by winged thumb nuts are placed in the crank case side. The pump is oiled by a special grease cup.

IGNITION.

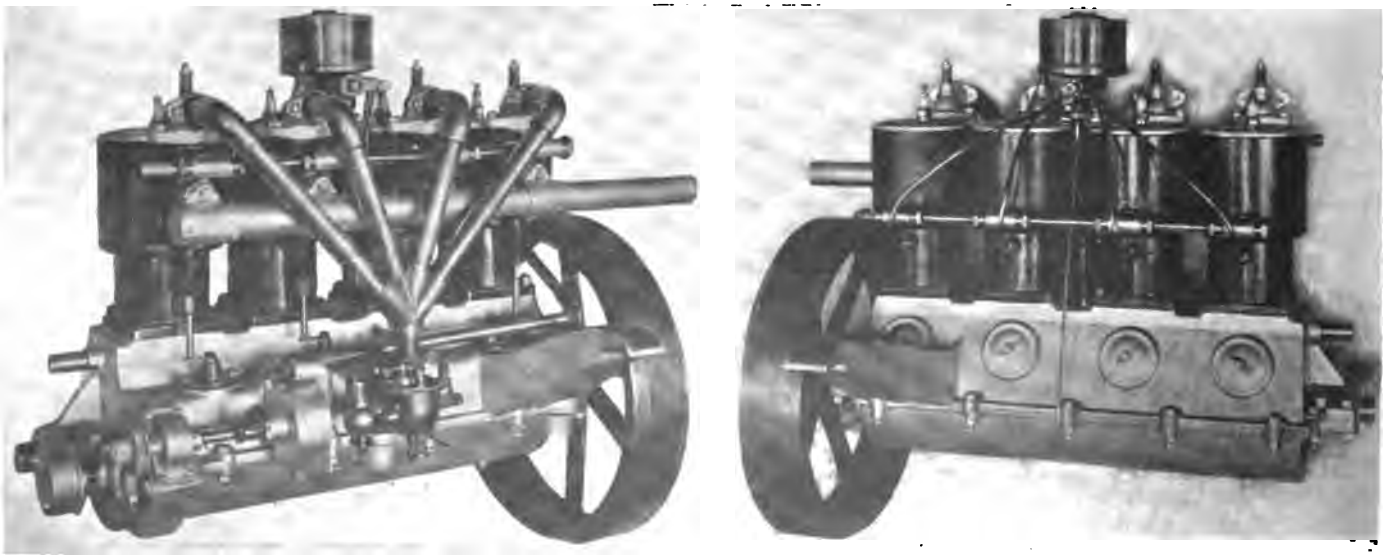
Ignition is by jump spark from spark plugs in the centre of the cylinder heads. Storage or dry cells are carried either on the running board or under the rear seat, the dry cells being eight in number, arranged in two parallel sets of four in series. The usual quadruple vibrating coil is placed on the dash. The spark control lever is placed on the wheel, and when retarded to an extreme position breaks the circuit. The terminals of the secondary wires are of the thimble type, and can be pulled out without straining or injuring the connections. The timer is placed directly on the front end of the cam shaft. It consists of a metal bar pivoted in a slot in the end of the cam shaft. At one end of the bar is a fibre wheel and at the other end a steel wheel. The body of the timer is a flat circular fibre plate, which has imbedded in it at equal intervals and flush with its surface steel pins of about three-eighth inch diameter, which are the contacts over which the steel and fibre wheels roll, but with a slight slipping action, which tends to keep the points clean and give a better contact. The plate carrying the contacts is pressed against the wheels by a coil spring back of it. The timer is fitted with an aluminum cover, and is filled with oil.

UNIVERSAL JOINT.

The 28 inch 90 pound flywheel has a slotted hub which drives the peculiar universal joint which is interposed between the engine and transmission. The parts of this joint are shown separated in the cut. Into the slot in the flywheel hub fits the oblong block shown at the left. This is pivoted at its middle on a shaft which centres it, and it is also free to slide in and out of the hub, forming a slip joint. The trunnions at its ends carry the bronze piece A, the other end of which carries the member B. Pivoted at E E is the member C, into which the end of the driving shaft fits and is keyed. By removing two nuts the halves of the middle member A may be separated and the joint taken out.

CHANGE GEAR AND CLUTCH.

The change gear is of the three speed and reverse sliding gear type, and runs on Timken roller bearings; all the gears are made of nickel steel and have a liberal width of face; the shafts are also of nickel steel, the lay shaft being under the square shaft. The aluminum case is split in a vertical plane, its rear end being fastened rigidly to the propeller shaft housing. To its forward end is bolted a plate integral

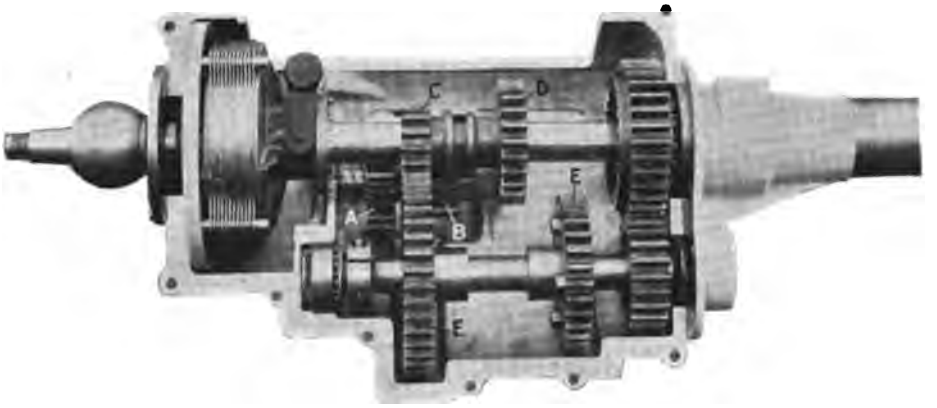


TWO VIEWS OF THE SMITH FOUR CYLINDER MOTOR.

with which is the large hollow steel ball shown in the accompanying photograph. This ball rests on the cast steel cross member of the frame in a socket between leather pads, and supports the forward end of the transmission and propeller shaft housing. The rear end of the housing is joined rigidly to the middle of the rear axle casing, so that the rear axle, propeller shaft housing and transmission case form a unit through which the thrust of the driving wheels is transmitted to the ball and thus to the steel cross member of the frame. The shaft from the universal joint passes through the steel ball, in which is a bronze sleeve for its bearing, and on its inner end, inside of the transmission case, is keyed and brazed a steel plate which carries four pins, upon which are strung the twelve bronze plates of the multiple disc clutch. The inside of the ball is packed with grease and communicates with a large grease cup on the outside, and the bronze sleeve has holes in it for lubrication. The small end of the square transmission shaft fits into the end of the shaft from the universal joint; this bearing is oiled by the splash in the case. The other plates of the clutch, which are carried between the bronze plates, are of one-sixteenth inch steel thickened one-thirty-second inch at the middle, where they are carried on the square shaft. The end plate is a ribbed casting, with a collar against which a forked arm, with steel rollers at its end, bears to disengage the clutch. Inside the hub of this casting is the usual coiled spring which forces the plates together. It is held and adjusted by a screw collar and shaft, and is retained by a key in the shaft, which in turn is held by a set screw and split pin. On reference to the photograph it will be seen that gears C and D on the squared shaft form the sliding members of the transmission. When gear D is slid to the right it engages with the internal gear, giving the direct drive; D meshing with E gives the intermediate speed, and C with F the low speed. When the sliding gears are moved to the left C first meshes with A, and then the forked arm which moved the pair pushes A and B together to the left, compressing the spring behind them. In this position B meshes with F, giving the reverse speed. When the sliding gears are moved back again the coiled spring returns gears A and B to their former position.

GEAR SHIFTING MECHANISM.

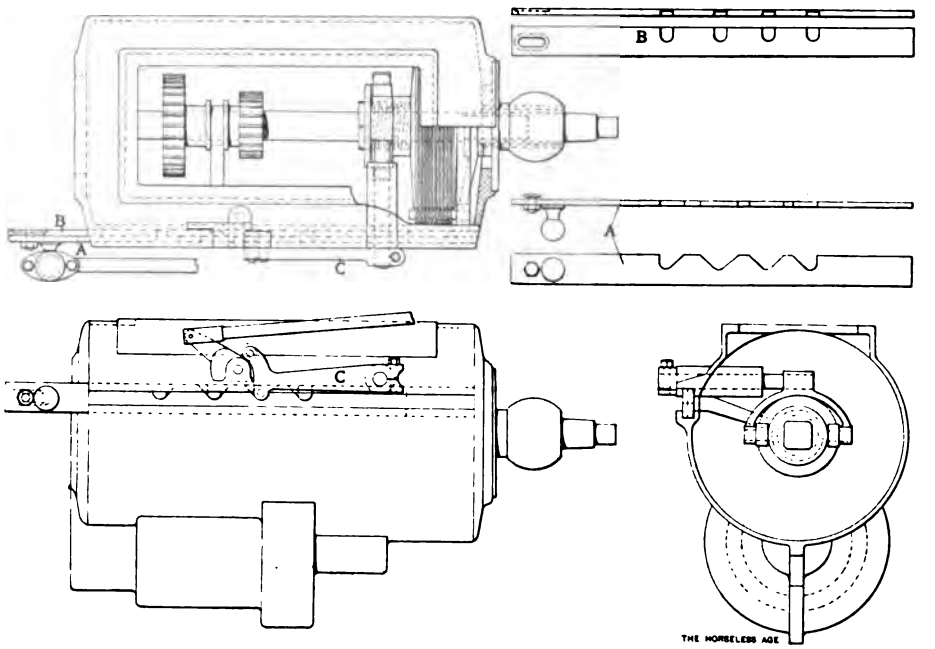
The gear shifting mechanism, although of the progressive type, is new and original. It consists of a single long lever on the outside of the car working in the usual notched sector, which not only shifts the gears but before each shift disengages the clutch, so that it is impossible to change the gear with the clutch in. This lever moves two sliding bars, A and B, in the upper sides of which are different shaped notches. Into these notches and upon the bars rests a roller at the end of the bell crank levers connected to the clutch; one of these bars is rigidly connected to the sliding gear pair. When the outside lever is moved either to engage or disengage a gear it moves bar A before the other. In this bar the edges of the notches are rounded, so that its motion lifts the roller, and by means of the bell crank connection disengages the clutch. A further motion of the shifting gear lever now moves bar 8, which meshes the gears. As soon as the gears are properly in mesh one of the narrow notches on this bar comes under the roller which drops into it, allowing the clutch to engage and locking the gears in position. Moving the gear shifting lever now causes the first bar with the rounded notches to lift the roller out of the narrow notch, which frees the clutch, and the next gear can be engaged.



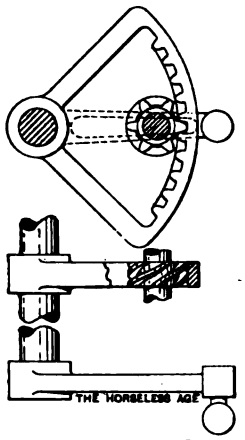
SMITH CLUTCH AND CHANGE SPEED GEAR.

CONTROL AND BRAKES.

There are two brakes. The one inside of the transmission case is a fibre lined steel band acting on a cast iron drum keyed to the propeller shaft, and is operated by the left foot pedal; it is independent of the clutch. The right foot pedal first disengages the clutch, then applies the rear wheel brakes. This pedal can be used as a clutch pedal in crowded streets, but is not required when shifting the gears. The rear brakes are cast iron cones, which slide on splines in the rear axle casing and engage hollow cast iron cones bolted to the rear wheel hubs; they are operated by a pull rod to the top of a small vertical shaft supported on the rear axle housing. The bottom of this shaft carries a cross piece, from the ends of which push rods slide the cones into contact. These push rods are made of light tubing, with forked ends brazed in. The throttle is controlled by a sole foot pedal, which fits the sole of the shoe, and is pivoted so that depressing the toe opens the throttle, and depressing the heel closes the throttle. This pedal can be used as an accelerator pedal, and stays in any position, allowing the driver the free use of his hands, while at the same time he has the engine speed under perfect control. The steering wheel is carried on a long splined sleeve which telescopes with the steering column, so that the wheel can be placed at any desired height and clamped by an eccentric lever.



SMITH GEAR AND CLUTCH OPERATING MECHANISM.



SMITH STEERING GEAR.

This post has considerable angle and passes through the dashboard to the steering gear, which is shown herewith. The gear is of the worm and sector type, but the sector has the teeth cut on the inside, so the point at which the worm teeth act is considerably farther from the axis than usual, giving greater leverage. With this construction the wear on the teeth causes less backlash or lost motion in the steering wheel than in the ordinary form. The usual form of ball jointed rods connect to the steering knuckle. The cross link has forked ends, and is placed behind the axle.

AXLES.

The front axle is a square section steel forging. The steering knuckles and pivots are drop forgings; the front wheels run on roller bearings. The hubs of these wheels are made of pressed steel, of the artillery pattern, into which are forced hardened and ground tapered steel pieces upon which the rollers bear. The rear axle proper is a divided steel shaft of the live type, with the rear wheels keyed to its ends. The middle of the housing is aluminum and the ends are steel, with the spring saddles cast integral; it is well trussed. The rear wheel hubs are also made of pressed steel, and roller bearings are used throughout. The differential is practically the only part of the car which is not made in the Smith factory. This is of the Brown-Lipe spur gear type, but carries six sets of spur gears instead of the usual three sets. The top of the differential housing can be removed for inspecting the gears.

FRAME.

The frame is of second growth ash, 2 inches in depth by 4 inches in width, with front and rear cross members of the same material, the front one being 2x8 inches, while the rear one is very light and simply serves to tie the two side members together. The only other cross members are the supporting arms of the engine and the channel steel cross member on which the transmission rests. The frame is intended to be flexible. A seven-sixteenth inch diameter rod is used as a truss under each side member and passes under a high king post at the middle; these rods are supplied with turnbuckles, at which place they are one-half inch in diameter; their ends are fastened to the frame by through bolts. This frame is claimed to be approximately 100 pounds lighter than the usual construction, and the makers claim never to have had a broken frame, except in the case of a car which was struck by a railroad train.

The springs, which are 36 inches long by 1½ inches wide, are full elliptic, both front and rear, the front one being under the frame and the rear outside, and both being supported on top of the axle. The rear springs have seven leaves top and bottom and are hung on forgings which project from under the body; their spring saddles are free to pivot on the rear axle casing, but are prevented from side slip by a cap screw head in a slot on the under side.

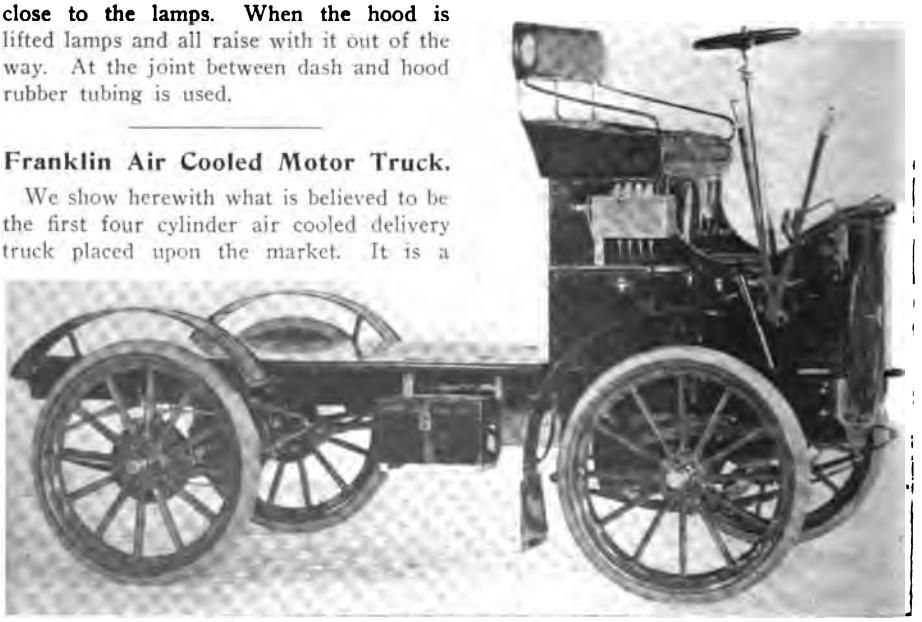
BODY.

The body is made of laminated wood. The side doors are aluminum castings, and are so fitted that they swing clear of the fenders. The rear of the body from the top of the seat to the frame is a single panel, and the side panels are made in the same way. The corners of the body are of the squared style, which they have used for several years. The space under the rear seat is used for luggage, and under the front seat for a 15 gallon gasoline tank, with gravity feed to the engine. The body is held to the frame by four bolts which pass through angle irons at the under side of the body and through the frame. The rubber covered running boards are supported on triangular steel drop forged hangers. The dash is plain mahogany. The hood is made in one piece without slats, and is hinged to the dash so that it swings clear of the engine. On each side and rigidly fastened to the hood are the aluminum brackets carrying the acetylene lights. The generator is carried on the running board, and the piping to the lamps is through the dash to the under side of the hood top and out through holes in the sides close to the lamps. When the hood is lifted lamps and all raise with it out of the way. At the joint between dash and hood rubber tubing is used.

Franklin Air Cooled Motor Truck.

We show herewith what is believed to be the first four cylinder air cooled delivery truck placed upon the market. It is a Franklin, with a 12 horse power, four cylinder, 3¼x3¼ inch engine, which has already been described in these columns in connection with the Franklin touring car. The mechanical parts are essentially the same as in the touring car, but the engine accessories and control members are differently arranged. Accessibility is an important feature. In front of the engine is a divided grill door which can be opened up to expose to full view the engine, timer and governor. At either side and underneath the driver's seat are compartment doors made to drop, which expose to full view each side of the engine. By removing the small trap door in the floor of the car the transmission and clutch are easily gotten at.

The wheels are wood, of heavy artillery type, fitted with solid rubber tires 32x2½ inches front and 32x3 inches rear. The wheel base is 72 inches, giving a platform 6 feet in length. The construction, however, is such that this may be lengthened to suit requirements. The truck is designed for loads up to 1 ton. The springs are full elliptic, 40 inches long. The car is fitted with both a transmission brake and hub brakes, both double acting. It weighs 1,600 pounds, has a speed range of 4 to 20 miles per hour, and is fitted with a 12½ gallon gasoline tank.



FRANKLIN 1906 COMMERCIAL CAR.

Cantono Electric Tractor and Trucks.

The Cantono Electric Tractor Company, of Newark, N. J., are now manufacturing three sizes of electric trucks. Their small delivery wagon, of 1 ton capacity, with a maximum speed of 12 miles per hour, is fitted with their electrical tractor, which is a power unit placed under the front of the body; it takes the place of the front axle and wheels, and can be used with almost any pleasure vehicle, small truck or delivery wagon. The middle sized truck has a ca-

acity of 3 tons and a maximum speed between 8 and 9 miles. The large truck has capacity of 5 tons and a speed of 5½ miles. The small machine has an ordinary open or covered delivery wagon body, with low platform, and the front end raised and supported on a fifth wheel of steel against bronze on top of the electric tractor. This tractor, which they also sell without body as a unit to be applied to different types of vehicles, consists of a solid square steel axle, which supports the motor for each of the heavy artillery wheels at each end upon which it runs, and on semi-elliptic springs supports a rectangular box in which is carried the storage battery.

A feature of this tractor, and also of the trucks, is the steering system, which is so arranged that, when the steering wheel is turned to go to the right or left, the outside wheel, which has the greater distance to travel, receives more current and moves faster than the inside wheel. In this way the steering is really done by power. By means of this same arrangement if one wheel strikes an obstruction and is slightly retarded, instantly more current is passed through its driving motor, and tends to overcome the obstruction. The steering is by a vertical post and wheel, with a bevel gear and pinion at the bottom, which drives a worm; this meshes with a worm wheel bolted to the fifth wheel. The worm is so arranged that it has a little freedom of motion lengthwise in such a manner that when starting to turn it moves a little in its bearings before the teeth mechanically take up the turning of the fifth wheel. This slight motion throws over a bell crank lever, at the end of the arm of which is a piece of insulated metal working between two electrical contacts. The normal position of this insulated piece when running straight ahead is between but not touching the contacts. Upon turning the steering wheel to go to the right, for example, the worm moves slightly lengthwise in its bearings, throws over the arm and makes a contact which increases the speed of the outside motor and wheel. As the motors are connected in series, when running straight ahead, the excitation is the same for both motor fields, each motor working under a difference of potential of about forty-four volts; but when the contact is made by the motion of the worm the current for the shunt winding is taken from a different place in the battery, so that the motor of the outside wheel is now working with its shunt fields under a greater difference of potential than the motor of the inner wheel, and therefore runs faster. When a wheel encounters an obstruction and starts backward it moves the fifth wheel and its connected worm wheel which moves the worm; this again operates the arm and makes the proper contact for increasing the speed of this wheel.

The fact that the motors are compound wound is claimed to result in slightly increased mileage on the same battery, as in going down hill or while changing from a higher to a lower speed, when the car is driving the motors faster than the battery current would otherwise drive them, the motors become to a slight extent generators, and this slight current tends to recharge the batteries, which gives, especially in hilly country, considerably more mileage than could otherwise be obtained. Only one set of brakes are supplied, and these are expanding bronze bands against cast iron drums bolted to the rear wheels; they are operated by a foot lever, but the controller is so arranged that when in a reverse position it causes the motors on the front wheels to become generators driven by the motion of the truck, which, while to a slight extent charging the batteries, is also a very effective brake. If extra strong braking is desired by pressing a foot button the motor armatures are short circuited, which reduces the resistance, and thereby increases the braking effect.



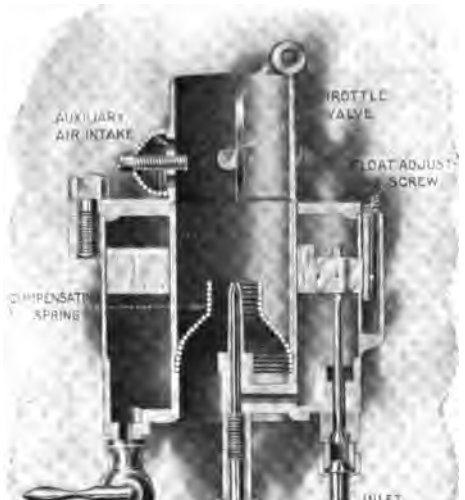
CANTONO FIVE TON TRUCK.

The battery weighs about 1,100 pounds, and the rest of the unit also 1,100, making the total weight 2,200 pounds. The wheels used are 34 inch heavy artillery type, with Firestone side wire solid rubber tires. The rear wheels are ordinary wooden truck wheels, with steel tires.

The large 5 ton truck and the smaller 3 ton truck are practically the same, except in dimensions, so that a description of the 5 ton will suffice for both. The batteries, front wheels and motors are not a separate unit, but a part of the truck; the front axle is 3¼ inches square section, steel forging, and the rear 3 inches. The motors are approximately 6 horse power, each at 900 r. p. m.; one is hung in front of the axle and the other at the rear of the axle, their method of suspension being the same as on the small truck. They are back geared to the wheels to give the desired speed of 5½ miles as a maximum. The rear wheels are of any size desired, but usually about 50 inches diameter, with 3½ inch steel tires; the front wheels are 38 inches diameter, with solid rubber tires 8 inches in width. These tires are placed on the front wheels in order to protect the batteries against jar. This location of the batteries helps to evenly distribute the weight when the truck is loaded. The fifth wheel consists of two plain rings of bronze and steel about 38 inches in diameter, facing each other. The rear brakes are double acting contracting leather faced steel bands, which act against cast iron drums 20 inches in diameter by 3 inches in width; the drums are fastened to alternate spokes by U shaped bands or clips. The platform slants downward at the rear to facilitate loading, and is 11¼ feet long by 5 feet in width; the springs, both front and rear, are semi-elliptic; those at the front are shackled at both ends, and the rear are made so that three leaves fold over and form a loop around a stationary bolt upon which they have a slipping action. An extra spring is placed in the middle of the rear axle, and comes into play with heavy loads or on rough roads. The rear wheels are slightly toed in at the bottom. As will be seen, all the driving is done by the front wheels. A special feature of the large trucks is the fact that they each carry a complete small power plant located back of the front seat, which is sufficient to drive them at a speed of from 2 to 3 miles an hour. This auxiliary plant consists of a 6 to 8 horse power vertical, single cylinder De Dion motor, which is directly connected to a dynamo of 6 kilowatts capacity. By means of a switch under the operator's control the current can be led direct to the motors, or used to charge the batteries, or for both at the same time. This auxiliary power plant is only for use in case of emergency.

The Gaither Carburetor.

A carburetor with a novel compensating device, the invention of Charles F. Gaither, of Youngstown, Ohio, has just been placed on the market by the Gaither-Owen Company, of 138 West Thirty-eighth street, New York. Referring to the sectional view, the air is taken in at the bottom of the central air tube, from the top of which it passes to the engine. Surrounding this air tube is a float chamber, in which is located a concentric float of the usual type.



GAITHER CARBURETOR.

From the float chamber the gasoline is conducted through an adjustable atomizing nozzle, which is surrounded by a peculiar shaped coiled spring. Each convolution of the coil normally sets closely against the one adjoining, so that no air can pass through the spring, except through the central opening at its upper end. With increased engine suction, however, the spring extends, and the openings between adjacent spires admit additional air. The compensating action is thus obtained in a simple manner without a single moving part, in the sense of one part sliding upon another. The spring is a little less than 2 inches in diameter at its base, and slightly more than a half inch at its top. It is made of copper plated steel wire, of about one-sixteenth of an inch diameter.

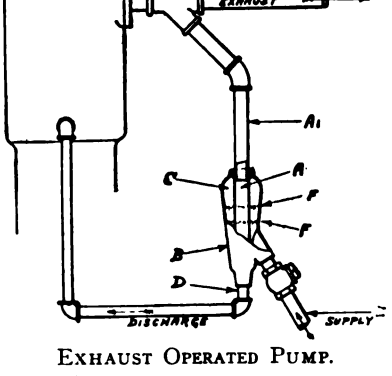
A hand controlled air intake provided is operated by means of a spring similar to that used to gain the compensating effect, except that in this case the spring normally stands open, and is compressed by a screw passing through its centre, to close its coils and shut off the air to any extent that conditions require. The throttle is a simple disc.

Exhaust Operated Pump.

A new circulating pump operated by the exhaust of a gas or steam engine has just been put on the market by Curtis & Waterhouse, New York. This pump, which is a single piece casting without moving parts, except one check valve, is suitable not only for circulating cooling water but also for other pumping duty. It is somewhat similar in appearance to a pulsometer, and is connected directly to the exhaust by a pipe. Fig. 1 shows the outside appearance, and in Fig. 2 it is shown in cross section and connected to a single cylinder engine.

The action is as follows: At each explosion of the engine a part of the exhaust gas enters chamber C through pipe A, and when cooled causes a partial vacuum which draws water through the check valve and supply pipe E; fills the space around A and imprisons a volume of gas at the top. After this, at each explosion, the sudden pressure in the chamber and the injector action of the pipe A forces water out through the outlet D, and the check prevents its return into the supply pipe; this again creates a slight vacuum in chamber C, which causes more water to be drawn in through pipe E, thus renewing the supply and maintaining the level approximately at F, as shown.

The simplicity of the pump is the feature most emphasized by the makers; it is without rotating or reciprocating parts, has no packing, requires no lubrication or adjustments, and no gears, chains or eccentrics to drive it. It is claimed that it will work perfectly at any speed the engine can be run, and costs practically nothing to operate, as it utilizes power which would otherwise be wasted. For this reason its makers claim that its application to an engine increases the efficiency, owing to the power saved which is usually required to



EXHAUST OPERATED PUMP.

run the ordinary pump. On account of the simplicity and strength of the design the manufacturers guarantee that if any part wears out or fails to work under normal conditions during the life of the engine to which it is attached they will replace the pump without charge.

The Riehle Testing Machine.

The cut herewith shows the Riehle testing machine, installed last year by the Winton Motor Carriage Company, for testing the materials which go into their cars. The machine has a testing capacity of 200,000 pounds, and requires about 7 horse power to operate it. Its over-all dimensions are 8 feet 10 inches in height, 9 feet 9 inches in length and 3 feet 10 inches in width, and its weight is 10,500 pounds. The machine allows of testing the strength an soundness of metal specimens in three di ferent ways. Test No. 1, for elastic limi gives the tension that may be applied t the test bar without deforming it perma nently. Test No. 2, for elongation, give the increase in length of a bar of ste before breaking. Test No. 3, for tensil strength, gives the tension under which th metal specimen will break across.

The machine is adapted to take spec mens varying in length from 8 inches to 3 inches, and allows of 25 per cent. elonga tion in 24 inches, with 36 inch specimen or more for shorter lengths. It takes roun specimens up to 2½ inches diameter, squar specimens up to 3 inches square and fla specimens up to 6 inches by 1 inch. Th speeds of the machine are as follows (a 225 revolutions per minute of the pulley) Speed for setting head, 8 inches per min ute; quick speed for testing, 3¾ inches pe minute; medium speeds for testing, 1½ inches and 1 inch per minute; slow speed for testing, 1 inch and one-half inch pe minute; slow speed for crushing test, one seventh inch per minute; motion for pullin head, 40 inches per minute.

The Rex Igniter.

A new storage battery for ignition pur poses is being marketed by the New Eng land Motor Company, of Lowell, Mass. under the above name. It is put up in 4, 6 and 8 volt batteries of cells made in three sizes, viz., 40, 60 and 80 amper hours capacity. The elemtns are of the pasted type, the active material being ap plied to a "non-oxidizable" lead alloy grid They are assembled in hard rubber com partment jars, thoroughly sealed, with hard rubber covers and vents. The con nectors and handles are nickeled. The cells are provided with valves to prevent slop ping.



RIEHLE TESTING MACHINE.

COMMUNICATIONS

Motor Cars in India.

itor HORSELESS AGE:

India is undoubtedly the country for mo- cars, as we have mostly a flat country th metaled roads. In Lucknow and all ound our roads are almost as good as an phalt pavement. There are a great num- r of motor cars in the country, in Bom- y over 400, in Calcutta about 300, ile in Lucknow there are only about enty. Most of them are English and ench makes, and run from a single cylin- r to six. I see no reason why American rs would not have a good sale here. A r that could be bought out here for about 650 to $2,000 would undoubtedly be able. There are quite a number of four linder expensive cars out here, but few ve the money to put in such a car, while y number would buy cars if they could t them cheaper. A great number of the tive rajahs have cars. They buy big cars ely upholstered with all kinds of acces- ries. There is no sale, or a very small e, for doctors' cars, as the European doc- rs never go out in the country, and Cal- tta and Bombay are the only places large ough to require much traveling about.

There is an opening for cars to carry ail and a few passengers. Such cars are ing tried now in a number of places. he country is more or less mountainous here they are used, the roads being met- ed, but having a uniform grade. I have t tried my single cylinder light touring r on them, but with much of a load am clined to think it would have to go on w speed most of the way on the up ades.

We who are out of Calcutta and Bombay ve to depend upon our own ingenuity if ything gets wrong. I ran my car all last mmer when I was home in Illinois over e rough and muddy roads, but as condi- ns are much more favorable for motor- g here I feel as if I can repair almost ything that could happen to the machine. here is nothing like sleeping in between o clay hills in a pouring rain, as my wife d I did last summer touring in southern linois.

Petrol is very expensive, and we pay in cknow 66 cents per gallon for Pratt's otor car spirits, but they are now putting an Indian petrol for 44 cents, but little tention seems to be paid to that once the r is purchased. It is saving up enough buy the car that troubles the average an in India.

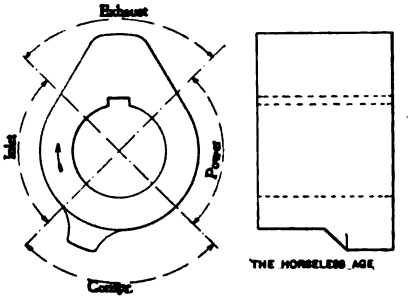
There is going to be any number of cars ught in India, and it depends upon the merican manufacturers to get live agents push their cars. A kerosene burner uld be more desirable on a car that uld use kerosene, but so far there is lit- tle complaint here on the price of petrol. Tires, batteries and all accessories that will do for all cars are kept in Calcutta and Bombay. B. D. SCHRANTZ, D. D. S.

Exhaust Relief Cam.

Editor HORSELESS AGE:

I have just bought a car which has a double opposed cylinder engine of 5 inches bore and with 80 pounds compression. It requires a hard pull to crank this motor, and I wish to remedy this. Opening the cylinder relief cocks lets air into the mixture, so I wish to design a cam for the purpose of opening the exhaust valves during part of the compression stroke. How should such a cam be shaped and how should it be placed with relation to the regular exhaust cam? During how much of the stroke should the valve be open for the engine to turn easy and yet to give sufficient power to start the motor operating? The cam will, of course, be disengaged when running. E. P. DU PONT.

[If it is desired to facilitate the starting of the engine by opening the exhaust valve during part of the compression stroke the



best thing to do is to replace the present exhaust cams with double cams, as shown in the cut, and provide means for shifting the cam shaft lengthwise. The cam is made about twice the usual width, and has an extra cam prominence extending less than half way across the cam, with a sloping approach, and located almost opposite the main cam prominence. If the cam shaft turns in the direction of the arrow this extra cam prominence will hold the exhaust valve open during approximately one-half the compression stroke, depending upon the size of the cam roller. This is the usual practice.—ED.]

Two Cycle Engines—Clutches.

Editor HORSELESS AGE:

I have been told that two faults of the two cycle engine are as follows: First, that when the engine is cranked one can never tell before it starts whether it is going to run forward or backward, as it is just as likely to do one as the other. Second, that the crank shaft bearings wear out much more rapidly in a two cycle than in a four cycle engine on account of the extra heat produced in the former by the crank case compression. Will you kindly inform me if there is any truth in either of these statements? I have detected so many agents in false statements that it is often difficult to determine when one tells the truth.

I wish you would consider discussing again, editorially, the relative merits of the different types of clutches. We have heard a great deal the past year about the merits of the multiple disc clutch, but one of our most prominent manufacturers has not only failed to adopt it but has gone back to the old leather faced cone clutch, which I had supposed was rapidly growing obsolete.

AN OLD SUBSCRIBER.

[The two charges against the two cycle engine are entirely unfounded. Most engines of this kind are now provided with spark adjustment, the same as four cycle engines, and if you attend to setting the spark late before cranking, as you always should, the engine can only start the right way. As the compression in the crank chamber is only about 6 pounds per square inch, there is no noticeable heating effect, and therefore no extra wear on the crank shaft bearings. A little wear on these bearings is more objectionable, however, than in a four cycle engine, as, unless suitable preventive means (packings, for instance) are provided, it will allow some of the charge in the crank case to escape during compression.

The relative merits of the different types of clutches have been repeatedly discussed in our columns. The disc clutch for automobiles is still in the first stages of its development, as is perhaps best shown by the fact that there is such great variation in practice as three discs for a 50 horse power motor in one instance, and twenty discs for a 20 horse power motor in another. The leather faced cone clutch, on the other hand, has been brought to a very high state of perfection, and is far from dead at the present time. Theoretically, the metal disc clutch is undoubtedly superior, and when the problem of its most advantageous design has been fully solved it will also be superior in practice.—ED.]

Commercial Vehicle Situation in Buffalo.

Editor HORSELESS AGE:

The criticism alluded to in the article on "Commercial Vehicles in Buffalo," in your issue of April 4, to the effect that Buffalo lags behind other cities in the adoption of commercial motor vehicles, may have some foundation with reference to the number of cars in actual use by local business houses, but can scarcely be attributed to lack of enterprise or to ultra-conservatism on the part of Buffalo's leading business men. I have had occasion to call on a number of representative Buffalo business men recently, and found, without exception, that they were all deeply interested in the subject, have devoted much time and study to investigating the merits of different cars, and expressed themselves as ready to invest in commercial trucks whenever they have reasonable assurance

that such an investment will prove satisfactory from a purely business standpoint.

There are only two concerns here that have tried out motor vehicles on a good scale, and I learn from the heads of other business establishments with whom I have talked that in their confidential talks with these gentlemen opinions not altogether favorable are given of their experience with motor vehicles. It is generally assumed that one concern continues the use of its cars chiefly because the president of the company is heavily interested in the concern that manufactures them, and it is a fact that a considerable part of their suburban work is regularly turned over to a local package delivery company which has in constant daily service upward of thirty horse delivery wagons. One of the proprietors of a local delivery company tells me he has had a number of cars of different makes demonstrated for his service, and has made diligent inquiry on his own account among users of commercial vehicles, and has been forced to the conclusion that at present the motor truck is not a good business proposition for his delivery system. His requirements may be a little severe, but they indicate fairly what is expected of a business delivery wagon under ordinary circumstances. This firm needs a truck that can be driven by men of ordinary intelligence, without special training; the wagons must be capable of pulling a full load under all conditions of weather, and of making from two to four trips daily, covering from 20 to 40 miles, sometimes making frequent stops at short intervals, and they must be cheaper than horse power for the same service. The question of speed is not of prime importance in service of this kind.

The president of our local automobile club, who is also interested in a large department store, said he was one of the first in this city to experiment with automobiles for delivery work. He went over the ground pretty thoroughly with me and wound up with the following illustration. As president of the local automobile club he found it necessary a few days since to use an automobile for the purpose of visiting hurriedly a number of business men in various parts of the city, whose signatures were needed to a petition he wanted to take with him to Albany. He telephoned for a car and driver to be ready the next morning, and started off in good shape, but broke a spring after getting away from the smooth asphalt pavements, and in consequence suffered considerable delay and inconvenience. In the afternoon another start was made, and the car did well on the smooth roads, but broke the crank shaft going over a cobble pavement, and there was more delay. Such experiences as this, together with the expensive tire problem, and the uncertainty of cost of upkeep after the first year or so, deter his firm and others from adopting motor vehicles for regular use.

It appears reasonable to assume that Buffalo will prove a rich field for the manufacturers of commercial vehicles whenever they can find the means to dispel prevailing doubt and prejudice.

DOUBTING THOMAS.

Route to Asheville, N. C.

Editor HORSELESS AGE:

I note in a recent issue of THE HORSELESS AGE you inform a Mr. Linkroum, who asks for information concerning routes to Asheville, N. C., that "south of Baltimore the roads are very poor."

I am told that there is a good road from Baltimore to Frederick, Md., and I know that from there there is a fairly good road either to Hagerstown or Martinsburg, at either of which places one may hit the pike road that runs up the valley of the Shenandoah to Staunton, Va. From Staunton to Lexington, Va., there is a good dirt road.

So far as this pike is concerned Mr. Linkroum can make his trip in May without trouble, but the dirt roads will hardly be in shape by that time. Even if they are dry the red clay will be very rough until worn down by travel. Last year in May the roads were nearly impassable because of the mud. L. H. GREENWOOD.

Explosion Engine Queries.

Editor HORSELESS AGE:

What should be the size of ports in a 5x5, three port, two cycle engine? Also, in a two port engine? What is the right size of compression space above piston for the above engine? C. D. A.

[The exhaust port should be about seven-eighths of an inch wide in the direction of piston travel, and the effective length 2½ inches. The inlet port of the cylinder should be about five-eighths of an inch wide and 2¼ inches long. The inlet port to the crank chamber should be about 1⅛ inches wide and 1½ inches long. It is not claimed that these are the best possible proportions, but they will give a workable engine. For a two port engine the dimensions of the inlet and exhaust ports could be somewhat reduced, as it would not be possible to run the engine at high speed. The compression space might be made about 1¾ inches in length.—ED.]

Ignition Query.

Editor HORSELESS AGE:

I have removed a two cylinder engine from my last year's car and installed a four cylinder high speed motor. I have two four volt storage batteries and find that I do not get as snappy a running engine, nor the power, when using one of these batteries that I do when I use a six volt storage battery loaned me by a friend. I do not wish to throw away my investment in these batteries, and it has been suggested that I could wire one of these up in connection with two dry cells, in that way obtaining six volts. May I ask your subscribers whether they have ever tried this and what results I might expect? Would the dry cells retain their efficiency as long as the storage battery, and would [illegible] have a bad effect on the other? [illegible]

[We believe that it would be bothe[illegible] to have storage cells and dry cells in [illegible] for the reason that they would give [illegible] different times, and you would [illegible] be bothered just twice as often [illegible] failing current. You might get two [illegible] tional storage cells of the same [illegible] make as your present ones, and [illegible] them in series one with each four [illegible] tery. You would then have two [illegible] batteries at comparatively slight [illegible] ED.]

The Status of the A. A. A.

Editor HORSELESS AGE:

The article in your issue of March [illegible] entitled "Disintegration of the A. A. A." shows so plainly your ignorance of the position that I am only too glad to [illegible] the opportunity of writing you for your instruction and our good.

The action of the Philadelphia Club in withdrawing to join another club and the formation of a Pennsylvania State Association is due almost entirely to the fact that they were and are ignorant of the work there through inattention and disinterestedness. Their representative on the board of governors failed to attend the meetings, and our repeated invitations by letter received no response. They laid up the lines of work for a State association which we started some time ago, some of the more active clubs in the State lean toward the A. A. A. organization, and sooner or later we think we will have in Pennsylvania what we have already accomplished in Massachusetts, New York, New Jersey, Illinois and Ohio. in each of which States associations have been formed affiliated with our body.

So much for that, and now a few words regarding our work and position. You speak of our control of racing as our chief virtue. This is only a small part of our work; but on reflection you or anyone else cannot fail to realize what this control means for this branch of the sport.

Our touring information for [illegible] maps, routes, our relations with other clubs for the benefit of our members touring abroad, all make practically the most valuable part of our work. Our "good roads" department is constantly active, many of our clubs offer reciprocal privileges to members of other affiliated clubs.

Our legislative support of State associations in their work, and sometimes by direct efforts, have proven of great value and always more or less successful. Our department enables a concerted and combined effort in one direction and to one object, which was impossible when the clubs were working, but seldom if ever. There is not a branch of the sport that does not have our honest support for the best interests of all automobilists. There is no money in it for anybody [illegible] are no paid officers outside of the

and his assistants, and our average income of about 50 cents per annum per member is very small compared with our expenditures, and a small additional income from the racing department is always acceptable and useful.

If any of our members or others care to take the trouble to find what they are receiving for a membership in our association, they may inquire of any of the active clubs or its officers, and be very easily answered; but the trouble is that even a paper like yours has not taken this trouble before putting in print the article mentioned, which comes at a time when this association was never more prosperous or in a more active and growing condition.

I wish you would follow this matter closely, and will be glad to have you call on me at any time, when any information you might request will be forthcoming.

GEO. E. FARRINGTON, Treasurer.

"The Views of a Kicker."

Editor HORSELESS AGE:

Referring to the discussion which has been started in your columns, I admit that the steam car is a very attractive proposition and will give good service to run about, near home, but when it comes to long runs, economy of upkeep and maintenance the gasoline car can more than doubly discount the steam. As a garage man of wide road experiences, I know the steam car costs vastly more for replacement and maintenance than the gasoline car.

The steam car motor lacks many of the requirements of an ideal motor. It requires a boiler or generator to produce the steam and a constant source of heat to accomplish this effect. The consequence is that a large percentage of the heat units employed are actually wasted, even in the best designed engines. The result is inevitable, because the fuel for combustion, the fluid to be vaporized by heat and the engine to be driven by the expansive energy are all separate and distinct elements, requiring elaborate devices to secure the end of cooperation as a practical working unity. If the expansive energy can be derived directly from the fuel and the ignition effected by an intermittent source of heat it is obvious that the machine is simplified and the total economy increased. On the whole its disadvantages are numerous and render it a poor substitute for the modern gas engine. Its open flame burning near the gasoline, its stored pressure, the considerable heat in hot weather, its 10,000 parts liable to get out of order, make it quite the inferior of the gasoline car.

As to the oil cooled cars, I admit that they are mostly well built and give fairly good service as runabouts, for short runs or on fine, level roads; but I have seen them fall down badly in regions of hard roads and hills of 10 to 20 per cent. for a hundred miles. I have in such sections found them laying up all along the road to cool off.

Yet withal some of the oil cooled cars are good. But my contention is that the car of cars is the car that will do good, faithful work all the time under the very hardest conditions. Now, any motorist of wide experience knows that the only car that stands the hardest work is a standard high grade, well built, water cooled gasoline car.

I am not knocking steam cars nor oil cooled cars, but merely name them in comparison to show thereby which is the best universally for universal purposes equal to the hardest kind of tests.

KICKER.

[While we have allowed the term "oil cooled cars" to stand in the above communication, we wish to say that we consider it misleading. It is admitted that the average air cooled engine requires more cylinder oil than the average equivalent water cooled engine; but the difference is not great, and we know of cases where water cooled motors with poor lubricating systems consumed much more oil than air cooled motors of the same power. Those who are interested may find actual data on oil consumption in our Doctors' Number and several other issues.—ED.]

In Support of "Kicker."

Editor HORSELESS AGE:

I have read with interest the article by "Kicker" and the replies thereto, all of which, with the exception of one, have been adverse to "Kicker." Those who replied tried to point out that "Kicker" was a crank, probably because he wrote something that belittled the judgment shown in the purchase of their car.

The facts that stand out vividly before us are, that where one man will buy a steam car and become so satisfied with it that he will purchase the next season's model of the same or some other make of steam car, until he has purchased two, three or four steam cars, there are, on the other hand, several hundred men who have followed up the purchase of one gasoline car with another without even considering the steam proposition. Thousands of intelligent men have, like myself, started with the steam car, because the gasoline motor was a newer power, and they thought that what they knew of steam would aid them in keeping out of trouble, but after several experiences of stopping and wiping the sweat out of our eyes to see a gasoline car go whizzing by, while we were making repairs by the roadside, we woke up to the fact that there were other cars besides the steamer, and after purchasing a gasoline rig nothing could ever persuade us to again invest in a steam car.

A steam car has so many other faults besides those mentioned by "Kicker" that the writer really believes that he truly expressed the situation when he said it was "the freakiest of all freaks"; for, in addition to the faults that he mentions, the steam car must carry more gasoline and three to ten times as much water; if up to date, it must have more radiating surface to cause condensation; it must have a change speed gear, or the driver must perform laborious work on hills, using the hand pump; it must have several times as much piping, with the resulting plurality of joints and couplings, and the majority of these joints, couplings, valves and stuffing boxes are under a pressure of several hundred pounds, which will cause them to leak and give trouble; then there are the valves, with their packing to shrink with the changes from hot to cold, that must have constant attention; there are the fire box, the pilot light, the steam pressure fire regulator and the boiler itself to burn out, block up, get out of adjustment, wear out and otherwise cause trouble; it has more weight per horse power, and without a condensing plant there are the visible exhaust steam, odors and heat. As the non-freezing compounds cannot be used, there is the liability to freeze in winter, so that here in our severe climate we seldom see a steam car running in very cold weather, while most every repair shop exhibits them with burst pipes in the spring, just from standing over winter. It does take more fuel than a properly adjusted gasoline motor, regardless of any comparison on the basis of two or three runs that may have been made between a steam and gasoline car. We have completely eliminated the possibility of an explosion in tubular boilers, the trouble of keeping up steam in very windy weather, and of lime accumulating, requiring that all of the small pipes be taken apart and cleaned about every so often.

"Kicker" made a wild statement when he said that it was so easy to make a perfect car, but I think that he meant to say "wholly practical," and such a statement is justified by gasoline cars of the four cylinder type with the motor in front under the hood, with an internal expanding or multiple disc clutch, sliding gear transmission, shaft or double chain drive, water cooled, force feed oiling, gravity gasoline feed, storage batteries or one storage and a set of dry batteries, jump spark ignition and an up to date carburetor, all made from the best materials.

The type of transmission that gives direct drive on high speed without a gear in mesh is better, especially when the four speed selective type is employed, for with this arrangement of the gears we can pass from low speed to high without passing through the intermediate gearing, saving wear and annoyance as well as delay in making shifts.

I have eliminated the governor, the magneto, the dynamo, the make and break igniter and other useless moving parts that wear out and cause trouble, that run dry for want of oil, that get out of adjustment or otherwise fail to perform their work and cause annoyance, for any part that moves or revolves does and will wear out and give trouble.

In the above I have more particularly endeavored to answer H. W. Beach, although it also covers a great portion of the remarks

of H. R. Stickney. This last named gentleman also defends the air cooled motor, and the planetary transmission as applied to good (large) cars other than runabouts. I think that if anyone was to buy a car of the touring type and follow Mr. Stickney's idea he would get stuck in good style. First, because the proper amount of radiating surface cannot be attached directly to the cylinder. When water is in contact with iron, the iron cannot become as hot as when such water is absent, even without circulating the water at all, as is proven by the fact that it is absolutely impossible to heat a kettle red hot with water in it, but if we allow the kettle to boil dry it will become red hot very quickly. It is also a fact, as every housewife knows, that when iron has become once burnt, it will burn very much quicker the second time, and is practically ruined for further use, as extreme care must be taken not to scorch it on further use. Just so with the air cooled motor after it has been once overheated; we must feed an excess of oil, or that which is furnished will burn and fail to lubricate.

In offering a second hand air cooled automobile for sale the statement is generally made that it has very recently been equipped with new cylinders, but who ever heard of this remark in connection with the sale of a second hand water cooled car? The reason why the cylinders are renewed instead of rebored, as are those of a water cooled motor, is easily explained. They cannot be rebored, because the cylinder walls are cast as thin as possible, to aid radiation, and also because running the car over bad, heavy roads on the low gear with high engine speeds for long periods so overheated the cylinder walls as to cause the cylinder to warp and become leaky around the piston. Reboring of the cylinder is impractical both because of its being too thin and because the overheating of the cast iron hardens it in spots, and the hard spots throw the tool out, causing the tooled surface to be uneven. This statement is backed up by the fact that stove plate and other cast iron that has been subjected to raw fire is never used in castings that are to be tooled, but rather for such things as sash weights and other purposes where tooling is not necessary.

Also, a hot cylinder cannot produce the same amount of power from the same quanttiy of gasoline, and it uses more cylinder oil, which makes the air cooled motor more expensive to operate. The surplus of oil is most liable to foul the plugs, to say nothing of the disagreeable smoke and odor sent out of the exhaust.

As with the steam car, were we to discuss all the defects of the air cooled engine it would be necessary to publish a book on the subject; so we will take up the subject of "the fool planetary transmission." It will be apparent to anyone of a mechanical mind that this gear is permissible only in small runabouts, and there only for the ake of economy in first cost, ease of operation, and the fact that it can sometimes be more advantageously placed and operated.

Among the many defects of the planetary transmission I will mention the multiplicity of gears, bearings and moving parts, all of which are subject to friction, which means wear, and unless they are properly oiled (which is rather difficult in this transmission) we will have hot bearings and worn bushings, gears, studs and gear casing, and when properly oiled the natural wear causes the bearings to become loose, and they rattle, with the result that this form of transmission consumes more power than does the sliding gear, and, as stated by "Kicker," it is not mechanical.

The writer had occasion to prove this to his full satisfaction during the construction of a coating machine, where it was necessary to increase the speed of a flywheel running free on the driven shaft exactly as the sprocket runs on the crank shaft in a planetary transmission. I purchased one and attached it to the machine, reversing its direction so as to increase the speed of the flywheel, instead of reducing it, as practiced in the auto. I applied a 10x4 inch face pulley, instead of the sprocket, to which pulley was applied a 4 inch belt from the line shaft, and, much to my surprise, this belt would not drive the machine when it was running idle, so as to turn the flywheel up to the desired speed of 700 r. p. m. By removing the transmission and placing a pulley on the flywheel and bringing down a 2 inch belt direct from the main shaft, no trouble was ever experienced, even when the machine was doing its full work. This showed me that the transmission was consuming several times the power necessary to do the work.

In the planetary transmission we must also contend with the extra friction due to the reverse being in motion while on low gear or the low gear being in operation while on reverse, or both low and reverse being in motion while the car is standing still with the engine running, all of which is wearing these parts out and causes them to rattle, and the case to become loose, when it will throw the oil out, with the result of extra wear on the parts for want of oil and the nuisance of having oil thrown over everything inside of the car. With all their loss of power, the waste of lubricating oil and the renewal and repair of parts these gears are expensive, as well as being unmechanical.

These gentlemen go on to say that they have had many pleasant hours riding in their steam cars, that the steamer possessed many commendable features, that there is good reason for its existence, and that it is not yet time for it to get off the face of the earth. With all this I agree. I also agree with the statement that there is not as yet a perfect automobile, but I do contend that the four cylinder gasoline rig, such as I have described, is more perfect than any steam rig today in operation. Still, when the newness of the automobile industry is considered, I think that any firm putting on the market either a steam, electric or gasoline car that will give fair satisfaction is entitled to a great deal of and it must be conceded by all that by eliminating the bad from the good by adding that which was good we day blessed with an automobile that give anyone but a crank fair satisfaction I also appreciate that price governs to a certain extent, so a car offered at cannot be as perfect as one costing $3,000 to $5,000.

As to the letter signed "Amateur," only say that he talks like a novice, and arguments are simply unworthy of He states that the time of starting a steamer is offset by the time for adjusting the carburetor and other parts of a gas engine just as though there was never anything do to the steamer but to get up steam sit in the seat and guide it. Is it not that some part of the steam car may as much or more adjusting? This comes under the head of comparative pairs and adjustments required by these cars, in which respect, I think, the car owners are willing to keep silent; they wish to start a comparison of the ture, I can only say that in the operation my 40 horse power the entire time in making adjustments was not ten hours during the season, and the time spent before starting and on the road not more than one hour, all told; the buretor was not adjusted more than times, while the coil never needed the est attention. The most serious trouble in the automatic intake valves, which most of the time above referred to was my first experience with this intake valves, and it will be my last will never purchase another car with them.

"Amateur" also refers to the air auto as being all right simply because has seen one or two in operation though one or two warm days make a mer, and the planetary transmission fectly satisfactory simply because he ating a car so equipped and it gives satisfaction. Why does he not state mechanical terms his reason for this is mechanical and as perfect as he claims to be?

I have operated a steam car and gasoline cars, three equipped with and the other with a sliding gear sion, and as I have posted myself aid of several books written by authorities and take regularly five tions devoted to the automobile conceited enough to think that I a little about an automobile and

C. J. Pe

[We would point out that our ent's efficiency test of the planetary valueless, as he drove it, or tried the reverse way. If he should try a worm and wheel by applying wheel he would reach a similar regarding this device, and the similar.—Ed.]

LEGISLATIVE and LEGAL

Supervisors' Good Roads Convention.

ALBANY.—The seventh annual convention f the New York State Supervisors in the nterest of good roads opened in the com- ion council chamber of the City Hall pril 3. The session was principally occu- ied with the address of State Engineer an Alstyne, who said in part:

One of the principal reasons why our roads have ot been better cared for in the past is that their ntire cost was placed on the people living outside e cities and incorporated villages, comprising ss than 20 per cent. of the people, and less than per cent. of the property of the State. The nprovement of these wagon roads, which consti- te a very important and essential part of the ansportation system of the State, is now receiv- g the attention of the people to a greater de- ree than ever before in our history. In 1898, llowing the example set by all European coun- ies having good roads, and by New Jersey in 91, Massachusetts in 1893 and Connecticut in 95, there was inaugurated a new departure in ad building in New York State, namely, that of tate aid in road construction and maintenance, us bringing to the assistance of poorer rural ounties and towns the great wealth located within e cities and villages of the State.

One of the most serious defects in the present ligbie-Armstrong law is the lack of satisfactory rovision for maintaining these roads after they re built, especially during the first two or three ears after their completion. *It is not only neces- ary to make the roads good; they must be kept ood.* The roads have a much greater traffic to arry after they are improved as they usually at- ract a large amount of traffic from adjacent and arallel unimproved roads, and are used more for leasure driving, automobiling and other classes f vehicular traffic. The hammering of horses' eet, especially when they are sharp shod during inter and spring, and the pounding of the heels, especially those having narrow tires, tend o loosen, wear out and form ruts in the stone omposing the macadam surface. This surface is lso more or less injured by the heavy automo- iles going at high speeds.

After explaining the imperative necessity of providing sufficient funds for mainte- nance, he recommended that the new State risons be located at such places as will en- ble convicts to be employed producing rushed stone. He also advocated planting hade trees along macadam roads, as in Connecticut and Massachusetts. He then spoke of roads improved under the "money ystem" as follows:

The proper maintenance of the 66,000 miles of irt roads, which it is not expected to permanently mprove under the Higbie-Armstrong law, con- inues to and will ever be the most important high- way problem for the people of the State. Nearly $5,000,000 in cash and labor are annually ex- pended on these roads and bridges by the high- way commissioners of the various towns in the State.

It is of the utmost importance that the millions of dollars annually expended by the highway com- missioners in the maintenance of these dirt roads be spent with the greatest possible degree of ef- ficiency and skill. The reports and accounts of the highway commissioners should be kept in the manner required by law, and also in such a man- ner as to permit any citizen to easily ascertain just how the money of his town is expended each year, and also in uniform manner in order to per- mit a comparison to be made between the different towns.

The number of towns that have adopted the money system of maintenance continues to in- crease. In 1899 only forty-three towns in eight counties had adopted the money system, requiring about $34,000 of State aid. In 1906 the number of towns had increased to about 468, located in fifty-four counties and requiring about $600,000 from the State for its share of the cost of main- tenance.

Thirteen counties in the State have now ap- pointed county engineers or superintendents of highways. The authority of these county engi- neers and superintendents over the highway com- missioners should be increased to a sufficient de- gree to permit their wishes and orders with refer- ence to the maintenance of the roads repaired un- der the money system to be carried out by the highway commissioners. Unless this is done they cannot be held responsible for the methods under which this money is expended. The highway commissioners are usually changed very fre- quently and scarcely have an opportunity to be- come familiar with the condition of the roads un- der their charge before a new official is seelcted. The county engineers or superintendents are likely to hold office continuously if their services are satisfactory, and their familiarity and experience with the conditions prevailing on each road in the county should be of great assistance in keeping these roads in a proper condition with the least expenditure of money.

E. A. Merritt was elected chairman of the convention and G. A. Butterfield secre- tary. At the session Wednesday resolutions were passed indorsing the Higbie-Arm- strong good roads bill and the West town road improvement bill.

For Punishment of Reckless Drivers.

NEW YORK CITY.—The action of the New York State Automobile Association in en- dorsing the plan for a bureau of complaints in each club, as outlined by Charles T. Terry, of the A. C. A., at the annual din- ner of the Syracuse A. C. last winter, has brought this important matter again to the attention of the automobile world. It has been embodied in a circular and sent to the seventeen clubs in the State, which have a total membership of 2,365, of whom 850 are members of the A. C. A., 200 of the Long Island A. C. and 577 of the Buffalo A. C. It can readily be seen that the adop- tion of this plan would act as a deterrent to reckless drivers. It is in full as fol- lows:

First—To have the club adopt as a part of its bylaws or constitution a provision for a com- plaint or grievance committee or bureau, to con- sist of from five to ten members. This commit- tee should perform the duty of considering any complaints of injury by automobilists, whether members of the club or not, and any complaint of reckless driving or other violations of the law, and hearing such proofs as any complainant has to offer. If the offense were committed by a mem- ber of the club he should be examined by the com- mittee, the charge read to him and his statement taken. If he pleads guilty, or if, upon investi- gation, the committee finds him guilty, he should be punished by the club by the imposition of a fine, graded, say, from $5 to $20. If the of- fense were flagrant and willful or grossly negli- gent, or if it were a second offense, he should, in addition to the fine, be suspended for a proper period, proportionate to the offense; for inex- cusable offenses or third offenses he should be expelled.

Second—In the case of complaint against those not members of the club, the statement of the com- plainant should be heard by the committee, to- gether with the statements of any witnesses who may corroborate such complaint. If it appears to the committee that a good case is made out the committee should invite the offender to reply to the charges. If he should fail to reply, or, if upon making his reply the committee is not satisfied that he has met the charges, the committee or some member of the committee should obtain a warrant and attend to the arrest and prosecution of the offender, perhaps through the attorney for the club.

Third—In case the complainant is able to stand the expense the committee should have him deposit upon the entering of the complaint a sum reason- ably sufficient to cover the expenses, reimbursing him the balance, if any, after the case shall have been finished.

Fourth—If the complainant in the case of com- plaints against non-club members is not able to stand the expense in whole or in part, the bal- ance of the expense within reasonable bounds should be paid by the club.

Motor Vehicle Accident Commission.

ALBANY.—Assemblyman Weber has in- troduced by request "an act creating a State motor vehicle accident commission, and defining its duties and providing for the recording of accidents by motor vehi- cles." The commission is to consist of three persons, appointed by the Governor, to hold office for two years. It is to serve free, with the exception of traveling and other necessary expenses. It is to have a secretary, who shall have the power to is- sue subpœnas for witnesses, administer oaths, etc., under the direction of the com- mission.

The chief office of the commission shall be in Albany, with branch offices, if de- sired, at New York city and Buffalo. Meet- ings are to be held three times a year. All examinations and investigations must be held before at least one member of the commission; and his action must be after- ward confirmed by one of his associates. The commission is to adopt rules for ex- amination into the causes of automobile ac- cidents and "other matters pertaining there- to happening upon the public highways and streets of the State of New York."

The peace officers of the jurisdiction in which the accident happens or damage is done are to send in a written report of par- ticulars. The commission is to keep a book in which record of all accidents will be made; and this book is to be accessible to the public at all times.

State Commission Not Wanted by A. C. A.

ALBANY.—President Dave Hennen Mor- ris, of the A. C. A., headed the delegation who appeared before the Ways and Means Committee of the Assembly last Wednes- day in opposition to the Stanley bill creat- ing a State automobile commission. They believed that the measure would be of no

benefit to automobilists. The L'Hommedieu bill imposing a tax on the weight of automobiles, the revenue from which will be devoted to the making of good roads, was indorsed by the delegation.

Assemblyman A. E. Lee has abandoned his bill, which would compel an automobile to slow down to 6 miles an hour within 20 rods of an approaching horse.

Assemblyman James A. Francis, of New York city, has introduced a bill which garage owners hope will be passed. It gives garage keepers an unrestricted lien on cars which they have stored, repaired or otherwise cared for. The measure also includes other vehicles stored or repaired in livery stables.

Sale Not Confirmed.

DETROIT.—Judge Swan, of the United States District Court, has passed upon the petition of the C. C. Wormer Machinery Company, of Detroit, for permission to remove from the plant of the bankrupt Auto Brass and Aluminum Company, of Flint, Mich., certain machinery which the petitioner sold to the bankrupt company on contract. He ordered that after the expiration of twenty days the petitioner shall be permitted to take possession of the machinery, unless in the meantime the trustee for the creditors should pay the petitioner the balance due on the machinery amounting to $6,363. The sale of the effects of the plant to C. J. O'Hara, of Detroit, on March 17, for the sum of $4,250, was not confirmed, and a new sale was ordered to be held later.

To Amend the Sims Bill.

WASHINGTON, D. C.—At a meeting of the Senate District Comittee, held last Friday, it was determined to amend the Sims bill in important particulars, before reporting it to the Senate. It is proposed to raise the limit of speed within the fire limit of the city to 12 miles an hour, and in the suburban streets and parks to 15 miles. The House bill placed the limit of speed at the intersection of streets in the crowded section to 4 miles, and the amended bill allows 8 miles.

The cumulative sentence for the third offense of exceeding the speed limit is placed at $50 to $250 at the discretion of the court. In this form the bill will be reported to the Senate.

Frelinghuysen Bill Passes House.

TRENTON, N. J., April 11.—The Frelinghuysen automobile bill passed the House late last night in an amended form. It will now go back to the Senate, where it is expected to pass today.

According to the new amendments automobilists in case of accident are required to stop and give the names and addresses of the male occupants of the cars. For failure to do so a fine of $100 or a sentence of imprisonment for thirty days may be imposed.

One amendment proposed by the House committee cuts out the establishment of automobile inspectors, one in each county, which provision is in the measure as it passed the Senate. The bill made it the work of these inspectors to obtain evidence of violation and otherwise assist in the enforcement of the act.

One of the most important amendments cuts out the provision for imprisonment for violations of the speed limit clause. As it passed the Senate the bill provides a penalty of $500 fine or imprisonment in the county jail for sixty days. The House amendment provides that the penalty shall be a fine of not less than $20 nor more than $100 for the first offense. For the second offense the fine is to be doubled and the offender's license revoked.

The fine of $500 or imprisonment for sixty days is retained as the penalty for driving a car without license, displaying a fictitious license number, or in case an intoxicated person is guilty of driving a car.

According to the new amendments proposed, the license of any driver may be revoked at the discretion of the commissioner of motor vehicles. Provision is made for appeal from the findings of magistrates in cases of alleged violations. The appeal will be to the courts, and will include a review of the case with regard to the reasonableness of the penalty imposed, as well as to the question of the evidence of the violation under which conviction was found.

The Baltimore Show.

The first show of the Baltimore Dealers' Association closed Saturday night, with an attendance during the eight days of more than 35,000 people. One hundred and twenty cars were exhibited by the twenty local dealers, and fifty sales were reported. The exhibition was held in the garage of the Motor Car Company. The dealers' association will be made permanent, and it is stated that a larger show will be held next year.

Richard J. Keating, president of the dealers' association; James L. Gibney, of Philadelphia, and J. M. Stoddard, of Washington, were injured in a collision after a supper given by the exhibitors on Friday evening. Mr. Keating's car skidded into an electric light pole, and the car of A. Stanley Zell, of the Motor Car Company, crashed into it. Mr. Gibney has concussion of the brain, but the others escaped with slight injuries. The police found that the speedometer on Mr. Zell's car registered 60 miles an hour, on which evidence he was arrested, and the case will come up next week.

One of the exhibits was a new pneumatic hub, the invention of W. G. Anderson, of White Marsh, Md., a wagon manufacturer. The wheel has a steel rim or tire that can be shod with a solid rubber tire, if desired. The hub contains a ball bearing, and has an outer steel rim, between which and the edge of the bearing case is a 3 inch pneumatic tire, which, the inventor claims, absorbs all vibration.

Pennsylvania Electric Vehicle Company to Liquidate.

Stockholders of the Pennsylvania Electric Vehicle Company, of Philadelphia, will meet April 24 to consider the liquidation of the company's affairs. It is thought the preferred stock will yield a value of about $4 a share. The common stock is valueless. The principal asset is the building on North Broad street, which is valued at over $175,000. With the exception of the New York branch, this is the last of the big electric vehicle transportation organization, which had branches in all the principal cities.

Vanderbilt Race October 6.

At its meeting on Monday last the racing board of the A. A. A. selected Saturday, October 6, as the date for the Vanderbilt Cup contest. The elimination trial to select the American team for the race will be held September 22, and the American team will be limited to 25 cars. The entrance fee for both foreign and American competitors is fixed at $1,000—double last year's fee. Closing day for entries, both American and foreign, will be July 1. The first five cars that finish in the elimination trial will be picked for the American team. The rule requiring that cars be equipped with a differential gear or an equivalent was abolished. Nothing definite was decided regarding the course for the race.

The cup commission this year will consist of the A. A. A. Racing Board and representatives of the Automobile Club of Great Britain and Ireland, the Automobile Club of France, the German Automobile Club and the principal automobile club of Italy. Last year the French club was the only foreign organization represented.

Waste Gasoline in Sewers.

A series of explosions last Friday—the fourth since the first of the year—sent manhole covers sky high along Eighth, Ninth and Tenth avenues, between Forty-ninth and Fifty-fifth streets, New York city, causing serious injury to a dozen persons, and a property loss amounting to several thousand dollars. It is thought that the explosions were the result of the practice of proprietors of automobile garages allowing gasoline, naphtha and refuse oils from the hundreds of machines that are stored within them to be washed into the sewer openings.

Although the proprietors deny this, the sewer department is mapping the automobile district, and charting every garage on the sewers tributary to the trunk sewer, which has an outlet at Fiftieth street and North River. The department thinks that waste gasoline is the only feasible theory of accounting for the explosions thus far advanced.

N. A. A. M. Will Not Recommend Rules for Glidden Tour.

At the regular monthly meeting of the executive committee of the N. A. A. M., held last Wednesday, those present were: S. T. Davis, Jr., W. E. Metzger, Windsor T. White, Charles Clifton, S. D. Waldon, W. E. Innis, C. C. Hildebrand, M. J. Budlong, E. H. Cutler, Albert L. Pope, L. E. Kittridge and S. A. Miles.

The contest committee reported that after full consideration of the rules of contests held in this and other countries, it had become convinced of the impossibility of making equitable rules to select from cars of every conceivable construction, weight, power, speed, seating capacity and price, one machine as a winner, except in a speed contest. It had therefore been unable to make any definite recommendation regarding rules for the Glidden tour, as requested by the American Automobile Association. There had been a joint meeting of the committees of the National and American Automobile associations, but without arriving at any satisfactory result.

In relation to contests generally the committee recommended that the association consider for approval during 1906 only such contests as are conducted by the American Automobile Association.

In relation to the show resolution adopted at the March meeting, and which provided that no member of the association should take part in local shows, it was decided that branch houses shall be considered in the same light as dealers, so that if a branch house manager desires to take part in a local show no penalty will attach to the manufacturer he represents.

Toronto Automobile Show.

The first automobile show ever held in Canada was formally opened by the Lieutenant Governor at the Granite Rink March 31 in the presence of 10,000 people. W. C. Ellis, of the Automobile Club, delivered an address, in which he spoke enthusiastically of the outlook for motoring in Canada.

The weather was ideal throughout the week, and it is estimated that 50,000 people visited the show.

Motoring has taken a long stride forward in Canada this year, the era of inaction having been passed. There was once much doubt whether Canadians had money enough to buy automobiles, but this seems to be no longer a question. American as well as European firms are waking up to the fact that Canadians have the means and will become as enthusiastic motorists as anyone else. One man in Toronto has bought eight cars this year at a total cost of $35,000.

An exhibit of the foreign cars of the newly organized British and French Motor Company is in progress at the Mutual street Rink this week. A temporary garage has been fitted up in this rink pending the erection of a building. The head of the company is John Palmer, with whom is associated his son, John Palmer, Jr. They will handle the Panhard, Daimler, Swift, Argyle and other French and English cars.

Five Municipal Garages Proposed.

Chairman Davies, of the finance committee of the New York city Board of Aldermen, introduced a resolution last week that the board consider the advisability of establishing municipal garages in each of the five boroughs of New York. He thinks in this way to overcome the objections of the Municipal Ownership aldermen to buying automobiles for city officials. These aldermen declare that the machines are wanted by the various commissioners for their personal pleasure and to take their families for drives in the country. Police Commissioner Bingham has asked for three automobiles, Commissioner Woodbury for two and Dock Commissioner Bensel for one. Chairman Davies believes with municipal garages in charge of responsible officials that these machines will be used only for public service.

The city already owns fifteen machines, as follows: Dock department, 1; police department, 1; park department, 3; fire department, 3; street cleaning department, 3; water department, 2; health department, 2. It is thought that the establishment of garages in the different boroughs would thus be an economy.

A. C. A. Appropriates $2,000 for Sign Boards.

The announcement was made at the monthly meeting of the A. C. A. directors, held at the A. C. A. clubrooms last Thursday, that the A. C. A. had appropriated $2,000 for the erection of signs on the main highways leading from New York to Boston and Philadelphia. These will prove a much needed aid to motorists. The lack of adequate sign boards was the cause of much delay to many who drove their cars from New York to the Boston Show last month.

Judge W. H. Hotchkiss, of the Buffalo A. C., has notified President Farson that he will not be able to serve as chairman of the committee on highways. The Macon (Ga.) A. C. was elected to membership. H. Bartol Brazier, of the Philadelphia A. C., which has withdrawn from the A. A. A., sent in his resignation as a director, but it was not accepted.

L. R. Speare, of the Bay State A. C., presided at the meeting in the absence of President Farson.

Automobiles in Telephone Work.

The Chicago Telephone Company have purchased five automobile delivery wagons for use in delivering telephone instruments to all parts of the city. They are built with a carrying capacity of 1,500 pounds, at 15 miles an hour. It is expected that they will be placed in commission about May 1.

They have also purchased two 8 ton, four wheel drive trucks for use in their construction work, which will be delivered the middle of the present month.

The company write us that they expect, from practical tests and figures, to make a considerable saving by the use of motor cars instead of horse vehicles. A garage fully equipped with tools for automobile repair work will be established in charge of competent mechanics.

The Cumberland Telephone and Telegraph Company, of Nashville, Tenn., inform us that the automobiles in their service are found peculiarly adapted to their "long distance" and "hurry" work.

The Bell Telephone Company, of Detroit, have placed in service a truck for distributing telephone wires.

To Manufacture Motor Trucks.

The Southern Automobile Company, Nashville, Tenn., will engage in the manufacture of commercial automobiles under the direction of J. H. Lawrence, formerly professor of mechanical engineering at Vanderbilt University. It is expected that the first cars will be ready for delivery July 1. Trucks will be built especially adapted to Tennessee roads.

They have contracted to furnish the Gulf Oil Refining Company, of Nashville, with a car for delivering oil to their patrons. Professor Lawrence claims to have designed a car that eliminates any danger of explosion by reason of using a gasoline motor.

The Auto Livery Business.

Mr. Harmon, of the Harmon Auto Livery Company, Cleveland, Ohio, says there is a great future in the auto livery business. At the present time he finds that tires are the greatest problem. In order to compete with horse liveries patrons must be carried over all kinds of roads at all times. The wear and tear on tires is consequently great, and the cost of replacing them the largest item in maintenance. This company has operated two touring cars the past year, and will buy another this spring.

Runabouts for Traveling Salesmen.

Grant Courtwright, of the firm of J. A. Sloan & Co., wholesale grocers, Columbia, Tenn., covers his territory in a 1906 gasoline runabout. He traverses the territory formerly given to three men, and recently stated that in a distance of 6,000 miles the repair expense for his car was $4.50. This remarkable item was shown to a member of the firm of Orr, Mizelle & Co., wholesale grocers, Nashville, who immediately ordered a runabout for the use of salesmen. This has proven so satisfactory that five more are to be purchased.

The Boston fire department received an Oldsmobile runabout last week to be used at Station 32.

MINOR MENTION



The Sayres & Scovill Carriage Company, Cincinnati, have started the manufacture of automobiles.

The Morris Auto Company, of Saginaw, Mich., has increased its capital stock from $12,000 to $25,000.

The Wright Motor Works, Buffalo, N. Y., are about to manufacture gasoline motors for automobiles.

The Clincher Tire Rubber Company, of Akron, Ohio, has increased its capital stock from $100,000 to $200,000.

The Buffalo branch of the Fisk Tire Company will move into its new quarters at 718 Main street April 15.

The Knox Motor Truck Company, of Springfield, Mass., has opened a Boston office at 43 Columbus avenue.

It is reported that the Lehr Agricultural Company, Fremont, Ohio, will engage in the manufacture of automobiles.

The R. E. Hardy Company, automobile accessories, have removed to larger quarters at 86 Watts street, New York city.

The Aerocar Company, of Detroit, have built an addition to their factory, affording them 4,200 square feet of new floor space.

G. H. Van Ness, agent at Cincinnati, Ohio, for the White cars, died on March 30 in that city. He was forty-four years old.

The Cleveland City Forge and Iron Company, Case and Lake streets, Cleveland, Ohio, have decided to resume the pressed steel frame business.

The Madeau Manufacturing Company has recently incorporated at Cincinnati to manufacture automobile tools. Its principal product will be a jack patented by W. H. Burtner, Jr.

Lawyer Xenophon P. Huddy addressed the Professional Chauffeurs' Club of America, 1775 Broadway, New York, last Monday evening on "Legal Matters of Interest to the Chauffeur."

The Maumee Motor Car Works is a new organization that has secured the plant of the bankrupt Wolverine Company at Dundee, Mich. W. K. Terry says they will have their model out in about a month.

W. E. Kane, of Syracuse, has bought the business of the Syracuse Rawhide Company, and will conduct the manufacture of rawhide gears at his plant in Shonnard street. The company was incorporated for $25,000.

T. Winton Henderson, of Philadelphia, is planning for the coming summer personally conducted automobile tours through the picturesque and historically interesting parts of France, with side runs into Italy, Switzerland and Germany.

The Page Motor Vehicle Company call our attention to certain errors in the description of their runabout in our issue of March 28. The coils should have been described as of the vibrator type, instead of plain, and the commutator as of the "short contact" type. The oil supply to the hollow wrist pin is obtained through a hole in the cylinder wall, instead of from an oil groove in the same, as stated.

An automobile driven by Peter H. Seery, of 63 Broad street, Newark, N. J., ran down and killed Harry Wire, twelve years old, who was riding a bicycle, last Thursday. Mr. Seery said the bicycle suddenly veered in front of his machine.

The Buffalo headquarters of the Hartford Rubber Company will move May 1 to the store at 725 Main street, now occupied by F. I. Alliger, Buffalo agent for the Packard cars. Mr. Alliger will temporarily occupy the store vacated by the Hartford Rubber Company.

The Diamond Rubber Company will occupy their new three story building at 1523-1531 Michigan avenue, Chicago, May 1, at which time their tire and mechanical branches at Chicago will be consolidated. O. S. Tweedy will have charge of the new establishment.

At the meeting of the mechanical branch of the A. L. A. M. last Friday further details of the fixed standards for screws, nuts and bolts were decided upon. Noises in automobiles, particularly gear noises, and materials for frames, as well as methods of construction, were other subjects discussed.

The Duquesne automobile factory, Jamestown, N. Y., was sold out on mortgage foreclosure on Monday, March 26, to R. J. Straight, of Bradford, Pa., the former owner of the plant. It is reported that the sale will not interfere with the manufacture of automobiles of the Duquesne Construction Company.

The Swinehart Clincher Tire and Rubber Company, Akron, Ohio, have voted to increase their capital stock from $100,000 to $200,000, to take care of increased business. They have contracted with the Logan Construction Company, of Chillicothe, Ohio, to furnish them with 500 sets of their standard clincher tires for their runabouts and light commercial vehicles.

The Parish Manufacturing Company, Reading, Pa., have leased a portion of one of the old shop buildings of the Reading Railway Company, and will shortly begin the manufacture of automobile frames. The company was recently chartered in New Jersey, and the officers are: President, Robert E. Jennings; vice president, J. E. Sullivan; secretary and treasurer, W. B. Kunhardt; A. E. Parish, manager.

Garage Notes.

G. D. Hubbel, Garden City, L. I., is erecting a garage on Seventh street, to be opened about April 15.

Norcross & Cameron Company, Springfield, Mass., have purchased the property at 55 and 57 Bridge street, and will erect on it a garage, with 65 feet front by 160 deep.

The Sid Black Company have opened a garage at 21 East Ninth street, Cincinnati, and will soon open another on Walnut street, near Seventh street.

Wood Brothers will build a new garage at Santa Cruz, Cal., this spring.

A. R. Evans has purchased the garage on South Fifth street, Leavenworth, Kan., from W. J. E. Carr.

The Camden Motor Company, Camden, N. J., are building an addition to their garage at 106 North Seventh street.

T. McElroy, of the Champion Manufacturing Company, Newark, N. J., has opened a garage at 139 Walnut avenue, Newark.

The new garage at Chenango and Utica streets, Buffalo, N. Y., has been named the Richmond Automobile Station. George H. Johnson is in charge. Mr. Johnson was formerly one of the proprietors of the Utica Street Automobile Station, of which the new garage is a branch.

New Incorporations.

Illinois Automobile and Parts Company, Chicago.—Number of directors increased from three to five.

Chatham Motor Car Company, Ltd., Chatham, Ont.—Capital, $50,000; to manufacture automobiles. Incorporators, R. L. Brackin, et al.

The Tacoma Automobile Company, Tocoma, Wash.—Capital, $5,000; incorporators, W. W. Pickerill, C. M. Seeley and E. R. Wheeler.

Brockton Motor Exchange, Brockton, Mass.—Capital, $3,000; to deal in automobiles. President and treasurer, O. A. Campbell, of Brockton.

P. A. Fogarty, Inc., New York City.—Capital, $10,000; to deal in automobiles. Incorporators, P. A. Fogarty, W. P. Fogarty and J. J. DeLong, all of New York city.

Coon's Consolidated Motor Company, Tacoma, Wash.—Capital, $900,000. Incorporators, R. E. Coon, William H. Peacock, L. M. Coon, G. H. Clark and Mary E. Gardner.

Goodyear Tire and Rubber Company, Boston, Mass.—Capital, $10,000; to deal in rubber tires. Incorporators and officers: President, not named; treasurer, C. W. Sieberling, Akron, Ohio.

Illinois Motor Roadway Company, Centralia, Ill.—Capital, $150,000; to maintain motor roadway. Incorporators, T. A. Johnston, W. Rolin Smith and F. B. Miller.

Flatbush Automobile Company, Brooklyn, N. Y.—Capital, $5,000; to make automobiles. Incorporators, E. G. Applegate, Annie E. Applegate and S. E. Maires, all of Brooklyn.

Trade Personals.

John C. Speirs, recently with the Autocar Company, has taken a position with the Midgley Manufacturing Company, Columbus, Ohio.

J. B. McIntosh has been appointed manager of the International A. & V. Tire Company's new branch at 214 Jefferson avenue, Detroit.

Frank Yerger, formerly with the Keystone Motor Car Company, Philadelphia, has taken the management of the Studebaker agency in Philadelphia.

L. C. Burnet, general sales manager of the Hartford Suspension Company, has resigned to accept a similar position with the Diezemann Shock Absorber Company.

Kenneth M. Blake has been appointed superintendent of the Boston branch of the Locomobile Company of America. He has been acting superintendent of the New York branch for some time.

L. M. Dieterich, formerly with the Waltham Manufacturing Company and the Cadillac Company, will be chief engineer and acting factory manager for the Aerocar Company, Detroit, Mich.

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THE

Horseless Age

VOLUME 17 APRIL 18, 1906 NUMBER 16

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"My Winton Model K, I think and feel, gives me the best service of any of these cars. I have been running it since November and I have had no trouble with it, and I am expecting to take this car to Europe.

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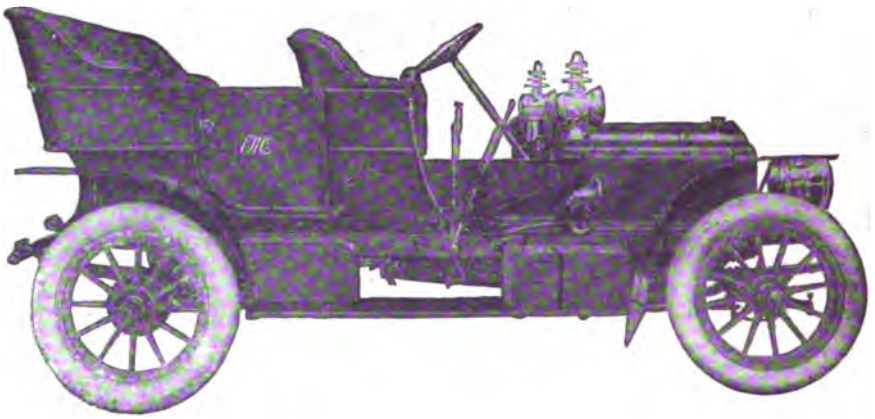
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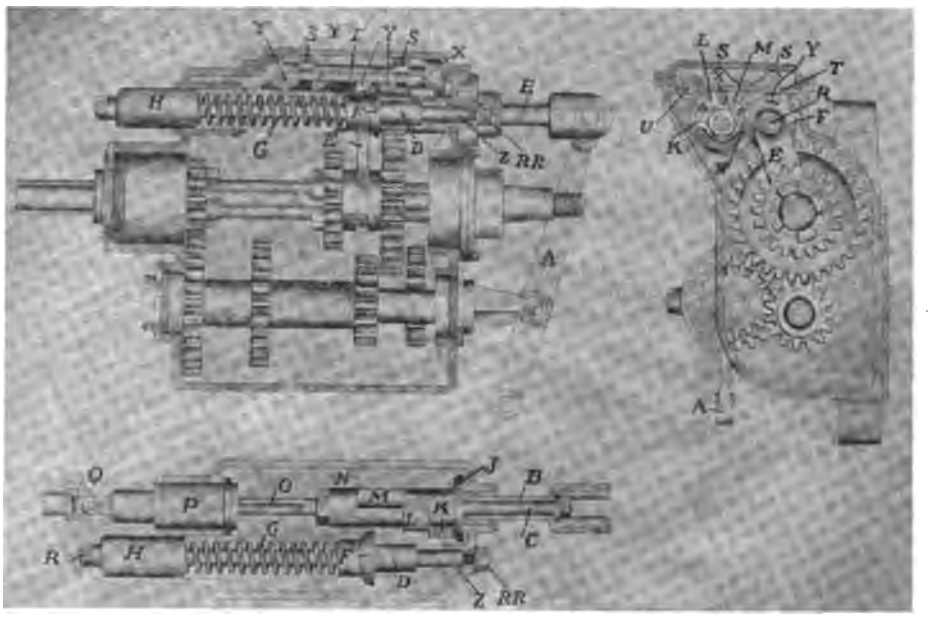
THE ELMORE MFG. COMPANY, 1004 Amanda Street, CLYDE, OHIO

Members Association Licensed Automobile Manufacturers.

Novelties at the Agricultural Hall Show.

(Special Report.)

The automobile show, which opened on March 26 and closed on March 31, had few novel things on view either in cars or accessories. A distinctly clever device named the Scowen automatic changing gear attracted much attention because it abolishes the use of the change lever, any alteration of gear being effected at the same moment that the clutch is withdrawn. The device was shown fitted to an ordinary Panhard type of sliding gear on a Gregoire car and could be adapted to any existing gear by either casting a new box with sufficient room for the device, or else cutting away the present box and fitting another cover over the two extra shafts needed. A bracket is bolted at any convenient position on the gear box, and to this is hinged the lever A, the eye at the bottom of the lever being connected by a rod or rods to the clutch disengagement movement. The upper end of the lever A is connected also by a hinge joint to the hollow shaft B. The shaft B can be moved to the left by the lever A. Within the shaft B is a shaft C, the extreme right hand end of the latter having a collar and nut which holds it up to an enlargement of shaft B, made to receive it. Immediately inside the right hand end of the gear box the shaft C has mounted upon it a cone J, together with teeth or moving faces K, L, M and N, the cone and teeth being machined from the solid and fixed on shaft C by a key and lock nut. To the left of shaft C is a keyway O, which slides on a feather within casing P; the latter is contained in a bushing allowing it to revolve. P is further extended to the left, outside the gear box, and is there formed up into a universal joint Q, which is connected by a rod to the indicating lever upon the steering column. The indicator (not shown in the illustration) consists of a small lever with suitable joints to connect to universal joint Q, and works over a small horizontal quadrant upon which are marked the various positions for the forward and reverse gears. When the indicating lever is moved, universal joint Q, casing P, shaft C, and the attached cone J, with teeth K, L, M, N, are all revolved together by reason of keyway O running upon the feather within casing P. It must be understood that shaft C is quite free to revolve within the short hollow shaft B, for, unless this important feature of the mechanism is made apparent, the action cannot be followed. In front of the shaft C is another shaft Z, upon which is loosely mounted collar D, which is solid with cone F, having a spring G abutting against F, and with the left end lying loose in casing H. To the left of the casing H is an adjustment nut to adjust spring G, which is locked by nut R. To the right of shaft Z is a nut RR, which is for the purpose of altering the adjustment of shaft Z, in relation to the other portion of the mechanism when assembling, but for no other purpose. Upon the left hand boss of cone F, the usual gear moving fork E is pinned. Above shafts C and Z is a flat plate T, which is hinged at U and rests, when the clutch is in engagement with the flywheel, upon a small lip at the top of the gear box. (This lip can be seen in the transverse cross section adjacent to the letters R and T.) Above the plate T are two plate springs S which tend to keep it pressed home. Below the plate T, and machined from the same piece of metal, are four teeth, or, as the inventor prefers to call them, locking racks Y, these being exactly in line with the middle of cone F on shaft Z. Below plate T, to the rear of the racks Y, and immediately over the centre of cone J, on shaft C, is a small lifting tooth X. C, this is taken over bodily to the left of the gear box. As shaft B commences to move, cone J comes in contact with lifting tooth X, below plate T, and as the plate is hinged at Q, plate T is lifted up together with the locking racks Y, clear of engagement with the back of cone F. As the movement of C to the left continues, tooth L comes against the back of cone F, and carries it also to the left, together with gear fork E, against the pressure of spring G. The moment the cone J passes clear of lifting tooth X the plate T is forced down upon its hinge Q by means of the springs S; but owing to the half round shape of the teeth rack Y the cone F can continue to lift the plate T, as it comes in contact with one of the teeth Y, and is pushed to the left by tooth L. F being rigid with



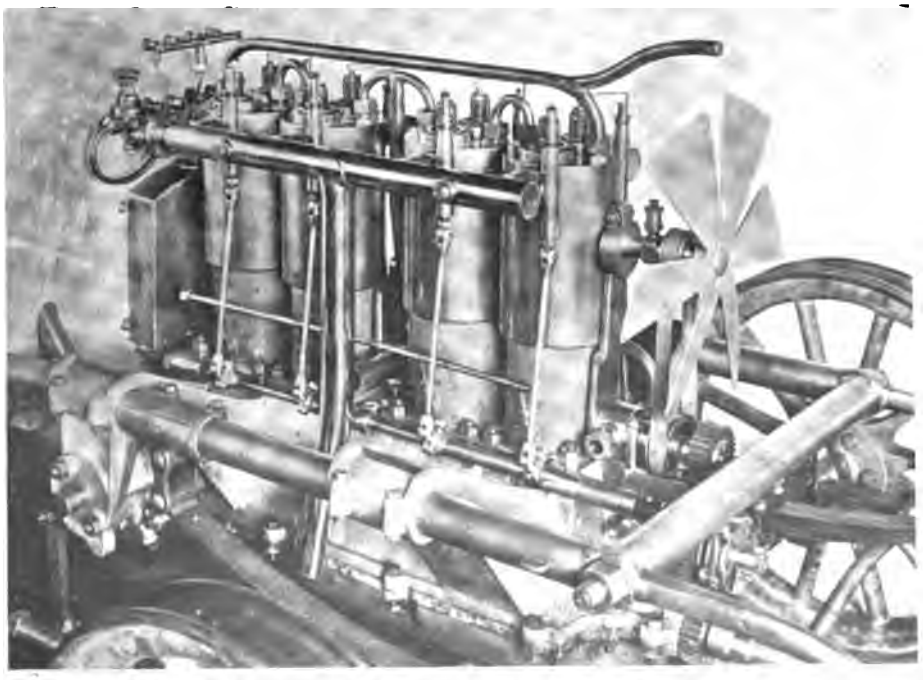
Scowen Automatic Change Gear.

No indicating letters are placed on the gear wheels, these being no different to the ordinary pattern and give a direct drive on top gear; the enlargements around the four ends of the gear shafts are ball bearings. It is now possible to follow the action of the various parts in relation to each other, noting that the gear is shown in the neutral position. To change into first speed, the indicator on the steering column is moved to the correct place on its quadrant, moving with it joint Q, shaft C and cone J, with its four teeth. Tooth L is thus moved around until it takes up the vertical position in which tooth K is seen, the latter meanwhile being also revolved out of sight. This setting of the movement can be effected at any time beforehand, preparatory to the change being needed. When the clutch is entirely disengaged, but not a moment before, the lever A has its shorter arm pushed over to the right, and being hinged upon its supporting bracket the longer arm is forced over to the left, carrying with it the hollow shaft B. The inner end of B abuts against cone J, and as the latter is rigid upon shaft clutch fork E, the latter is also carried to the left, bringing the gear wheels into mesh for the first speed. The clutch being released, the lever A comes back into the position seen in the illustration, and the spring G tries to force F right back again; but as tooth L is now vertical and is in line with one of the teeth Y, the back of cone F is stopped by the flat on the tooth and the gear is thus locked in position. The same process brings each of the other gear wheels into mesh, one step at a time. For the reverse, shaft C is revolved in a contrary direction, consequently turning all the teeth K, L, M and N quite clear of the back of cone F; therefore, spring G can push gear fork E to the extreme right of shaft Z, and cone J can, on its return to the right, lift plate T, permitting the reverse to come in; this is one of the clever points of the device, because even if the rack teeth Y were lifted right clear, the tooth K, were it in its normal position for neutral, would not allow the back of cone F to proceed any farther. The change from the top speed or any of the forward speeds into the reverse can be made instantly right through; but

movement from reverse to neutral, or any forward speed, must be taken a step at a time. The device is so arranged that a certain amount of "lead" is given to the clutch, so that it is possible to obtain as much "slip" as desired, the change only taking place when the clutch is entirely disengaged, but not before. From an extended run which the writer had upon a car fitted with this device it was proved that the gear changing, once the indicator was set, was made without noise or shock, and that the claims of the inventor are justified. Acting upon a suggestion of the writer's, a safety catch will in future be fitted on the indicator to prevent the reverse being thoughtlessly engaged at night time.

A NOVEL ENGINE AND FRAME.

The Green engine has many novel features. The cylinders have separate copper water jackets with at least three times the amount of water space above the cylinder heads. The exhaust and inlet valves are overhead and are worked by vertical tappets which come down parallel with the cylinders. The lower ends of the tappet rods are hinged, and each is connected to its own cam shaft, each one of the four shafts for inlet and exhaust respectively being hollow and carried concentrically one within the other. The shafts are not enclosed and are taken to the front of the engine, where each shaft has a rocker rigidly attached to it. The actuating cams, eight in number, are also open and are between the half time spur wheel and the front of the crank case. In action, the cams in turn each lifts its own rocker, thus partly revolving its own shaft and thereby pushing up the tappet rod. By loosening a single nut the right angled arms at the tops of the tappet rods can be swung right or left so as to clear the valves and springs. The water circulation is peculiar, the inlet pipe coming up between the second and third cylinders, passing into them by a T arm, and after the water has circulated around these, passes out at the tops, enters the tops of the first and fourth cylinders and leaves these again at the top and enters into a branch pipe to the radiator. The fan, together with its belt and gear drive, can be entirely dismounted by the removal of two nuts; immediately behind the fan belt driving pulley and on the same shaft is the water pump, which thus also can be quickly dismounted. The engine is carried on the tubular frame by four arms which at their ends are split to form clips around the tubes; by undoing one pair of the clips and disengaging the steering connections the engine can be swung right up on the frame for examination of the crank shaft big ends, etc. By knocking out two cotters and removing the front tubular cross strut of the frame, the engine, together with flywheel and clutch, can be pulled straight out entirely clear of the frame.



GREEN'S NOVEL ENGINE.

The Two Cycle Gas Engine.

(THE STATE OF THE ART UP TO AND INCLUDING THE SINTZ AND COCK PATENTS.)

By E. J. STODDARD.

Below I have given an outline of the development of the art of two cycle engine construction, in view of which all patents must be judged, and I here wish to introduce the subject, pointing out principles which should be held in mind in judging of the probable scope of the Sintz and Cock patents.

It seems reasonable to say that there is no invention in bringing a number of devices together in one structure to do just what they have always done, if no new result is produced thereby. The courts have uniformly held such a joining to be an unpatentable aggregation and not a patentable combination. In Richards vs. Chase Elevator Company, 158 U. S., 302, the Supreme Court said: "So long as each element performs some old and well known function the result is not a patentable combination but an aggregation of elements."

The Sintz application was submitted by one of the most skillful and experienced experts in the country, therefore if a claim is narrow it may be inferred that it is necessarily so in view of the state of the art.

Below will be found a sectional view and brief description of the Sintz engine. The claims likely to be of most interest are the second and sixth. All the other claims seem to be confined to the igniting mechanism, or to combinations involving the port through the wall of the piston which is not generally used.

The second claim is:

2. In a gas engine, a cylinder having supply and exhaust ports arranged near the centre thereof and approximate to each other, and a piston adapted to normally close both of said ports, said piston being adapted to uncover one of said ports and cause it to communicate with one end of the cylinder, as it approaches the limit of its movement in one direction, and to uncover the other port and cause it to communicate with the opposite end of the cylinder, as it approaches the limit of its movement in the other direction, and a communicating chamber adapted to form a communication from one end of said cylinder to the other, as the piston reaches the limit of its movement in one direction, substantially as and for the purpose specified.

The concluding words have been thought to limit a claim to the specific device or devices shown, in case of doubt. (Hobbs vs. Beach, 1901 C. D. 311.)

In this claim there seem to be three elements, each of which is specifically described. First, the cylinder having supply and exhaust ports arranged near the centre thereof, etc.; second, a piston adapted to cover and uncover these ports, as described; third, a communicating chamber adapted to form a communication from one end of said cylinder to the other, etc.

THE FIRST ELEMENT.

From the résumé of the art below it will be seen that the exhaust port near the centre of the piston operating as described was well known at the time of the Sintz application. This exhaust port had been used in connection with engines having crank case compression, the mixture being admitted to the crank chamber by various other forms of valves.

It will also be seen that this form of inlet valve for pumps was shown by Collet and Rose, 1876 and 1884 (see Figures 13 and 14 following). But it may be argued that this form of inlet valve used in the pump of this kind of gas engine produced a new effect in that it occasions an even draught, better adapted to produce uniform carburation of the charge. But even if we admit this, devices of this kind are shown used with gas engines of this kind, and acting to produce the same effect. See for instance

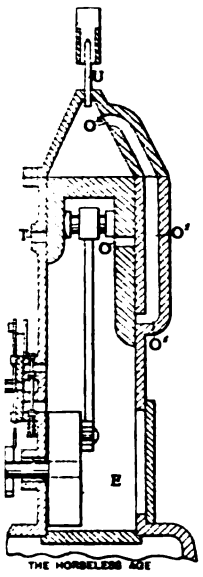


FIG. 1.

U. S. patent No. 291,065, January 1, 1884, to H. S. Maxim; U. S. patent No. 302,271, July 22, 1884, to the same inventor; U. S. patent No. 322,650, July 21, 1885, to C. Shelburne; British patent No. 4,816, October 10, 1883, to Williamson, Malam and Ireland, etc.

Is there anything new in substituting one well known form of pump for another, to produce a result that has been pro-ed in the same way?

THE SECOND AND THIRD ELEMENTS.

f the "communicating chamber" is to be strued broadly it will be found in a ge number of devices, referred to below. was well known at the time of the Sintz lication. If it is construed narrowly so to include the port in the piston wall equivalent, it is not believed to be very irable, or generally used.

)f course, the piston to operate with the er elements is necessary, and in itself claim to novelty would be made.

Reference may be made to the figure wing the Day engine of British patent . 6,410 of April 14, 1891, or Nash patent . 386,211, July 17, 1888. This second im was distinguished in an argument m the Nash device by the fact that the rge was transferred by the simultaneous ning of two ports (amendment of Feb-ry 27, 1893).

The sixth claim reads as follows:

. In an explosive engine and in com-ation, a piston, and a cylinder having irect supply and an exhaust port both ar-nged to be closed by the piston on its up-rd or compression stroke, and to be ned by the piston at the limit of its wer or downward stroke, the said ports ng opened and closed successively by the vement of the piston, substantially as scribed.

It has been claimed that the words "said rts being adapted to be opened and closed cessively by the movement of the pis-," especial emphasis being given to the rd successively, was the novel and con-lling feature of this claim which will ntrol the art.

It is uniformly held that if an appli-nt makes a claim during the prosecu-n of his application and abandons it, cannot construe the remaining claims to ve the scope of the claim voluntarily ased. The following claim was made ring the prosecution of the Sintz appli-ion:

"The combination in a gas engine of a power cylinder having inlet and exhaust ports and a piston adapted to uncover the exhaust port, and immediately after to uncover the inlet port, substantially as described."

This was rejected upon the German patent to Ridealgh & Fairman, No. 44,572, January 26, 1888 (shown in Fig. 1 herewith), and canceled. That this German patent shows the feature of the successively opening ports seems clear. The sketch shows an arrangement that must operate in this way, and the specification described it specifically as follows:

"Sobald die Ausströmungsöffnung T frei wird, entweichen die Verbrennungsproducte, und sobald der Kolben *noch ein wenig herabgeht,* stellt sich die Oeffnung O genau gegenüber dem Seitenkanal O', und die comprimirte Ladung dringt aus E durch O' in die hutförmige Kammer O2, woselbst sie durch das Zündungsrohr U entzündet wird. Auf diese Weisse wird der Kolben wieder zurückgetrieben, und die Operation wiederholt sich."

The italics are not in the original.

It would seem as if the Day patent of 1891 was sufficient in itself to answer this claim. It is true that the applicant filed an affidavit carrying his invention back to May, 1892, but in the Office letter of July 29, 1893, the Office calls attention to the alleged fact "that the affidavit does not go back far enough to overcome the British patent to Day and the United States patent to Drautz. The German patent to Ridealgh & Fairman was not cited until after this.

But we must look at the state of the art in the aggregate, and not judge from an unnecessarily narrow point of view, as the Commissioner remarks in ex parte Sinding-Christensen, 120 O. G. 2,755-2,756. "It is the knowledge of the public derived not from one patent alone, but from all, which negatives patentable novelty in any case."

It is for this reason, among others, that many whose interests are directly involved think there should be a technical element in the proposed "Court of Patent Appeals."

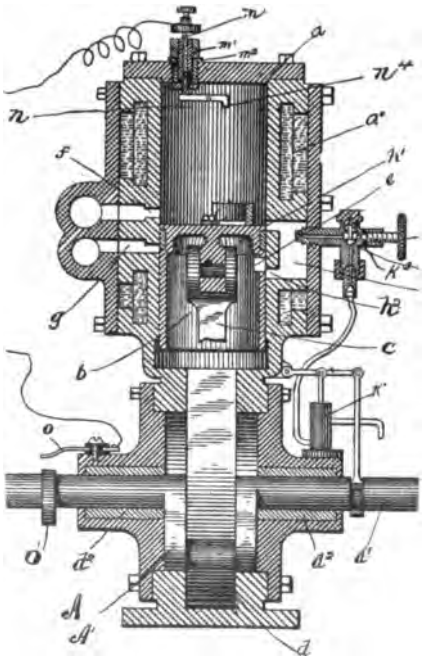
The term two cycle gas engine has, by use, come to have a much narrower meaning than is strictly indicated by it. It generally means primarily a valveless engine, in which the charge is compressed before the piston and the various ports are opened and closed by the piston passing them. This is illustrated by Fig. 2, which is part of a drawing from the Sintz patent No. 509,255, in which *a* is the cylinder, *b* a hollow piston having a port *e* formed through its side; *f* is an exhaust port, and *g* the intake port through which the charge is drawn into the crank chamber; *h* is a port opening directly into the cylinder, and h_2 is a port communicating by passage *h* with the port h_1, and put into communication with the crank case through the port *e* in the piston at the lower end of the piston stroke, so that at this time the space above the piston and that below it are in communication with each other through the port *e*, h_2, passage *h* and port h_1. A carbureting device is located in the passage *h*.

The operation of the engine is as follows:

From the lowest position shown in the figure the piston rises, closing first the port h_2, then the port h_1, then the port *f*, and after these ports have ben closed the explosive mixture is compressed above the piston. As the piston rises it draws a vacuum in the crank chamber, and when the piston is at the upper end of its stroke it passes from over a covered port *g* so that an additional supply of explosive mixture rushes in through said port to fill the vacuum in the crank chamber. The mixture is ignited above the piston, and drives the piston down until it uncovers the exhaust port *f*, when the burnt products which are under considerable pressure escape through said port. As the piston descends further it puts the upper and lower part of the cylinder into communication, as above described, so that the mixture, compressed to from 5 to 10 pounds gauge in the crank chamber, rushes through the ports h_2, h_1 and passage *h*, and displaces the product of combustion above the piston. The piston then again rises, and the cycle is repeated.

In the ordinary construction of this class of engines the passage *h* remains open at its lower end to the crank chamber, and is not opened and closed, the port h_1 being covered and uncovered as above described. It is, of course, necessary to let the pressure out of the upper part of the cylinder before the explosive mixture will run in from below under the small pressure given it in the crank chamber; on this account the exhaust passage is placed a little ahead of the intake passage, which is alleged to be a desirable construction.

(*To be concluded.*)


FIG. 2.—SINTZ ENGINE.

ELECTRIC IGNITION

The Spark Coil.

There are essentially two methods of electric ignition for hydrocarbon motors, viz., jump spark ignition and touch spark or make and break ignition. In the former system a spark is caused to jump the gap between the ends of two electrodes in the cylinder wall, insulated from each other, while in the latter system the spark is formed between relatively movable terminals in the cylinder wall, which are first brought in contact for a moment to close the circuit and allow the current to flow, and then rapidly separated. The former is also known as the high tension system and the latter as the low tension.

The high tension system of ignition in its simplest form consists of the following apparatus: A source of current (battery or mechanical generator), an induction coil, operated by the source of current, for producing extremely high pressure electric impulses on the principle of electromagnetic induction; an interrupter, or timer, operated by the motor, for actuating the coil at the proper period in the cycle of operation of the motor; a spark plug, which is secured into the combustion chamber wall of the engine, and the electrodes of which are connected to the secondary winding of the coil.

The simplest form of spark coil or induction coil, known as a plain coil, is built about as follows: A core is made of soft annealed iron wires (about No. 20 B. & S. gauge) from one-half to three-quarter inch in diameter and about 6 inches long. Over this core is slipped a spool of insulating material (hard rubber or composition), on which is wound first the primary winding of the coil, which consists of several layers of about No. 15 B. & S. gauge silk insulated magnet wire. After the primary wire has been all wound on and the ends have been properly brought out through the heads of the spool to be connected to binding posts thereon, a layer of insulating material is applied over the primary wire, and the secondary winding is then wound on. This consists of about No. 36 B. & S. gauge single silk covered magnet wire, the amount used varying considerably with the different manufacturers. When all the wire has been wound on the ends are brought out to binding posts, the coil is soaked in shellac dissolved in alcohol and baked, or in melted paraffin or a paraffin compound, and allowed to cool. It is then placed in either a cylindrical hard rubber shell or in a prismatic hardwood box, according to the use to which it is to be put. The proportions of these coils vary greatly. For motor cycle use they are made long and of small diameter (10x2½ inches, for instance), while for some other purposes short and thick coils are found more convenient (4x6 inches, for instance). A diagrammatic representation of an induction coil is given in Fig. 1.

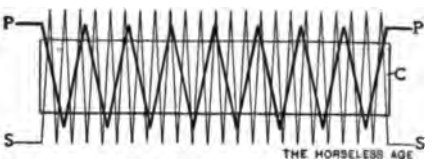


FIG. 1.

According to S. P. Thompson it requires about 10,000 volts to jump a gap of one-sixteenth inch in the atmosphere. The electrical resistance of an explosive charge under compression is several times as great as that of the atmosphere, and hence, though the spark plug terminals are usually only one-thirty-second inch apart, the coils are wound to give a spark from one-half to three-quarters inch long in the atmosphere. This, according to Thompson's rule, requires from 80,000 to 120,000 volts maximum pressure.

With a coil constructed as described above, a jump spark may be produced for demonstrating purposes as follows (Fig. 2): Connect the ends or leads of the secondary winding to fixed insulators and bend the ends so they are from one-sixteenth to one-eighth inch apart. Connect one end of the primary winding to an electric battery, and with the other lead of the primary winding brush against the other terminal of the battery, as indicated. When the contact is broken there will be a spark both at the point of rupture in the primary circuit and at the gap. An electric impulse is also induced in the secondary circuit when the primary circuit is closed and the current flowing in it gradually rises to its maximum value, but this impulse is too feeble to cause a spark to jump across the gap. Only the impulse induced in the secondary during the dying out of the current in the primary is utilized. The electromotive force induced in the secondary winding varies substantially as shown in the curve, Fig. 3. While the current in the primary winding rises to a maximum an impulse is induced in the secondary winding in the opposite direction to that flowing in the primary circuit, and while the [illegible] in the primary decreases an [illegible] induced in the secondary in the [illegible] rection as the primary current. [illegible] and experiment show that the [illegible] impulse in the secondary [illegible] break in the primary has about [illegible] the maximum value as the direct [illegible] during the "make," but lasts [illegible] half as long. The quantity of [illegible] —in other words, the product of [illegible] age current by the time—is the [illegible] for both impulses. Under certain [illegible] tions of self inductance and [illegible] the secondary circuit the discharge [illegible] of an oscillatory nature; that is, [illegible] passes through the circuit first [illegible] direction, then in the other, [illegible] diminishing in value, as indicated [illegible]

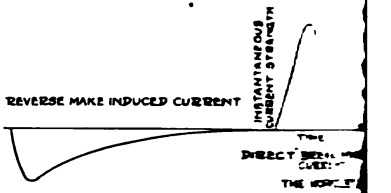


FIG. 3.

4. It does not appear to be known [illegible] the conditions in the average high [illegible] spark circuit are such as to cause [illegible] oscillatory discharge.

A coil used as illustrated by the [illegible] described experiment will [illegible] feeble sparks for its size, for the [illegible] ing reasons: The inductive effect [illegible] primary winding on the secondary [illegible] pends upon the rate at which the [illegible] in the primary winding decreases [illegible]

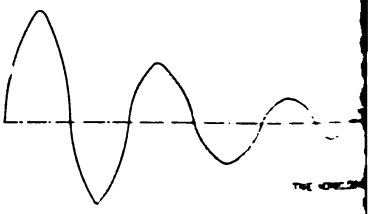


FIG. 4.

out. If a strong inductive effect [illegible] produced in the secondary the current [illegible] the primary must stop suddenly [illegible] this is prevented by the self induction [illegible] the primary coil, which has a tendency [illegible] to prevent the current from decreasing [illegible] The direct result of this is that when [illegible] primary circuit is broken a spark [illegible] at the break, which simply means [illegible] the current continues to flow [illegible] break has occurred, dying down [illegible] paratively slowly, and the induced [illegible] on the secondary winding is small [illegible] spark at the break in the primary [illegible] cuit is even larger than that in the [illegible] ondary circuit, and as this primary [illegible] serves no useful purposes, but, on the [illegible] contrary, quickly eats or burns away [illegible] contact points, such an arrangement [illegible] obivously defective. The whole [illegible] is evidently due to the self induction [illegible] of the primary circuit, and the value [illegible] this self inductance must there-

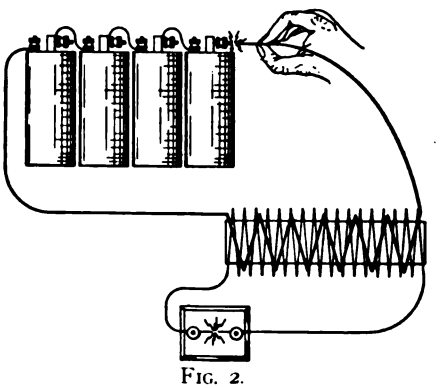


FIG. 2.

ercome in some manner. This is ac-nplished by means of a condenser. An electric condenser is a device which l absorb or hold an electric charge in

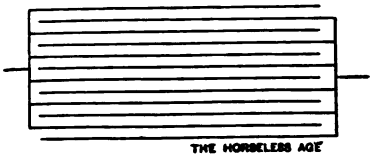


FIG. 5.—DIAGRAM OF CONDENSER.

out the same manner as a jug holds a uid. Every conductor of electricity ms a condenser, and its capacity for ding charge depends upon its sur-e. A condenser is therefore made of ctrically conductive material formed o such shape as to present the great-possible surface for the least amount material. The usual method of con-ucting an electric condenser is as fol-rs: The conducting material used is tin l, of which a large number of sheets prepared, all cut to the same size. ese are placed one on top of the other, h a thin layer of insulating material, ually two sheets of paraffined paper, ween. Numbering the successive ets of tinfoil serially, all sheets of n number are connected together, and sheets of odd number are connected ether, these connections forming the minals of the condenser. The con-ser is then connected across the break the primary circuit. The action of the denser is as follows: When the cir-t is broken and the current begins to down, an "extra current" is pro-ed by the self induction in the pri-ry circuit, but this extra current, in-ad of forcing its way across the gap, ses into the condenser, charging it, s avoiding the spark at the break. Of course, the condenser must be of h capacity as to just neutralize the uctance of the primary circuit. Ca-city is, in fact, an "antidote" for self uctance, and neutralizes all its effects. the capacity just balances the self in-tance, the current in the primary will down almost instantly, and conse-ntly a high pressure will be induced the secondary winding. The self in-tance that must be neutralized by the

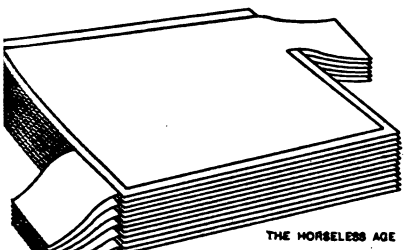


FIG. 6.—CONSTRUCTION OF CONDENSER.

acity of the condenser is not only that the primary winding of the coil, but it of the whole primary circuit.

(To be continued.)

Improvements in 1906 Cars.

BY ALBERT L. CLOUGH.

In looking over the 1906 models one is struck by the almost total absence of those revolutionary changes in construction and appearance which instantly appeal to the casual observer. Of course multicylinder, two cycle engines, six cylinder motors and frictional transmissions are sufficiently radical departures from ordinary practice to attract the eye and engage the attention of all, but the changes in the so called standard types of two and four cylinder cars are mostly in inconspicuous though not unimportant details, or in important structural and mechanical refinement which are not apparent upon the surface. Last season the side entrance tonneau, mounted upon a lengthened frame, was the all important innovation, so far as the general public was concerned, but this year affords no similar salient departure from previous practice. The side entrance car was something which appealed as an improvement to every automobile user, and its adoption by manufacturers led to the purchase of a vast number of new cars, and the flooding of the second hand market with a host of rear entrance vehicles. This year the industry has failed to present to the public any such obviously evident improvement. People are constantly remarking: "I suppose there are a great many improvements in automobiles this year," and one need have no hesitation in answering in the affirmative, but to explain the nature of most of them one has to go into technicalities.

NO CHANGE IN TYPES.

At the beginning of 1905 a very large proportion of the leading manufacturers were engaged in the building of four cylinder touring cars, with three speed sliding gears and shaft drives, and the double cylinder car with planetary change speed gear was the accepted type for lower priced vehicles. This condition prevails at the beginning of 1906, and to the superficial observer it would appear that the chief changes in the former type had been to give it more power and to lengthen the springs and wheel base, while little change had been made in the two cylinder type, except, in a number of cases, to remove the engine from the body and place it under the hood. Such a casual onlooker is losing the very gist of the situation.

In this country the present season is the first in which the majority of automobile concerns manufacture the same types of cars as the season previous. It is the first year in which the serious business of a large proportion of the factories has been the refinement and general working out of a type of car which they have built during the previous season. Instead of having to go to work and lay out a car of entirely different type, with an engine of a different number of cylinders, differently placed, a change speed gear of an hitherto unfamiliar construction and a transmission and rear axle radically departing from his previous usage, with the whole mounted upon a frame of necessarily different proportions, the manufacturer has only to review his experiences with his last year's product, to digest the reports of his repair department, run over the complaints and suggestions of users and agents, study the details of his competitors' cars of the same general type, and then go to work to make a general

REFINEMENT OF DETAILS.

No engineering skill can absolutely insure the production of a car which, in its first season, shall prove free from weaknesses and defects, unless, indeed, the machine be an absolutely servile copy in both material and design; but with a season of fairly successful experience with a certain type of car the manufacturer may feel that the "past at least is secure," and devote himself to a careful study of all minor changes which may reasonably be expected to make his product even better. A very large number of factories during the past manufacturing season have been in this latter situation, and this fact constitutes 1906 the first season which may be denominated as in an important degree one of refinement, working out and detailed improvement. Certain manufacturers have even taken pains in their advertising to convey the impression that they are making the same car this year as last, with detailed improvements merely.

Aside from the very general increase in horse power, which most automobilists probably regard as a great advantage, it may be said that the chief improvements in high grade cars of so called standard type are three in number: The general use of specially adapted materials of construction; improved machine work, especially on the vital parts of the engine, and the refinement of design of mechanical parts, especially bearings.

BETTER MATERIALS.

Up to the present season the use of special steels in American automobile construction has been rather limited and it has been a difficult matter to obtain such materials in the domestic market, but within a short time past American steel manufacturers have begun to take cognizance of the automobile business as an important consumer of raw metal stock and have commenced to take some pains to meet the requirements of the new industry.

Now the automobile manufacturer is beginning to keep in close touch with the mechanical testing laboratory and the metallurgical chemist, by whose expert aid the physical properties of steels and bronzes are made known to him. The action of the Licensed Association in equipping a testing laboratory and employing metallurgical experts is one of the recent events of extreme importance. Foreign manufacturers

have hitherto enjoyed an advantage over American builders in their ability to obtain the special materials which they desired. and this has been one of the causes which have contributed to the excellent reputation of foreign cars. Now that American manufacturers are rapidly securing as good facilities for the purchase of appropriate raw materials, and are actually very largely using specially adapted metals for the important parts of their cars, this disadvantage under which they have been laboring will speedily vanish.

It is an undoubted fact that a vast deal of care has been expended upon the selection of the most suitable materials for the vital parts of 1906 cars. No such attention has ever been paid to the subject before and never in the history of the art has so much high priced special stock been consumed.

CRANK SHAFT STOCK.

The crank shaft—the most severely stressed part of the car—with its rapidly recurring combined twisting and bending effects, has come in for a vast amount of expensive experiment as regards the most suitable steel from which to construct it, and the methods to be used in the treatment of the metal, and in most first class factories it is now machined from specially compounded material. Not so very long ago a good machine steel was thought proper material for a crank shaft, but now no well regulated automobile shop is using anything but special high cost compounded material and treating this in the most approved method. The material entering into axles and shafts has recently received almost equally careful attention.

Perhaps no part of the whole car, so far as the material to be used and its treatment are concerned, has given manufacturers more trouble than the gears of sliding pinion change speed combinations. Without specially adapted materials and proper treatment it is practically impossible to construct a strong and durable sliding gear combination. Better materials enter into the gears of 1906 cars than ever before. Cylinders, and pistons also, have been the objects of very great attention as regards quality of material. Similar careful studies of special bronzes and aluminum alloys as applied to automobile work have been made, and more appropriate materials of this class are being embodied in cars of late.

Costly improvements in the materials which enter into the cars are not apparent to any ordinary scrutiny, and they do not appeal to the ordinary user as do more evident, but really less valuable, features of the product. However, the use of first class metals in recent cars has been the means of reducing the vehicle weight and of increasing ability without sacrifice of endurance.

IMPROVED WORKMANSHIP.

The improvement in workmanship is most noticed in the engine cylinders and pistons. In the 1906 product in general the most minute attention has been paid to the perfect fitting of these two all important engine parts, with the result of a well-nigh perfect retention of compression and a minimum of frictional losses in the motor. Although grinding of cylinder bores has been extensively practiced in previous seasons, it may be said that this year it is for the first time a practically universal method, as applied not only to the cylinder but to parts of the piston and to the rings.

Grinding may be objectionable in some respects, but it is nevertheless regarded as an indispensable process by the majority of first class automobile manufacturers. The aging of cylinder castings to relieve initial stresses which might result in future distortive actions gives to the present refined processes of boring and grinding an efficacy which leads to very perfect results. A careful allowance in piston size for expansive effects due to running temperatures has resulted in reduced engine friction.

No better example of the care which is lately being taken as to piston fit can be cited than that of piston rings. Up to the present season the number of rings employed upon automobile engine pistons was very generally three. In 1906 engines four rings is a more usual number, and makers go so far as to employ double and triple rings in each slot, each one of which is accurately machined and ground on sides and face.

SPECIAL MACHINE TOOLS.

As the automobile business becomes more and more manifestly a large industry of considerable stability, manufacturers are warranted in the purchase of special machine tools of modern design, which ensure a better quality of machine work throughout the car mechanism. Builders of machine tools have lately paid special attention to the needs of the business, and accurate automatic tools of great rigidity and extreme accuracy are being offered to automobile manufacturers and installed by them in considerable numbers. Boring mills for a multiplicity of cylinders, with grinding attachment, automatic gear cutters and automatic screw machinery specially adapted to the industry, have contributed to the excellence of the workmanship found in 1906 cars.

The improved workmanship found in this year's cars may not appeal to the ordinary buyer as would some more superficial novelty applied to the vehicle, but the greater durability and higher degree of reliability which it implies will doubtless result in a previously unknown measure of satisfaction upon the part of the user.

With a large number of manufacturers this year building cars almost identical in model with those which they produced last season, attention can be given to the careful revision of the design of each important part. Such changes as adding a little metal where it is found to be needed, "whittling" off a trifle where it can be spare[d] ing certain parts more easily [acc]ess capable of being dissembled [with]out volving the disturbance of other [parts] creasing frictional surfaces where [wear] been excessive, are the kind which suggest themselves and lead to decreased weight, increased strength, added convenience and greater durability. Such improvements of this kind enter largely into 1906 cars and add materially their value.

Poor materials and badly designed lubricated bearings have, in the past, been the chief causes leading to the repair of motor cars. With the almost universal [re]carding of gas pressure or other [effec]tive oil feeding devices in the [pro]duct and the general adoption of [some] visually indicating, positive, dash-[board] bricator or the submerged positive "flooding" the bearings, together with widespread use of ball bearings, lubrication troubles will be reduced to an unattained minimum.

THE SELECTIVE GEAR CHANGE.

Among 1906 improvements of [more] readily apparent nature than those [already] to spoken of the adoption of the selective gear changing system, with its [gears] ning on ball bearings, is the most worthy.

This system is more or less safer, and the average operator [gets] far better results with it than with system.

Much attention has been paid springs of the 1906 models and effects will be apparent to every rides in the new cars. Better of the gears which drive auxiliaries more general provision of means protecting the car mechanism teristics of the latest cars.

Makers who continue through seasons the building of practically type of car, work out very convenient changes which are of considerable value changes as pedals of a less [ob]a better arrangement of levers ing wheel, mud guards better shape to protect passengers, the carburetor where it may be ly primed, the provision of [more] space, the addition of an [extra] the provision of oil retaining hangers, strut joints, etc., and little touches which the designer make to refine a certain type

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The Spanish military [authorities] recently received delivery of power Daimler motor [truck] 6,600 pounds and fitted with tires. The body is of the [omnibus] and the driver's seat is [under] carriage top. The wagon age speed of 7 miles per [hour] and takes hills up to [25] change gear gives three [speeds] the drive is by side chains

THE HORSELESS AGE

...EVERY WEDNESDAY...

Devoted to Motor Interests

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Jump Spark versus Make and Break.

The rapid introduction of four and six cylinder automobile engines and the future possibility of the use of even eight cylinder motors have brought the question of the economical application of ignition current into great prominence. At the same time the jump spark method, as at present applied, is beginning to be suspected of inferiority as compared with the contact spark system, so far as practical results in securing quick and complete combustion of the charge are concerned. It would thus seem that the jump spark method is "on trial" as never before as to its economy and adequacy, and in order that it may retain its present popularity it must demonstrate that it is capable of producing just as complete and practically as prompt an inflammation of gasoline charges as can its competitor. Perhaps a considerably lower electrical efficiency upon the part of the jump spark system would cheerfully be tolerated by users as being only a partial offset to the mechanical advantages which it is generally felt to possess. Indeed the question of the relative current consumption shown by the two systems is of substantial importance only when batteries are the source of electrical energy. With a supply from a mechanical generator the matter of current consumption becomes of comparatively slight moment.

The question as to which system, as at present applied, affords the most energetic ignition is, on the other hand, of the most vital import, and will have a profound bearing upon the futures of the two methods. It can hardly be doubted that the balance of evidence points to the superiority in this all important respect of the contact spark system over the jump spark method as now practiced. Manufacturers of jump spark coils have been striving most energetically during the last few years to increase the heat developed by the spark and to reduce the energy called for by the primary, and much has been accomplished.

There can hardly be a doubt that jump spark coils can be constructed which will deliver as much effective igniting energy as contact spark coils do or ever can, and that such coils will be produced (if, indeed, they are not already) is open to no more question. The mechanical difficulties of the contact spark system appear to be such that a considerable increase in cost of jump spark outfits will be tolerated if they can thus be made equally efficient. One may look for an improvement in high tension ignition practice when the requirements are fully known rather than for its supersession, and it is reasonable to expect that an increase in the use of improved mechanical current generators will be coincident with it.

Gasoline (?) Explosions in New York Sewers.

As reported in our last issue, a series of violent explosions occurred recently in the sewers in that part of New York city where most of the garages are located, the detonations sending manhole covers into the air and injuring many people. The explosions have been ascribed to the accumulation of gasoline vapor in the sewers from gasoline emptied through drains in the garages. The city officials, however, discredit this explanation, and have announced their determination to fight claims for damages until the true cause of the accident is proven. This decision is highly commendable, because if the actual cause of the disaster can be found it will not only place the blame where it properly belongs, but it will enable steps to be taken to prevent a recurrence of such

explosions. The theory that the explosions were due to gasoline vapor is incomplete, for it does not explain how this vapor was ignited. Gasoline vapor mixed with air in certain proportions will burn with explosive violence, but such a mixture is not in any sense self-igniting, and to effect ignition it must be brought in contact with a flame or some red hot object. The inquiry, if one is made, should, therefore, evidently cover two principal points, viz., the nature of the explosive and the nature of its ignition.

There is undoubtedly a good deal of danger connected with the emptying of stale gasoline into sewers, and the practice should be strictly prohibited. Gasoline being much lighter than water will float on top and evaporate, and the vapor may well mix with the air in the sewers in a proportion rendering it inflammable. The danger of an accumulation of inflammable gases in sewers is apparent, as even a lighted match carelessly thrown into an open manhole might set them off.

An Automobile Livery Evil.

Garage owners, especially in the smaller cities, make a practice of using for livery purposes old cars taken in trade from purchasers of new ones. One cannot exactly blame them for their efforts to turn these vehicles to some account, but the practice is calculated to give a black eye to the automobile business generally, and particularly to the firm concerned. Exceptions to this rule may be made in the case of cars embodying the best workmanship and sound design, but used cars to which this description applies are usually quickly disposed of, and in not a few instances it is the poorly designed, ramshackle vehicle which the garage keeper is unable to find a customer for that is definitely added to the livery department. The short-sightedness of this policy is apparent. If a person requiring livery service orders an automobile, he usually does so because he is in a hurry, and if the car breaks down en route the incident is doubly aggravating. Where only old fashioned, worn out cars are used, the service will quickly acquire a reputation for want of reliability, and its custom will drop off; the connected agency and garage business is likely to be also adversely affected.

Gasoline Motor Fire Engines.

We had an inquiry some time ago as to who makes a high powered motor car fitted with a power driven pump for fire fighting purposes. Our correspondent lives in a suburb of Philadelphia and is a member of the local volunteer fire brigade. Our answer was that no such machines are now being built, but the thought occurred to us that possibly there might be a field for them large enough to warrant the attention of some manufacturer. There are volunteer fire brigades in practically all the smaller suburban towns of large cities, but the efficiency of these bodies often leaves much to be desired, largely owing to their inability to get promptly to the scene of conflagration. Here a gasoline motor equipment would come in very handy. There is probably not one of these fire brigades which does not count among its members some experienced in automobile driving, and this would tend to help to rapidly familiarize the whole corps with the operation of the machine. A motor car of 40 to 50 horse power, carrying a pump capable of absorbing about the whole of this power, ought to prove a very efficient fire fighting machine, owing to its instant readiness for the road, its high speed, and its ready change from self propeller to a fire pump, which could be accomplished by a single manipulation. The cost of such a machine might be too high for the smaller towns, but would be quite within the reach of the average city suburb, and the advantage of installing such an up to date fire fighting apparatus would be enhanced by the possibility of a reduction in insurance rates which it carries with it.

The Color Line in Chauffeurs' Clubs.

The recent vote passed by the New Haven Chauffeurs' Club, barring colored men from membership, will naturally result in the formation of a colored chauffeurs' club in the Elm City. It was explained that this vote was not intended as a slur on colored chauffeurs, but was found necessary for the preservation of the club on account of the great number of colored men in that city who had taken up motor car driving as an occupation. New Haven has an unusually large colored population for a Northern city, and it is quite likely that the colored chauffeur has become an active competitor of the white man. Yet it is to be regretted that a club or organization of any kind should feel itself called upon to take such action *formally*. Undoubtedly it is the sentiment of all clubs of white men to exclude colored members, and vice versa. Neither race appears anxious to overleap natural barriers. Colored people in New Haven have flourishing churches, clubs and fraternal orders as well as white people. Thus the passage of such a vote by any organization is only effective in precipitating a vast deal of fruitless discussion.

When it comes to the question of earning a livelihood the colored man should have full opportunity according to his abilities in motor car driving as well as table waiting. We have no doubt that there will be many capable and trustworthy colored chauffeurs in time to come, and there are probably some now. It is an occupation where mechanical knowledge combined with good judgment counts for efficiency, and if the colored man has these qualifications he will find no lack of employers, whether he is a member of a chauffeurs' club or not.

A. A. A.—N. A. A. M. Compact.

It appears that the American Automobile Association and the National Association of Automobile Manufacturers are about to enter into an agreement for their mutual protection. The former organization now exercises control over automobile racing, and is evidently desirous of also controlling all other forms of automobile competition. The manufacturers' association, on the other hand, is interested in limiting the number of events organized, to keep down the expense of the manufacturers, and insure that such events do not become too common and devoid of interest to the public. This latter object can evidently be much better accomplished if a single body is in control of all sorts of competitions, and has the power to disqualify firms and drivers who participate in unsanctioned events. It is therefore most likely that the manufacturers' association will adopt the recommendation of its committee, to support in future only events sanctioned by the A. A. A. So far as the latter body is concerned, the move evidently represents an effort to provide against the eventuality of its authority being disputed at some future time.

MAINTENANCE AND REPAIRS

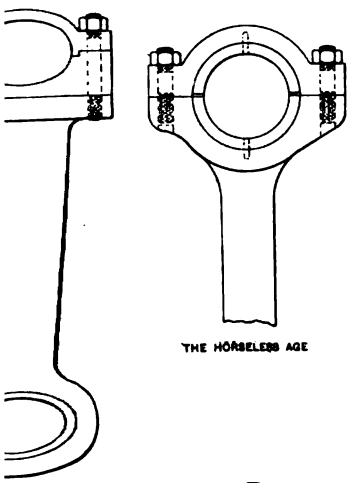
cting Rods and Other Parts.

By O. V. H.

do automobile manufacturers persist ing in such measly, light change id parts? Some of them build a 20 iorse power engine with a certain nge gear, then build an engine of horse power and scarcely increase of shafts and gears to transmit he power. There seems to be too margin of safety above the size l actually transmit the rated horse If the load was steady no doubt s would prove ample, but with the strains imposed upon the gears conditions of roads, they should far heavier and with wider face Actually the change gears used of the 40 horse power touring about the correct size for a good . What mechanic in good milling would think of transmitting the om a 40 or 50 horse power engine ⅞ inch or 1¼ inch shaft, espe- th variable and reversible load? l be considered crazy, yet in auto- ractice this is frequently done.

ADJUSTABLE BEARINGS.

ription of a new runabout in one ade magazines conveys the infor- iat "the main bearings are phos- ize bushed and are 4 inches long, long life," etc. It seems strange age of the game that "men who ild an engine for the market with bushings and not make the bear- stable. I may be a crank, but s of experience with both kinds r adjustable bearings the only e. Let us suppose a bearing gets little; it pounds, but scarcely



1. FIG. 2.

warrant new bushings, so it must gets so bad that new ones must this requires the flywheel to be as a great many are forced on ic pressure; while, if the bearings were adjustable, a few minutes' work would make the engine run like a new one.

TEST OF ACCESSIBILITY.

I think a test similar to the one used by the Government at the Sandy Hook proving grounds would be a good one. There, when a gun is submitted for trial, the operator, among other things, must

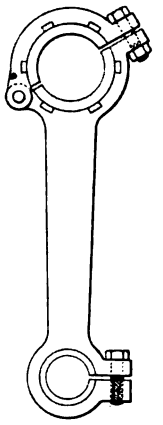


FIG. 3.

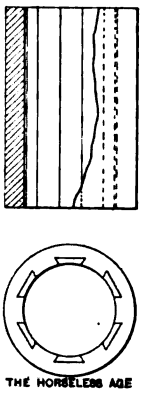


FIG. 4.

take the mechanism apart and replace it, and the difference between the different makes is astonishing; but even more astonishing would be the results of the same test applied to automobiles. It would be more interesting to see some of the operators take out a crank shaft, put in a new gear in the transmission, or a high speed clutch, or do stunts like that, than to see them going around a track a mile long in less than a minute. Seems to me this is a better test of real worth, for it's the kind that appeals to a man's business sense and his purse.

THREE POINT SUSPENSION.

I know it is easier to find fault with a thing than it is to remedy it. There are lots of ingenious devices on automobiles, and the cars are being improved steadily. but it seems there is a lack of good judgment of the terrible strains a machine has to stand. Lately, the three point suspension seems to be used more, and it should be used more than it is, as it eliminates strains. I could never see the reason for securing a body to a running gear at four points and expecting it to be flexible. It racks the joints of a body apart and strains the frame. Take the engine suspension, for instance; it is far easier to line an engine on a three point support than on a four point, with possibly an additional one in an outboard bearing bolted to the frame of the chassis, that twists and binds every time the rig goes into a chuck hole, causing the bearing to heat.

FORMS OF CONNECTING RODS.

Taking up the subject of connecting rods, which are an important member of an engine, Figs. 1 and 2 show, perhaps, as good a rod from all viewpoints as any in general use. Fig. 1 shows the old type of marine rod of forged or cast steel with a T end. It is easy to make without special tools, and is very convenient to fit, as the brasses can be taken off and fitted to the pin and then put into position without removing the piston, which is a decided advantage in types of engines where the cylinder has to be removed to get the piston out. In this type of rod the bearing part is usually of bronze, but it can have babbitt cast in dovetail slots, as shown in Fig. 4 This method of putting in babbitt allows of peening or riveting it so it will not work loose, as is apt to be the case where plain anchor holes are drilled. In Fig. 1 the cap should have a tongue on either side, extending into a corresponding groove in the rod, so as not to depend entirely on the studs for fitting together correctly.

Fig. 2 shows another form of connecting rod which can be made of steel and bushed with bronze, and yet allows adjustments to be made. It is perhaps an easier form to make than that shown in Fig. 1, except that it has to be bored to receive the bronze, the latter being held in place by brass dowel pins. Every repair shop does not have a lathe large enough to swing a rod like this to bore in the ordinary way, and it might be necessary to use a boring bar, which takes more time. Of course, where they are manufactured it is customary to clamp the rod on a jig, or, more properly, a holder, and bore both holes at one setting in a boring mill; but very few repair shops have

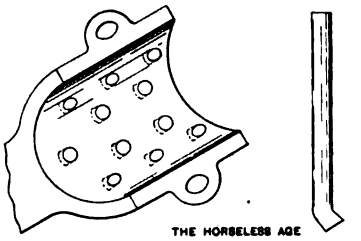


FIG. 5. FIG. 6.

a boring mill. It is easy to fit new bushings to this type of rod, inasmuch as the bushings can be bored and turned and then put in without removing the rod from the engine.

Fig. 3 shows a type of rod used a great deal on runabouts and which answers the purpose very well, but it can scarcely be considered a strictly high grade job. The sketch is self explanatory. The rod is made of forged or cast steel and the cap is hinged by a rivet or pin, slightly headed, and is fastened together with a cap screw and lock nut. Anchor holes are drilled in the ordinary manner, but do not seem sufficient to permanently hold the babbitt, as considerable trouble has been caused by the babbitt coming loose. Sometimes tinning the surfaces before babbitting will help hold it; but care must be taken not to get the babbitt too hot or some of the ingredients will be burned out; yet it must be made pretty hot if it is to stick to the solder or tinning, unless the rod can be pretty well heated before pouring.

BABBITTING JIG.

A cheap jig for babbitting such a rod is shown in Fig. 7. Take a piece of

bar iron of suitable width and drill a three-quarter inch or any convenient size hole at A and B, which should be the exact distance from centre to centre as the bearings of the rod; or one of the holes can be slotted, as shown at A. However, if the jig is to be used for only one length of rod it is better not to slot it. Then take two pieces of cold rolled shafting and turn shoulders on them so they will fit the holes drilled in the plate. The cold

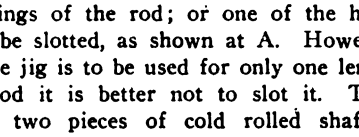
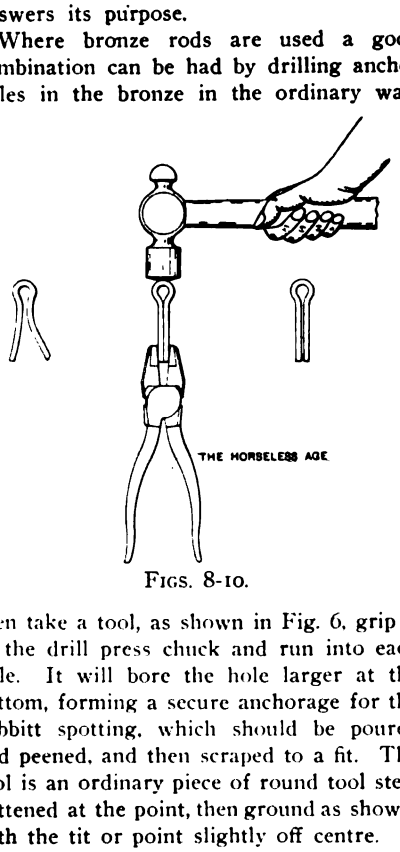


FIG. 7.

rolled stock must be the size of the crank pin and the piston pin respectively. Pin A will fit the bushing in the piston end of the rod. Lay the rod on its side, with a liner between the rod and cap; put clay or putty (clay is better) around the bottom, and also around the top, if the babbitt is to project beyond the rod. Then melt babbitt till it will char a pine stick, drop a piece of rosin about the size of a one-half inch ball into it to prevent blowing, and pour it. When set, immediately knock the pin out with a mallet or fibre and hammer, remove the cap screw and saw the babbitt in halves with a coarse hack saw, and scrape to a fit.

One disadvantage of this type of rod is that after closing it, it does not fit exactly on the pin, owing to the fact that the cap screw end travels faster than the hinged end; yet the inaccuracy is slight, and for ordinary work the construction answers its purpose.

Where bronze rods are used a good combination can be had by drilling anchor holes in the bronze in the ordinary way,



FIGS. 8-10.

then take a tool, as shown in Fig. 6, grip it in the drill press chuck and run into each hole. It will bore the hole larger at the bottom, forming a secure anchorage for the babbitt spotting, which should be poured and peened, and then scraped to a fit. The tool is an ordinary piece of round tool steel flattened at the point, then ground as shown, with the tit or point slightly off centre. It is a homely looking thing, but it does the business, and results are what are cared for in most cases.

REPLACING COTTER PINS.

Cotter pins are a small affair, but some men have a large amount of trouble with them. A short time ago I saw a man vainly trying to put a cotter pin in a hole which he could not get at very readily. Of course, the cotter was spread at the point, and he was trying to squeeze it together and put it in place with pliers, but failed. I showed him an old trick for accomplishing the object, which is illustrated in Fig. 9. Pinch the pin together with a pair of pliers, place the point on iron and hit the pin a light tap, just enough to "set" it. It will then assume the shape shown in Fig. 10 and will go to place without profanity.

Winter Driving in South Dakota.

By S. B. DICKINSON, M. D.

When I purchased my first automobile, nearly three years ago, I made the remark that I did not believe I should ever again keep a horse.

Before the 1st of January, 1904, I began to wonder if doctors always mean what they say, and many a time during the first winter did I wonder if people gave me credit for being as much of a fool as I really was. Having decided to run my machine through the winter, however, I determined to stick to it if possible, and although the experience cost me several dollars, I was rewarded in the spring by complimentary remarks from a great many people, who said they certainly thought I was getting value received from the use of my machine, and they did not suppose it possible to run an auto as I had run mine, etc., etc.

Perhaps it was more of an advertisement for the auto makers than for me; but I was after the experience, and I got it; not all the first year, however, for I have been learning more every winter, until now I believe I am safe in saying that, with a suitable machine and proper care, there is no earthly reason why a person should not use it during the winter months.

A horseman could not expect an animal to do satisfactory work in winter without being sharp shod and properly fed and blanketed when left standing in the cold; neither can an automobilist expect to get satisfactory work from a machine unless he pays attention to the kind of cooling solution and strength used at different temperatures, the kind of oil used, and whether or not it feeds properly.

My first experience with cold weather troubles came in November, 1903, when one evening I left my machine standing for about 30 or 40 minutes in front of my office, with water in the tank and coils. It was warm when I stopped it, and I thought there would be no trouble, but the temperature was several degrees below the freezing point. Receiving a hurry call, I went down to crank my machine, but it did not turn, and putting a little extra weight on the crank I managed to break the shaft pin t the pump, but the motor would not star and after receiving another summons t hurry, I left my runabout in the street an hurried away. Not being able to retur until next morning, it, of course, meant se eral dollars in repairs to the radiators an pump.

Seeing the necessity of a non-freezing s lution, I purchased a sodium chloride mi ture, which was anything but satisfactor

I then thought if machines of air cool make would run indefinitely in hot weath without overheating, mine certainly ought run a mile or two at one time in wint weather without harm, and I would use m machine for town use only; but a few sho runs not only showed me that this woul be impossible, but that I had alread cracked the water jacket. I then tried Pol oil, and this answered very well for run not to exceed 6 or 8 miles, but it would soo soften the hose connections, so they woul have to be replaced by new ones.

This winter I have used a solution o wood alcohol and water, varying in strengt from 10 to 40 per cent., according to weath er conditions, and have had no troubl whatever.

The oiling is another thing that has ne cessitated close attention to prevent trouble and I have frequently added a little kero sene to the oil.

The cylinder oil cup resting on top o cylinder doubtless makes a considerabl difference in the working of the engine, a the oil is warmed sufficiently to feed prop erly soon after starting the motor.

A great deal of trouble can be saved b having a warm room in which to store th auto, or at least one that can be warme for working purposes when desired. Eve though the oil is warmed before using, it i hard sometimes to get it into all the bear ings, and this is one of the prime essen tials for success, as the parts are bound t cut if not oiled.

I am now having built on the south side of my new residence an auto room with shed roof, cement floor and foundation which will have small gutters to carry off water when I wish to wash the rig. A tap from the basement will furnish water, and a pipe from the furnace, with a shut-off register, will supply heat when desired. A wire from the house also furnishes light. This room will also have a work bench.

The snow causes me but little trouble, especially when I use chains on the rear wheels. Having a light machine, I can with little trouble work my way out of drifts, and I have several times managed to plow through them after getting stuck by throwing the laprobe down and running over it.

After using my machine through three winters and studying the necessary requirements for winter motoring, I am more than ever convinced that the automobile is preferable to the horse for winter as well as summer. I would appreciate suggestions from THE HORSELESS AGE readers on any conveniences for my new auto house.

COMMUNICATIONS

Difficulties in Selling American Cars in Italy.

Editor HORSELESS AGE:

In your issue of April 4 Carlo Rizzardi makes some suggestions to American manufacturers regarding "the automobile in Italy." He appears anxious to see American manufacturers export their motors to that country, and regrets that at the automobile show of Turin there were only four American cars, viz., three White steamers and a Reo. He states that six French automobile firms and the English Napier had combined with Italian capitalists to build vehicles of their own design.

The writer has had quite a long business experience in Italy, and thinks that if there are some good openings there are also many difficulties for a foreign manufacturer.

"I do not fear any outside automobile manufacturers," one of the best known Italian manufacturers said to me some time ago. "They cannot compete with us. We have made a great change. We are not the Italians of a few years ago. Now we are proud of what we are able to do today, and the buyers are the proudest of all. You see, we are a very peculiar people. We do not think any good of ourselves till we have done something worth while. But let us do that, let us win two or three more races —and we will—and then everybody will be sure that we can go all over the world and compete with everybody. We are a very peculiar people, difficult to be understood by one who has not lived in Italy for a long time. This fact is our best salesman."

It is difficult to predict how this feeling of the Italian people will be overcome, and those who know do not care to tell. It is a big mistake to send an American salesman to Italy. It is the greatest error a concern can possibly make. The Italian people are most hospitable, but when business is to be talked they not only want a man who can speak Italian fluently but one who can speak their own dialect. For instance, the best society of Milan want to speak the dialect of Milan. It is difficult for an Italian to know five or six dialects, but how much more difficult for a foreigner! The writer had an experience in that line a few months ago when he lost two contracts for this reason.

Frenchmen can do a good business in Italy even if they do not know the Italian language. It is common in Italy among well to do families to know French, and in Northern Italy (the only promising place for business in the Italian kingdom) everybody speaks and likes to speak French. This is why French manufacturers can compete with Italians, and knowing Italy quite as well as an Italian does they combine with Italian capitalists in order to secure a large sale of their automobiles.

To establish an agency with a German agent is another great mistake American manufacturers are liable to make. Germans and Italians are very friendly toward each other, but the former like to sell the machines of their own country.

It is a fact that there are only a few Italians in the exporting business in America, but these few are the only ones who can do any good for American manufacturers. There are many good openings in Italy, and it is a mistake to wait to take advantage of them. Everything shows that the best Italian automobile concerns are going to form a trust, and should that happen all good openings would disappear. Italians connected with the best Italian families are the best salesmen for foreign cars, and two of the American concerns that went to Italy regret what they did, notwithstanding that one of them says that they could compete with Italian manufacturers.

The coming exhibition of Milan will prove to the American manufacturers who are going to send American salesmen there that "the peculiarity of the Italian people is the best salesman for the Italian manufacturers."

V. EPIANI.

The Need and Care of Differentials.

Editor HORSELESS AGE:

I cannot pass the "Comments by a Railroad Man" without a few words, as I have had quite a lot of experience in the line he mentions. Of course, if he wants steel wheels and tires and a live rear axle without any compensating device, he would probably find that they work all right (on an ice wagon), but for an automobile they would not be a joy forever. In the first place, a solid rear axle could be made strong enough to force a vehicle to turn in a very short radius, but the inner wheel would bore post holes while the outer one went around it, and think of the strain on the machinery in the meantime! I once had a compensating gear stick, and it twisted a 1¼ inch axle off with a 4 horse power engine. True, the rig had rubber tires and good traction, but if it had had iron tires no doubt the inner wheel would have slipped. I know that locomotives run without compensating gears, but wouldn't they run nicer with them? I have known a number of cases where steel axles 8 inches in diameter have snapped off on locomotives when rounding a curve. One case I remember in particular. On a fast passenger train the axle snapped while rounding a curve, and the driver went spinning off the right of way into a field, after the rods had torn the cab off and killed the engineer and fireman. If there had been a compensating device I think that wouldn't have occurred. If compensating gears are properly made of spur gears, bushed with bronze, of ample pitch to stand the strain, and are enclosed in an oil tight case filled with non-fluid oil, they will run a whole season without any attention whatever. So many makers use gears far too light and have steel gears running on steel pins not case hardened, which should never be used, even if they turn over only once a year, as steel running on steel will "cat tooth" or cut, and freeze together. A number of the cheaply constructed runabouts use bevel gears for compensating, with fibre washers to take the end thrust and keep the gears in mesh. These washers are very often left to themselves or never examined until they become worn enough to let the pinion slip out of mesh with the gear and strip the teeth and wreck things in general. The rear axle should be jacked up and examined for end or lateral motion occasionally, and if it shows much in the compensating gear better have new washers put in, as it may save you the cost of a set of gears. This cannot occur on a spur differential, as there is no end thrust.

O. V. H.

Small Vulcanizers.

Editor HORSELESS AGE:

In your last issue H. R. S. inquires about small vulcanizers. I will say that I bought one about a year ago and have used it considerably. A conservative estimate of its earnings would be considerably over $50. During the deep snow months I have saved two 30x3½ casings by vulcanizing a 2 inch strip of canvas, cut bias. Around where they were rim cut through the rubber all around, and the fabric in several places, I let the canvas extend up on the shoe about an inch, and the rest of it went over the edge, vulcanizing only that part that showed on the outside and cementing the part that went over the edge afterward. As only about 2½ inches can be vulcanized at a time it is rather a long job, but it was done at spare moments, and it holds. I ran my car last fall considerably on frozen ground, and cut the shoes more or less. All of the cuts I repaired with this same vulcanizer, and the shoes are all right. The directions that come with the instrument must be followed fully, particularly as to cleanliness of parts. Other vulcanizing cements are cheaper than the kind furnished by the firm making the machine and are just as good, but the vulcanizer itself is all right and quickly pays for itself in actual work, aside from the convenience of being able to do the work yourself at your own time. I am not an auto repairer, neither have I any interest in this particular vulcanizer, but the one that I bought a year ago has paid big returns.

I wish to thank the doctor that suggested putting glycerine in my inner tubes that

were porous. I tried one-half pint in one 30x3½ inner tube, and it worked all right and the tube does not leak now.

OREL E. DAVIES.

Editor HORSELESS AGE:

In answer to your correspondent's query re vulcanizers, would say I have used an instrument with perfect success, as far as outer shoes are concerned. Many patches I have made I could not find now if I were to look for them, so well do they match with and cohere to the outer shoe. I think it has greatly aided in reducing my tire repair bill. Could you give me the address of any publishers of maps of Ontario suitable for auto use? S. H.

[Perhaps some one of our readers knows of such a map.—ED.]

Editor HORSELESS AGE:

Referring to the inquiry of H. R. S. in the current number of THE HORSELESS AGE regarding the tire vulcanizer, will say I purchased one last fall, and it proved to be all that the maker claimed. I have used it over a dozen times and made a success with it every time. If any one has the time for repairing punctures of inner tubes there is nothing to get away with it. I have never tried the acid cure preparation; those who have tried it tell me it is satisfactory, but I believe the vulcanizer mentioned makes the neatest job.

J. G. STOERR.

The Purpose of Spring Checks.

Editor HORSELESS AGE:

The article on springs by C. H. T. in the HORSELESS AGE of April 4 contains some convenient formulæ, but the comments on auxiliary devices (presumably spring checks or shock absorbers) show that the writer shares a common error as to the real usefulness of these devices.

The true purpose of a spring retarding device is not to assist the spring in performing the functions for which it was designed, but to prevent it from doing work which is unnecessary and which under conditions frequently met with causes discomfort to the passengers and often damage to itself.

Let us assume that a car carrying its normal load is running over a smooth road, and that with everything balanced one of its springs has the shape shown in Fig. 1. When the wheel supporting this spring strikes an obstruction the spring takes the shape shown in Fig. 2. It is now exerting an upward pressure which is greater than the downward pressure due to load, and it therefore recoils. If this recoil is unchecked it will be sudden, the body will be suddenly thrown upward beyond the point of equilibrium, and the spring will take the shape shown in Fig. 3. This sudden upward motion of the body causes discomfort to the passengers in passing over a single obstruction. While spring and load are in the position shown in Fig. 3 the upward pressure of the spring is less than the downward pressure of the load, therefore the body descends quickly, and in so doing gathers some momentum, which carries it below the point of equilibrium, and the spring takes the shape shown in Fig. 4. Now, if while the parts are in this position another obstruction is encountered, the spring will be compressed still more; perhaps to the point of striking the axle. The spring now recoils with redoubled force and if a number of obstructions happen to be just far enough apart for the speed at which the car is moving the springs will strike the axles at every one. Most motorists instinctively avoid a succession of obstructions or undulations in the road; they know the effect, although they may not take the trouble to ascertain the causes which produce it.

Let us now assume that the spring has been fitted with some efficient device for retarding its recoil and that the car is run at the same speed over the same road.

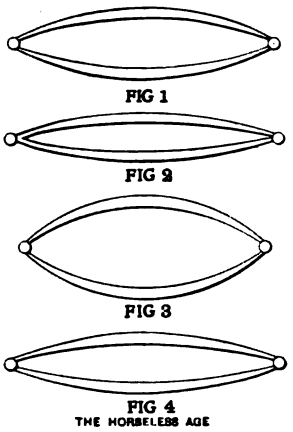


FIG 1

FIG 2

FIG 3

FIG 4

THE HORSELESS AGE

When the wheel strikes the first obstruction the spring will again take the shape shown in Fig. 2, but its recoil is retarded, or, to use a mechanical term, dampened, and the upward motion which it imparts to the body is not fast enough to throw the latter beyond the point of equilibrium. Therefore, the spring at once resumes the shape shown in Fig. 1 and is ready for another obstruction. It has not thrown the body upward and the passengers into the air, both to come down and meet a second jolt worse than the first, with more to come.

A question has been raised as to what might happen if more obstructions be encountered before the spring has assumed its normal shape. The answer is easy. The first jolt would be as soft as the spring could make it; the second would be equal to one due to a slightly stiffer spring, the third might be equal to one due to a still stiffer spring, but this is doubtful. In any event these jolts would be short and due entirely to the inequalities of the roadbed, and could cause no damage to the springs or discomfort to the passengers. It is only when the effect of these road inequalities is multiplied in intensity by the vibrations of the spring itself that they become serious and the purpose of the spring check is to nip these vibrations in the bud.

A pair of such devices fitted to the rear springs of an automobile will render its passengers deaf to any arguments against them, particularly those passengers who ride in the tonneau.

It may be possible to so construct a spring that it will by itself meet the conditions above named in a satisfactory manner, but this has not yet been done, and it is somewhat doubtful that it can be done.

With all due respect to your correspondent's opinion, he seems to have given the auxiliary devices but little attention.

B. LOUIS TOQUET.

The "Kicker" Discussion.

Editor HORSELESS AGE:

Referring to your issue of April 11, kindly allow me to comment on the articles by "Kicker" and C. J. Pembroke.

"Kicker" is a changed man. The wind seems to be going down and comes now only in fitful gusts, although he still stands "for his time honored principles." He is evidently, after all, a first rate fellow, but too much inclined to see only one side of things.

His discussion of the relative economy of the two systems of generating power is not very exhaustive. In the case of the steam motor he states that a large percentage of the heat units are actually wasted, but when he comes to the consideration of the internal combustion engine his memory fails him. For instance, he entirely overlooks the fact that about 50 per cent. of the total heat units contained in the fuel pass off in the jacket water and are simply useful in modifying the climate of the particular region in which the car may be operating. The fact is there are so many things that go to make up economy or the lack of it in a case of this kind that a theoretical discussion from the standpoint of thermodynamics would be neither profitable nor desirable under the circumstances. The most satisfactory and practical test is the relative amount of fuel used in carrying the same load the same distance under the same conditions. This being the court of final appeal the writer is firm in the belief, based upon experience, that his flash steamer is not going to be left very far behind.

"Kicker" now admits that the steam car is "a very attractive proposition" for running about near home, but limits its usefulness to the one class of work. How, pray, does he reconcile with his position the record of the endurance contests of the past four or five years, and the fact that drivers of the flash steamers are among the most persistent and successful tourists, and that the remarkable steam car tours made during the past year, far from a base of supplies and under the most adverse and unusual cir-

cumstances, have been carried out so successfully? I wonder if "Kicker" would care to follow, with his gasoline car, the trail made through the Maine woods in the summer of 1905?

Now as to the communication from Mr. Pembroke. The latter part of his first paragraph shows surprising lack of familiarity with the article he is discussing. The statement in my reply to "Kicker's" original letter, that I own and drive both steam and gasoline cars, and hold them in about equal regard, shows what my "judgment" is in the matter, and rather takes the wind out of his sails.

Just a few lines more by way of analysis and comparison of the positions of Mr. Pembroke and myself.

My position is, and has been from the start, that steam is fully the equal of gasoline for either local work or touring, all points being considered on both sides, and in all my articles the emphasis has been entirely on the flash steamer. Mr. Pembroke takes the opposite view, and in allying himself with "Kicker" becomes an extreme radical; indeed he clearly states this to be his position in the first part of his third paragraph.

I base my position upon two points:

1. Personal experience in actual comparison of up to date cars of both classes operating under the same conditions in local driving and touring.

2. The uniformly excellent record made by the flash steamer in direct contest with gasoline and otherwise, and under the most exacting conditions and adverse circumstances, in the hands of drivers of all kinds, the world over.

Mr. Pembroke also bases his position upon two considerations:

1. Personal experience with an antiquated type of steam cars.

2. Theoretical knowledge gained from books, etc.

Now we will assume that Mr. Pembroke's powers of judgment and my own are equally sound. In any particular case, then, it follows that in order to determine the value of the judgment rendered the considerations which cause the judgment to operate must be investigated,

Mr. Pembroke judges entirely from personal knowledge, gained by experience and study. The experience gives him no basis whatever for sitting in judgment upon the flash steamer, which is, admittedly, a radically different proposition from the older car used by him. He is assuming the right to condemn the whole of a certain class or species on account of deficiency in an inferior representative of that class or species. His later satisfactory experience with gasoline cars has, by reason of its sharp contrast with his steam car experience, simply served to emphasize and impress everlastingly upon his mind a prejudice against steam cars in general that absolutely unfits him for impartial judgment. Theoretical knowledge gained from books is very often misleading and of little value in a case of this kind. For instance, it will be apparent to those who have operated flash steamers that the theoretical troubles mentioned in his third paragraph are very largely those not materializing in actual practice.

The writer's judgment is also partially based upon personal knowledge, gained by experience, but the experience is such that it should render the resulting judgment of value. It consists in a fair and extensive comparison of the most highly developed models of both classes of cars—the very cars under consideration. The second point which I claim in support of my position is entirely independent of personal experience. It is a cold fact, indelibly written on the auto records of recent years, well known and necessarily admitted by all who have followed the game.

I submit the case to the readers of THE HORSELESS AGE for decision.

H. W. BEACH.

Explosion Engine Query.

Editor HORSELESS AGE:

Will you kindly inform me what relation length of stroke of engine bears to the power developed? For example, in a four cylinder engine would a 4½x5½ inch give greater power than a 4½x4½ inch? If so, can power be increased by lengthening the stroke for a given bore, or is there a limit at which maximum power is obtained? Would a 4½x5½ inch cause less vibration than a 4½x4½ inch four cylinder engine? D. J. A. B.

[The length of stroke has no appreciable effect on the power of an engine, as an engine with short stroke will run at a proportionally greater number of revolutions per minute. Of two engines with the same bore, but unequal stroke, while the power will be about the same, the one with short stroke will be lighter, while the one with long stroke will vibrate less and be more economical of fuel. This is under the assumption that everything except length of stroke is the same in the two engines.—ED.]

Why the Pennsylvania Clubs Left the A. A. A.

Editor HORSELESS AGE:

In view of Mr. Farrington's letter in your issue of April 11, and of articles in a couple of journals calculated to give the impression that the Pennsylvania Motor Federation was simply formed by soreheads in the automobile clubs of Philadelphia and Pittsburg, I feel that your readers should have the other side of the story.

Mr. Farrington states that in forming this State organization we followed up a line of work started by the A. A. A. some time ago. This is only in part true. In January, 1905, the Automobile Club of Pittsburg appointed a committee to confer with the Philadelphia Club regarding the formation of a State branch of the A. A. A.; but the latter were not disposed to consider it and the matter was dropped.

In December, 1905, the A. A. A. wrote the Pittsburg Club (and I suppose the Philadelphia Club) suggesting calling a meeting of the clubs of Pennsylvania with the view of forming a State association. (The meeting the previous January was, by the way, not at the suggestion of the national body.) We went over the matter carefully, and wrote them that we felt the meeting should be called by the two clubs, not by them, as all organizations in the State should be included, and the matter of making it a State association of the A. A. A. could be decided at the meeting. The Pittsburg Club felt that it would be best to make it an independent organization. We were open and above board throughout.

The Federation was not formed by two clubs merely. All clubs in the State were urged to send representatives, and six did so. Two or three others expressed their approval by letter, and several individual owners were present. It was thought best to make it an independent organization, and not restrict ourselves to such clubs as care to join the A. A. A.

We have no feeling of antagonism against the A. A. A. or its officers. But the benefits derived from membership were greater in theory than in practice. The Philadelphia Club asked their assistance when the automobile bill was before the Legislature in 1903, and again in 1905. No help was received. If the organization was proving itself of real benefit to its individual members the failure of the director representing the Philadelphia Club to attend meetings would not be sufficient cause to blind our eyes to the fact. It is more than probable that the A. A. A. will be conducted along different lines in the future, but members certainly derived little benefit in the past.

To cut the matter short, we saw no return for our dues, amounting to from $500 to $600 per year, and know that this money properly used in Pennsylvania will do some good.

We do not know in what parts of the State are hid the "more active clubs" that lean toward the A. A. A. State organization, but will be very glad to get into correspondence with them, for that would be no barrier to their helping and being helped by the Federation.

PAUL C. WOLFF,
Secretary of the Pennsylvania Motor Federation.

Address Wanted.

Editor HORSELESS AGE:

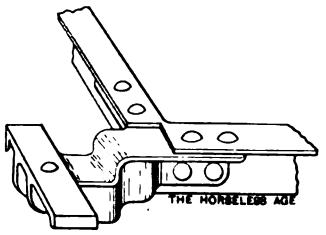
Can you furnish me with the address of the manufacturers of the "Keno" pump connection? A. S. LAMAY.

[Perhaps some one of our readers can furnish us this address, which we shall be glad to forward to our correspondent. —ED.]

NEW VEHICLES AND PARTS.

16 Horse Power 1906 Moline Car.

The 16 horse power car built by the Moline Automobile Company, of East Moline, Ill., is a double cylinder touring runabout, with a seating capacity of four. It is fitted with a 4¾x5 inch double opposed motor under the body. The transmission is of the two speed, all spur gear planetary



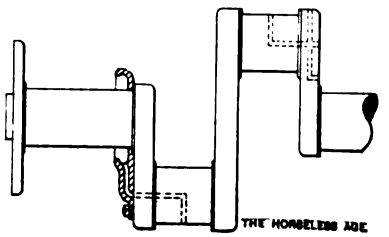
FRAME DETAIL.

type, and the centre chain drive is used. The wheel base is 86 inches and the tread standard; the wheels are 30 inches in diameter; the front wheels run on one-half and five-eighths inch balls, and are fitted with 3 inch tires, while the rear ones are pinned through their hubs to the shaft and have 3½ inch tires, as they carry more than half the weight.

The body is made of laminated wood, is very light in construction, and has 19 inch side doors, which open to the rear. The tonneau is removable and held by three bolts to metal fixtures fastened to the body, and can be replaced by a neat duck-back, converting the car into a runabout. The dash is of wood, straight, and with a brass railing. The space under the rear seats is left free for carrying purposes. At the rear of the brass edged rubber covered running board is a box, one side of which contains the batteries, while the upper part of the other side is hinged, and when swung to one side uncovers a small compartment, in which the starting crank is kept. The upper portion of this side is used for tools.

FRAME.

The frame is made of one piece of angle steel, except the front cross member, which



MOLINE CRANK SHAFT.

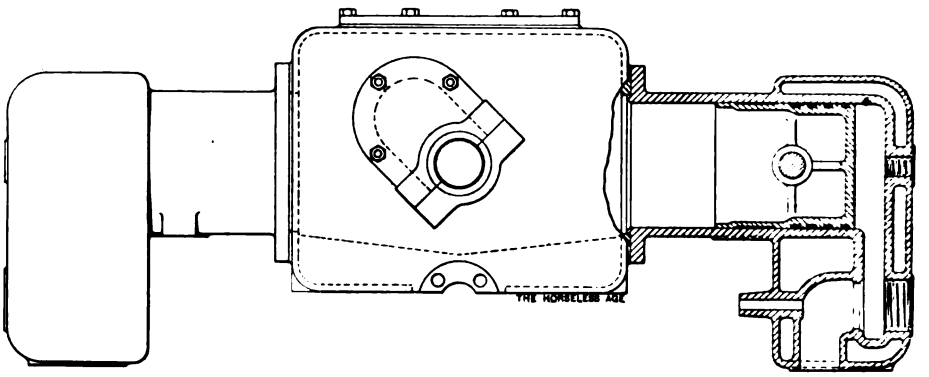
is of T section. Cast steel fittings form the spring supports at each side of the rear of the frame, and are riveted in position, as shown in the accompanying sketch. The engine is supported on two channel section cross members of malleable iron. One of these cross members has integral brackets and this supports the control levers and the short shaft which operates the clutch and planetary gear.

AXLES.

The rear axle, made by the Weston-Mott Company, consists of 2½ inch steel tube housings, with spiders at the inner ends, which are bolted together around the differential, which is of the Brown-Lipe spur gear type, with double acting Raymond brakes on each side. These brakes are belting laced steel bands, 1¾ inches wide and 8 inches in diameter; they act simultaneously and do not brake through the differential. The drive is by a single roller chain, five-eighths inch wide and 1 inch pitch, to the rear sprocket on the differential housing. The live axle is 1¼ inches in diameter, with the wheels pinned to the ends through the hubs, and the pins retained by the dust caps, which are flanged over them; it runs on four Hyatt roller bearings. Adjustable rods are connected by pivots to the spring saddles, and their forward ends are joined to the frame on special brackets. The front axle is 2 inch tubing, with the usual brazed-on forked ends, which carry integral arms for the cross spring shackle supports. Hollow rods with brazed-on ball and socket joints are fastened to the front axle at each end and connect to steel castings riveted to the frame. A Brown-Lipe steering gear is connected by the usual ball and socket jointed rods to the steering knuckle. The drag link, which has forked ends, is placed at the rear of the front axle.

MOTOR.

When placing the double opposed motor in the frame it is lined up by measuring from the chain at the rear to the side frame, then from the chain at the front sprocket to the side frame, these measurements being made equal. Shims are then placed under the engine supports until a straight edge placed on top of the case (which is milled parallel with the shaft bearings) is the same distance above the frame on each side. The engine supports are then surrounded with fire clay and babbitt is poured under them, which maintains the correct alignment. The engine does not rest directly on the babbitt, but small bosses are cast upon the subframe members, and in lining up these are filed off until the right height is obtained.

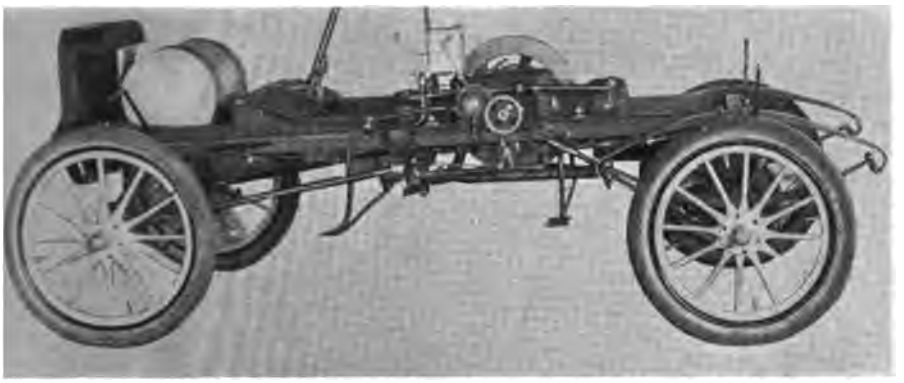


MOLINE ENGINE PARTS, ASSEMBLED.

The cylinders are the usual gray iron castings, with the valve chambers on the under side, and the water jacket (which surrounds the valve chambers) cast integral. These cylinders are interchangeable and carry integral brackets on their under side, which rest on the subframe. The cylinders are bored and allowed to "age" for about thirty days, and are then finished by grinding on a Heald grinding machine. The crank case is also of gray iron, cast in one piece, and not split at the middle, but is provided with a hole at each side, through which the crank shaft is inserted. This hole is rectangular in shape and set on an angle of 45 degrees, as shown in



MOLINE MODEL G, DETACHABLE TONNEAU.

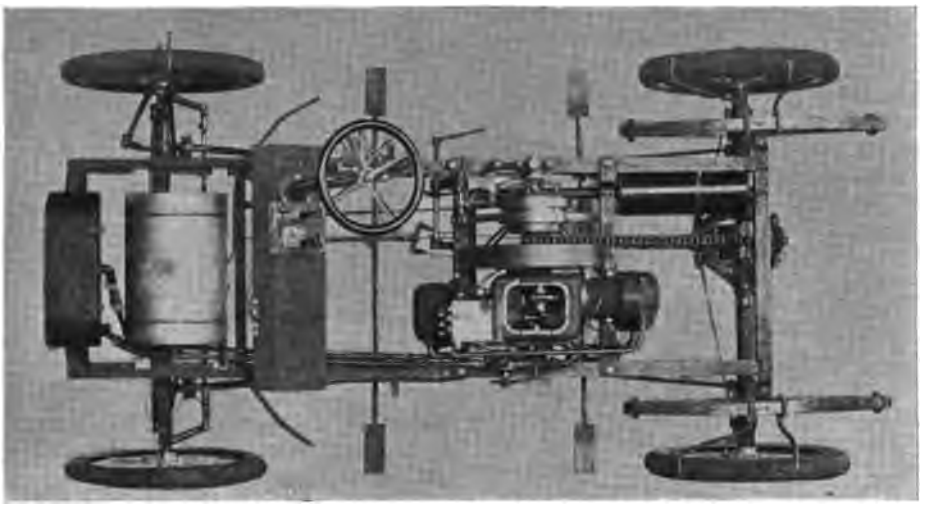


SIDE ELEVATION OF MOLINE MODEL G CHASSIS.

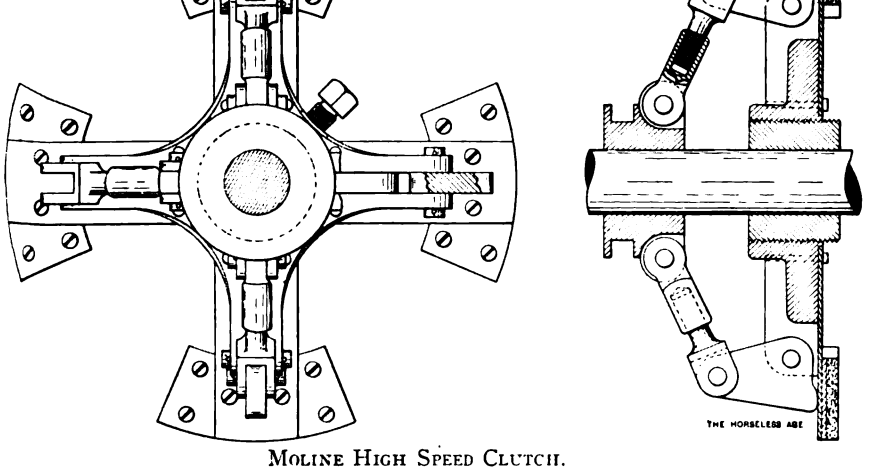
drawing. The lower portion forms half support of the crank shaft bearing, d the cover plate forms the other half. iis plate is held by cap screws in slotted les, to allow of adjusting the bearings. the top is a large hand hole cover, and bottom of the case, which carries the n shaft and push rods, is held by five ts, and can be easily removed. The cam ars are on the outside of the case, the n shaft gear being cast iron, and the aller gear steel. These are marked so at they may be placed in the proper posi- n and are pressed fits over Woodruff ys. The steel cam shaft with case hard- ed steel cams, taper pinned to it, runs two bronze bearings supported on the movable bottom of the case. The push ds are square and made of steel, and ide in grooves cut on the inner side of e crank case bottom; they carry in their otted ends hardened steel rollers, and eir outer ends are offset to operate the alves. The valves are made of nickel eel, with integral heads, and are all me- anically operated and closed by the usual pe of spring, which is retained by an uminum nut and washer combined, gainst which is screwed a long, narrow, ardened steel nut, against which the push ods act. These valves are removable rough the ends of the valve chambers, hich are covered by screw plugs. The rank shaft is a steel drop forging, with bearings of nickel babbitt, which are divided and set up with fibre shims. The flywheel disc at its end is electrically welded to it; the short shaft in the transmission has another similar flywheel disc forged integral with it, and the flywheel is bolted between these two discs. Under each nut is a small piece of brass with two ears, one of which is turned up against the nut and the other down against the rim of the flywheel, the object being to prevent the nuts from loosening. The pistons are of the usual gray iron, cast with flat tops and carry four eccentric rings, the lower one of which goes over the ends of the wrist pin. These rings are ground on three sides, diagonally cut and not pinned. The hardened and ground tool steel wrist pin is a driving fit into the bosses and prevented from turning by Woodruff keys. The connecting rod is a steel drop forging of I section, the lower end being the usual cap construction, held by through bolts, lock nuts and cotter pins. The bushing is a divided babbitt box with flanged ends, 1⅞ inches in diameter by 1⅞ inches in length. The upper end of the rod has a pressed-in bushing.

IGNITION AND OILING.

The ignition is by jump spark from two sets of six dry cells each, placed in the running board box. A double Splitdorf coil is used on the dash, with a two throw switch and a Splitdorf ball bearing timer.



PLAN VIEW OF MOLINE MODEL G CHASSIS.



MOLINE HIGH SPEED CLUTCH.

The plugs are placed in the middle of the cylinder heads. A six feed Hill precision oiler is supported on a bracket over the forward cylinder, where it does not interfere with the removal of the crank case cover. It is operated by an eccentric from the cam shaft through an arm to a ratchet inside the case. Bleeder tests are supplied on the case and may be inspected by lowering the heel board. There are six oil feeds, one to the top of each cylinder and one to each main bearing, and of the other two one runs into a hollow ring of bronze, which is screw retained to the crank web, and the other runs to a gear on the other side of the crank whose hub is cut out and forms the corresponding oil ring. These rings catch the oil and centrifugal force feeds it through the oil holes in the shaft to the crank pin bearings.

COOLING.

A centrifugal bronze bladed pump, driven by a fibre gear meshing with a cast iron gear on the engine shaft, forces the water from the tin tube radiator (the upper part of which forms a tank) through the

engine jacket and back to the radiator. The gasoline is carried in a 12 gallon galvanized iron tank of cylindrical form under the hood, and is fed by gravity to the 1906 Schebler carburetor. The brass inlet pipes branch at the carburetor and go direct to each inlet chamber. The inlet and exhaust pipes are held to the cylinders by a yoke at the end of a steel stud from the cylinder, and are retained by a single nut; asbestos gaskets are used at the joints.

CHANGE GEAR.

A two speed and reverse all spur planetary gear is used. It consists of the usual drums acted upon by fibre faced bands, and carrying three sets of triple spur gears, and a high speed clutch (see cut), which has four fibre faced fingers supported at the ends of a four armed spider and engaging the side of the high speed drum by means of a powerful toggle joint. The smallest gear has sixteen teeth, and no integral gears are used.

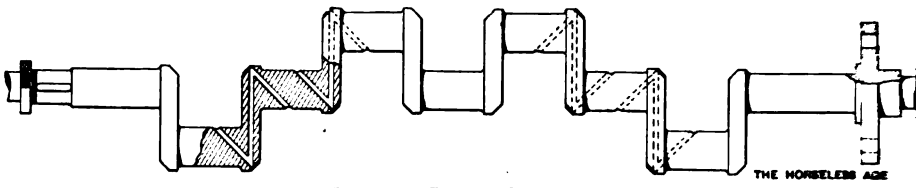
CONTROL AND BRAKES.

The transmission speeds are controlled by a single side lever, which in its forward position operates the high speed clutch, and in the backward position tightens the band on the drum next to the flywheel, giving the slow speed. A foot pedal next the steering column applies the outside band for the reverse, and the double Raymond brakes are operated by a ratchet foot pedal through an equalizing bar, which is shown in the plan view of the chassis. Just under the steering wheel is a notched sector with the usual spark and throttle levers, each of which works on half the arc and is stopped by pins set into it; both increase the speed when moved forward and operate through a sleeve and rod parallel with the steering column, with arms at the lower end.

The Tincher 80 Horse Power Car.

The Tincher Motor Car Company, of Chicago, are building two models for the 1906 season, one rated at 45-50 horse power and the other at 80 horse power. Both cars have four cylinder vertical engines, with separate cylinders and spun copper water jackets, the cylinder dimensions being 5x6 inches and 6x7 inches, respectively. Excepting dimensions the two cars are very much alike, and the following description of the 80 horse power car will also give a very fair idea of the other vehicle:

The large car has a 124 inch wheel base, standard tread, 34 inch wheels and 4 inch tires both in front and rear; it seats seven people and weighs complete 2,800 pounds, which gives 1 horse power for each 35 pounds total weight. The chief change since last year is in the extended use of nickel-chrome steel in place of crucible steel, the object being to get as light a car for its size and horse power as is consistent with strength and durability. These machines are fitted with a special contracting band clutch, a sliding change gear with a selective system of control, and side chain drive.



TINCHER CRANK SHAFT.

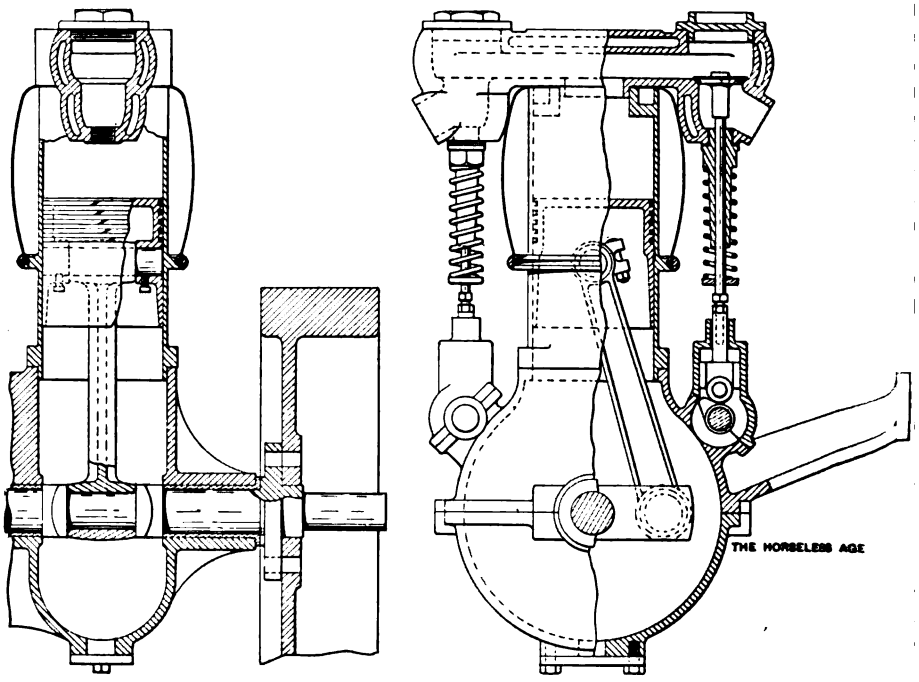
MOTOR.

The four cylinders are cast separately, with separate heads and spun copper water jackets. The head is a separate long and narrow casting, with its water jacket integral and a valve chamber at each end. It is fastened to the cylinder proper by four studs. The copper jacket is somewhat dome shaped, the upper portion being turned inward between the head and cylinder, forming the gasket, and its lower portion being made water tight by being inwardly flanged and caulked into a groove in a flange around the cylinder by means of a one-eighth inch annealed copper wire. The cylinders are held by four stud bolts to the aluminum crank case. The valves are made of a single piece of nickel steel and have very long stems, the portion exposed to the heat being larger in diameter than the rest. The usual type of springs surround long, tapering cast iron guides, which are screwed into the lower portion of the valve chambers. The springs are retained by split washers, which fit into grooves in the valve stems and are held in position by cup washers. The valve lifting rods consist of a piece of machine steel squared at the lower end to prevent turning and carrying a hardened steel roller; into the upper end of this is screwed a cap screw with check nut on it, by means of which the length of the tappet may be changed. The cam shafts are of machinery steel, with hardened and ground cams pinned to them and run in eight bronze bearings held by aluminum housings, which are split diagonally and fastened to the crank case by screw collars which fit over the tapered ends of the two halves of the housings. This arrangement allows of the quick removal of the cam shaft and its bearings, and also of the inspection or replacement of the tappet rods or rollers, as illustrated and described in our February 7 issue.

The crank shaft is made from a slab of chome-nickel steel, from which it is cut and not forged; it runs in five alligator metal bearings and is drilled with oil holes for centrifugal oiling, as shown in the drawing. The external openings of the oil holes, instead of being plugged, are closed by soldering small pieces of metal over them. The flywheel flange is turned integral with the shaft, and supports the flywheel by eight "through" bolts.

The crank case is of peculiar construction, of cast aluminum. Each crank compartment is made practically separate and carries integral with it a supporting arm of T section on each side from its neighbor and is joined by a strong web to the next compartment. The entire construction of the case is such as to combine lightness with extreme rigidity. It is divided horizontally at the centre, with the supporting arms integral with the lower half. The engine shaft is well supported in its five bearings, which are rigidly held by the case partitions, and the rear bearing next the flywheel is of extra length.

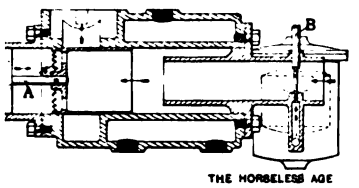
The connecting rods are of I section, hand forged, chrome-nickel steel. The up-



SECTIONAL VIEWS OF TINCHER ENGINE.

carries a phosphor bronze bushing, one side for adjustment and re- y a small bolt. The lower end is l cap construction, held by two stud d carries a split babbitt box, which with fibre shims. The pistons are it gray iron castings, rather short, y five diagonally cut eccentric rings pper end. The wrist pin is hard- l ground Shelby steel tubing, held et screws with lock nuts.

am gears are at the front end of and covered by a special aluminum the ends of which are supported rame; the large gear is steel and ler gears are bronze. A fibre gear ing the water pump meshes with e gear on the cam shaft. This n water pump is in the shape of ng plinth, with an S shaped cham-



TINCHER CARBURETOR.

1 the middle to its outside, which he water at the rim and throws it ie centre; it is driven by a friction on composed of a bronze plate held two fibre plates to prevent damage of a freeze-up. The water circula- as usual, and a Kells honeycomb provides the cooling surface.

CARBURETOR.

arburetor is a very large one, of feed type. It is aluminum jack- hot water, and the nozzle opening iliary air openings are controlled eously by hand. At the right end oat chamber and to one side of it le controlled by the screw stem B, of large diameter and coarse pitch. eft end is a cylindrical chamber eculiarly shaped auxiliary opening, 1, the curves of which have been out to give the best results on this This opening is covered and un- by the cylindrical piece attached , which is moved by hand in con- with the nozzle opening, and is matic. The inlet pipes are one tings, and the gasoline is carried gallon tank under the rear of the exhaust pressure feed.

OILING.

l is forced by a Hill precision ated under the footboards and a gear from the rear end of the t—to the bearings at each side of le bearing, from which it is car- entrifugal force through the shaft ank pins. The surplus oil thrown the crank pins supplies the cam d pistons; the lower parts of the ave a broad, shallow oil groove, ps to distribute the oil. The cam in an oil bath.

IGNITION.

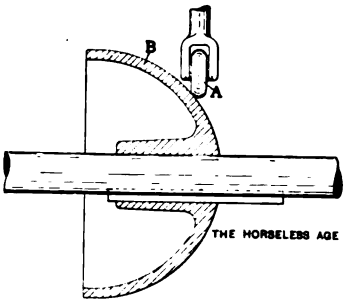
Two independent systems of ignition are supplied, one being operated by a Lacoste high tension magneto run by gears direct from the cam shaft, and the other by storage batteries carried in a box on the running board, which supplies current to a distributer of their own make, and a single vibrating coil on the dash. Both sets of plugs are carried in the caps over the inlet valves. The manufacturers claim to be able to start the engine from the spark of the high tension magneto without cranking, as by moving the spark lever rapidly it gives the armature about one-eighth of a turn, making a quick break, which is sufficient to give the necessary spark.

CLUTCH.

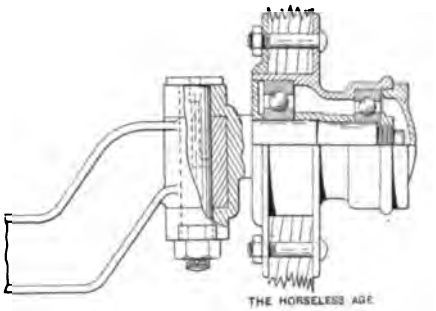
The clutch consists of a bronze drum, which is fastened to the transmission shaft, and a cast steel band, which rotates with the flywheel and which can be closed to grip the drum. One end of the band is pivoted on a pin, and into the other end, which is thickened, gear teeth are cut, with which a small spur gear meshes. This gear is given a partial rotation by an arm, at the end of which is a small steel wheel, which runs on a bell shaped piece, instead of the usual cone, for moving the arm outward for engaging the clutch. This bell shaped piece is moved to the right (see sketch), and when the roller is in the position A engages the clutch, but after the roller reaches the point B a further motion of the bell gives a very gradual engagement, moving it to the left, causing a very rapid and complete disengagement of the clutch. This metal to metal clutch is enclosed in the flywheel, runs in oil and is claimed to make it possible to start the car gradually and without jar, even on the fourth speed.

CHANGE GEAR.

The four speed gear is of the usual sliding type. All gears and shafts are made of chrome-nickel steel. There are two sliding gear pairs, which move on fluted shafts. The usual divided aluminum case is used, with a large hand hole cover at the top and side. This case is supported at two points at the front end, and by the jack shaft at the rear. The four speeds are controlled by a single side lever of new design, operated on the selective principle. It is arranged to slide in a slotted guide on pins, and can be raised or lowered when at its neutral or middle position. Joined to it at its lower end by a ball and socket



TINCHER CLUTCH COLLAR.



TINCHER FRONT AXLE END.

joint is a cross lever pivoted on a pin which works in a slot. The other end of this lever carries a vertical rectangular pin, which engages notches in the four gear shifting rods. The slots which guide the control lever are not arcs of circles, but are so shaped that the motion of the rectangular block which moves the gear shifting rods will be in a straight line, so that moving the control lever forward or backward in one slot operates one set of gears, and, dropping into the lower slot and moving forward, controls another set of gears. The backward motion gives the reverse, which cannot be engaged without raising a latch on the side of the control lever by means of a thumb button at its upper end. The principal gears are bolted by square bolts, which also act as keys, to flanges forged integral with the shafts. The jack shaft is without Oldham couplings or other flexible joints, and runs in large ball bearings, which are supported in nickel aluminum fittings fastened to the side frame members, to which the radius rods are also attached. At the ends of the jack shaft are large crucible steel sprockets with integral drums, upon which contracting bands with leather faces act. These brakes are controlled by the right foot pedal, and are independent of the clutch. The chain is a 1¼ inch pitch Diamond. The rear sprockets and drums are also of crucible steel, acted upon by internal expanding bronze bands, which are fastened to the radius rods, which take all the strains of braking. These brakes are operated by a side pull lever which disengages the clutch. The usual spark and throttle control are placed on the steering wheel.

AXLES AND SPRINGS.

Both front and rear axles are forgings of I section nickel-chrome steel. Semi-elliptic springs are used on both front and rear and placed under the frame. The front spring is shackled at the rear end and the rear spring is shackled at both ends to allow for chain adjustments.

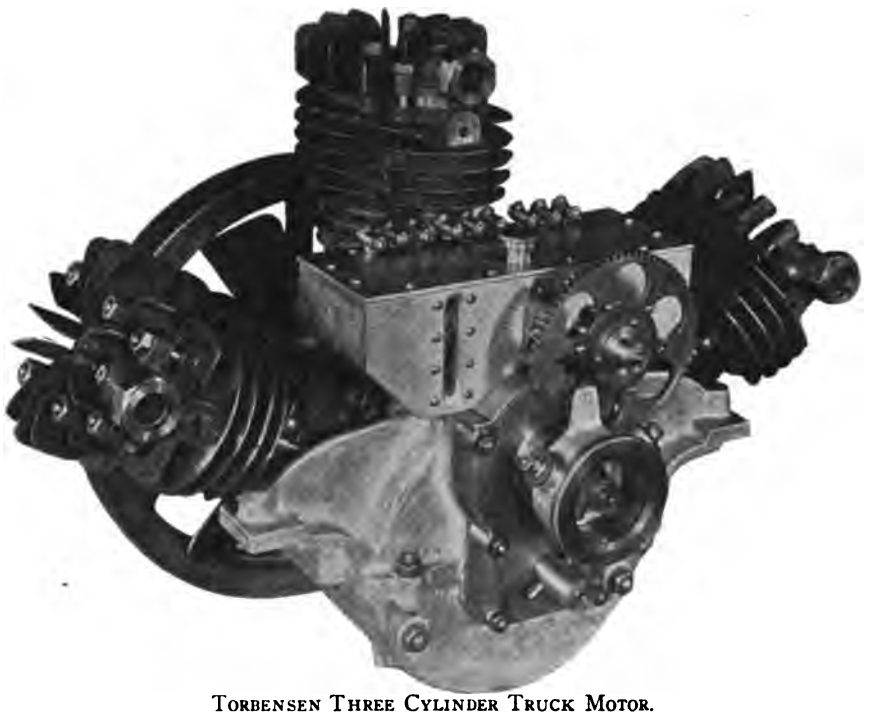
The steering gear consists of a bevel pinion and sector encased in nickel aluminum and connected to the steering knuckle by ball jointed rods; the cross link is in front of the axle.

The frame is made of carbon steel of angle section, 2x3x¼ inch, with the ends narrowed and formed into a channel. The drop forgings for the spring supports are

brazed and riveted in place. Crossbars of angle section are fitted at the front and rear, and the frame is trussed at each side with heavy rods, which are arranged to be taken up at the rear by a nut and screw, so that the frame can always be maintained in alignment.

The Torbensen Three Cylinder Truck Motor.

The Torbensen Motor Car Company, Bloomfield, N. J., have in process of construction a light gasoline motor truck of a load capacity of 1,500 to 2,000 pounds. The vehicle is to be built somewhat after the style of the contractors' wagon, with an open body, to which a canvas top can be fitted if desired. The change speed gear is a Torbensen planetary gear, while the engine, which is located under the seat, is



TORBENSEN THREE CYLINDER TRUCK MOTOR.

of a peculiar three cylinder type, which has been tested for over a year, and is illustrated herewith, both in sectional and side elevations.

The crank case is placed lengthwise of the truck, and carries at its forward end two cylinders set on to the sides of the case, with their axes in the same plane and at 120 degrees. The third cylinder is vertical and to the rear, as shown in the photograph. The motor is air cooled, 4x4 inches, and rated at 12 horse power, at 1,100 r. p. m. The crank shaft is similar to a two throw crank, with the crank pins in the same plane, except that one pin is double the length of the other and carries the connecting rod ends for the two diagonal cylinders. The cooling is effected by means of a belt driven fan set forward above the engine and at 45 degrees, so that it blows backward and downward on to the cylinders. The cylinders are cast with separate heads and carry very large thin integral flanges, as shown in the drawing. The separate heads are cast with radiating integral flanges, and are held to the cylinders by four stud bolts, which screw into cast lugs on the cylinders between the flanges. A soft metal gasket is used to make a tight joint. The cylinders are bored, and the finish is obtained by wearing in the pistons with the engine on a block, using oil and rotten stone as an abrasive. This process occupies from four to five days. The valve chambers are on the upper side, and the inlet valves are automatic; the cylinders are held to the cast iron crank case by four stud bolts. The upper part of the crank case carries four T section arms which support the engine. The spark plugs are inserted in the middle of the head.

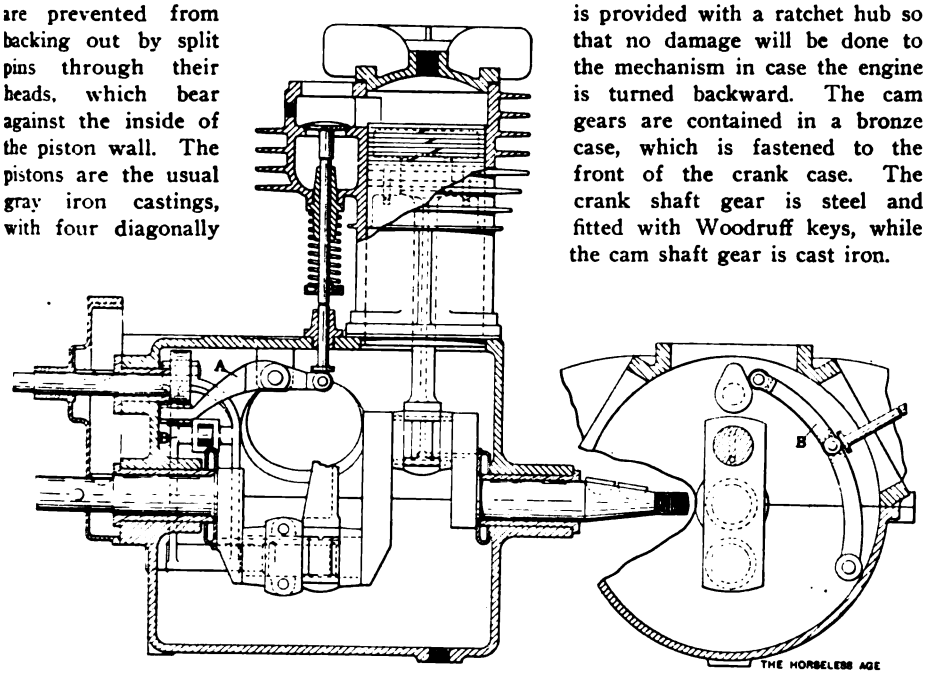
The cam shaft and valve lifting mechanism is quite novel, a single cam operating the exhaust valves of all three cylinders. A short cam shaft running lengthwise extends through the top part of the case only a short distanec from the front, and carries a timer of the usual roller contact type at the front end and a single case hardened steel cam integral with the shaft at the rear end inside the case. This shaft is supported by a single bronze bushed bearing in the end of the case, and at its outer end runs in a bearing formed by the bronze cam gear case. The valve push rods are tool steel, with circular disc ends unhardened, and run in cast iron guides, cap screwed to the case. As they do not carry rollers means to prevent their turning are unnecessary. The cam acts on three rocker arms of peculiar shape, as shown in the drawing. These arms carry hadened steel rollers at the points of contact, with both the cam and the push rods. Rocker A is pivoted from lugs at the top of the case, its long arm reaches toward the front, and its barrel shaped roller runs on the cam, while the short arm, with the cylindrical roller, operates the vertical push rod of the rear vertical cylinder. It is evident that the barrel shaped roller has a sliding motion on the cam, as it is at the end of a pivoted arm. For this reason the roller has been given its peculiar form, and after a year's trial the makers are entirely satisfied with its operation. There are two levers of the form shown at B, which are pivoted at their ends to lugs on the inside of the case at the lower right and left side, and the rollers at their extreme ends work on the cam, while the middle rollers operate the push rods of the slanting cylinders. The rollers of these three arms are set around the cam at 120 degrees, and the cylinders fire at equal intervals, giving a uniform exhaust. The three cylinders are connected to two Kingston mufflers, which are located lengthwise at each side. Each of the diagonal cylinders is connected with the mufflers at its side of the car, and the connecting pipes are joined by a cross pipe into which the exhaust from the vertical cylinder passes. In this way all three cylinders are connected to both mufflers. Short nipples are screwed into the valve chambers, and the pipes are fastened to this by an ordinary union.

Both the inlet and the exhaust valves are made of nickel steel, with heads integral; the usual spring, retained by a cup washer and a notched key through the stem, is used; both valves are of about 1⅝ inch diameter. The cage over the inlet valve is a bronze casting cap screwed to the cylinder and joined to the brass inlet pipes by a union; this inlet pipe runs from the Holley carburetor to a T, from which it branches to the three cylinders, giving an even distribution of the charge. The joints between the valve cages and their seats are ground.

The two throw crank shaft, with the cranks at 180 degrees, is made of 40 point carbon steel, with one pin double the length of the other and carrying two connecting rods; the other crank pin carries the connecting rod of the vertical cylinder. This shaft is no longer than the ordinary two throw crank shaft, and runs in two bronze sleeves, flanged at their outer ends and prevented from rotating by small pins. The rear bearing is 3⅜ inches in length and the forward one 3⅛ inches, and the crank shaft and crank pins are 1 7-16 inch diameter. The crank webs are continued on the opposite side of the crank pins, and have bolted to them counterbalance weights of bronze, which by continued experiments they have succeeded in placing in such a way as to give a very good mechanical balance. The flywheel, which is 15½ inches in diameter and weighs 48 pounds, is carried on the tapered end of the crank shaft, and is retained by two Woodruff keys and a nut.

The connecting rods are H section of

ast steel, with the crank ends separate; hese ends are boxes of white brass without bushings or gaskets. The through olts which hold them to the connecting ods also serve the purpose of holding the alves together. As the axes of the diagonal cylinders are in the same plane, the ods for these cylinders are offset 2 inches, which is the width of their bearing surface upon the crank pin. This brings the connecting rod bearings side by side on he 4 inch pin. The rods are two and one-alf times the length of the stroke, and heir upper ends carry bronze bushings. The wrist pins are hollow steel three-quarters inch outside diameter, with five-sixteenth inch hole, case hardened and ground, and are retained from slide slip by two set screws through the piston bosses and spotted into the pin. The set screws are prevented from backing out by split pins through their heads, which bear against the inside of the piston wall. The pistons are the usual gray iron castings, with four diagonally split eccentric rings above the pin; these rings are about one-fourth of an inch wide, and are not pinned; they are compressed and finished after being cut open.



SECTIONAL ELEVATION OF TORBENSEN MOTOR.

On top of the engine case between the slanting cylinders is the force feed oiler and tank. This oiler is of the company's own make, and consists of a single vertical metallic plunger worked from a rocker arm pivoted at one side, the end of which is raised by a circular horizontal annular cam with as many lifts as there are feed pipes. The plunger is forced downward by a small coiled spring, and works in a vertical rotating cylinder, the lower part of which is formed into a horizontal disc, with a single outlet for the oil on its under side near its periphery. As the cylinder and its integral disc are rotated, the oil outlet at the exact instant of the downward stroke of the plunger registers with an opening leading to one of the oil pipes. A ground joint is used between the rotating disc and its seat, and the whole runs in an oil bath. There are six oil leads from the tank, one to each of the main bearings near the outside end; an oil groove in the bushing leads inward and carries the oil into an annular bronze ring around the shaft from where, by centrifugal force, the oil is carried through a hole in the crank web and pin to the surface of the crank pin bearing. No oil is carried in the base of the case, as it is not intended to depend upon splash. Two oil leads enter the rear vertical cylinder, one at each side near the base, and the remaining two lead to the upper side of the slanting cylinders. Sufficient oil is thrown off from the crank pins to maintain an oil mist in the case, which provides for the rocker arm bearings and the cam shaft. The location of the oiler assures the oil being fluid at all seasons. The oiler is run by two spur gears from the cam shaft gear. One of these gears is provided with a ratchet hub so that no damage will be done to the mechanism in case the engine is turned backward. The cam gears are contained in a bronze case, which is fastened to the front of the crank case. The crank shaft gear is steel and fitted with Woodruff keys, while the cam shaft gear is cast iron.

Jump spark ignition from a battery of fifteen or twenty dry cells is used; the cells are arranged in groups of five in series, the groups being connected in multiple, by which arrangement, it is claimed, much more mileage is obtained. A triple vibrating coil and a roller timer are used.

The Century Flash Steam Generator and Kerosene Burner.

The Century Auto-Power Company, of East Orange, N. J., are building a new flash steam generator, combined with a kerosene burner, suitable for automobiles. The generator resembles in appearance others already on the market, but the circulation is different. It consists of a set of horizontal spiral coils of seamless drawn steel tubing united by right-and-left threaded seamless steel couplings. After the individual coils are assembled (care being taken to stagger them so as to obtain the greatest possible heating surface) they are bound into a unit by vertical steel rods which run through the coils and are threaded at top and bottom into heavy cast iron spiders. The whole is then encased in sheet iron, covered with asbestos, to prevent radiation, and this again covered with thin sheet iron held on by brass bands.



ELEVATION OF CENTURY STEAM GENERATOR.

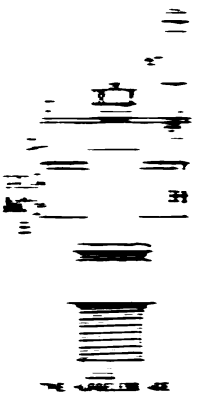
The chief peculiarities of this generator are the direction of circulation of the water and the absence of a thermostat. Water under pump pressure flows through a tube directly over the fire, up through the central opening of the generator and into the top coil; from here it travels downward from coil to coil about half way, whence it is carried by a tube to the coil next the fire, and begins an upward circulation to the coil, just under the one from which it was diverted; from here the steam is carried down the centre and across the bottom over the fire, in a specially heavy steel tube without joints or couplings, which delivers superheated steam. It is claimed that the steam never becomes excessively superheated, owing to the limited surface of the superheating tube. By this circulation the danger of burning the lowest coils of the generator is said to be practically eliminated, as they are always filled with saturated vapor instead of superheated steam. From the point of discharge the steam is carried through a fourway steam fitting on the outside to the engine throttle, a diaphragm water regulator, a diaphragm



BOTTOM VIEW OF CENTURY STEAM GENERATOR.



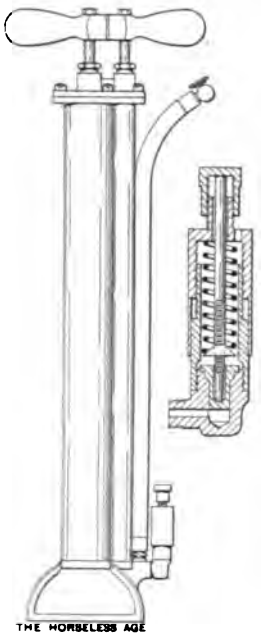




h D as the porcelain dielectric, accumu- ng electricity until the voltage reaches a ue sufficient to break down the gap, en it discharges itself and puts the en- energy into the spark.

The "Safety" Tire Pump.

The Artizan Brass Company, 118 Mich- n street, Chicago, are manufacturing re pump fitted with an automatic re- valve which makes it impossible to

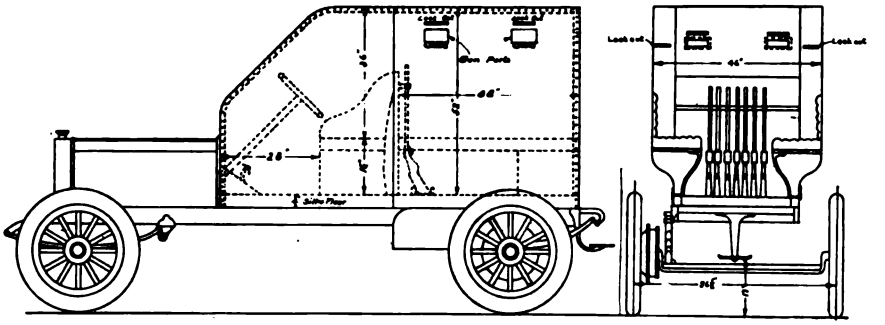


AFETY TIRE PUMP AND RELIEF VALVE.

p up more pressure in the tire than for which the relief is set. A side elevation of the pump complete and a sectional view of the relief vavle are shown ewith. The pump is made of seamless, wn tubing, nickel plated, and is de- ned to act on the compound or two ge compression principle. It is med by the manufacturers that an ex- s of air pressure in the tires is a se of great deterioration, and that this obviated by the use of the relief at- hment.

Acetylene Torch.

loore & Moore, Westfield, Mass., are ut to place on the market an acety- e torch for owners of automobiles. is torch consists of an acetylene ner or jet enclosed in a perforated nder attached to a wooden handle, burner being connected with the gen- or on the automobile or to a sepa- one by a small rubber tube of any red length. The torch gives a bright t, and it is claimed that there is no ger of setting the car on fire while ing adjustments or repairs in the t time. It is also claimed that it is ossible to ignite gasoline or any kind as with it, and should gasoline be ed directly on the torch it would im- diately extinguish the light.



PLANS FOR ARMORED THOMAS CAR.

New Armored Car.

The E. R. Thomas Motor Company, Buffalo, send us some plans of a car ordered by the Giroux Consolidated Mines Company, of Los Angeles, Cal., through the Western Motor Car Company, of the same place, to whom the plans are due. A Gatling gun is to be mounted on the footboard at the side of the driver's seat, and is to be operated by a man sitting at the left of the driver; it will command an arc of fire of over 90 degrees. At the sides and at the rear are portholes for the repeating rifles, of which seven will be carried. There is ample room in the rear for two men, and perhaps four. In addition to these there will be two revolving seats, which can be detached and stored away when not in use. This car is to be used by the Giroux Company in their mines, where it has been found necessary to provide protection against the attacks of the Yaqui Indians. The gold will be carried in the tonneau.

The mines are located a considerable distance from the railroad, and in taking the gold from the smelter to the nearest line of transportation it is necessary to pass through a country infested by Indians. Armed guards are always sent along, but recently the number of these guards has had to be increased, and even then the cavalcade has not been immune from attack. This method of transportation has been found too slow, and it has been decided to use at least one armored automobile.

New Packard Limousine.

We show herewith a Packard 24 horse power stock chassis fitted with a new design of limousine body built at the Packard works. The car seats five inside, and weighs complete about 2,900 pounds. All the windows, with the exception of the wind shield, slide down, and the wind shield slides up under the ceiling, so that in warm weather the vehicle can be operated as an open car. All the usual little conveniences, such as electric light, capacious side pockets, receptacle for toilet articles, arm rests, foot rail and speaking tube for communicating with the driver, are provided. The extra seats fold out of the way when not required. The side windows have draw curtains, while the rear, front and door windows have roll curtains. The ceiling upholstering is in plain cloth, instead of being tufted.

The Potting prize of 1,000 crowns, offered by the president of the Austrian Automobile Club for the best automobile invention made by a citizen of the Dual Monarchy during the year, has been awarded to Otto Hieronimus, engineer of the firm of Arnold Spitz, Vienna, for a metallic clutch of the conical type.



NEW PACKARD LIMOUSINE.

COMMERCIAL APPLICATIONS

Motor Cars in the Undertaking Business.

The purchase of a 20 horse power touring car by J. W. Sexton, an undertaker of Leavenworth, Kan., and the announcement that he will buy others, for use in his business, has awakened considerable interest in the possible use of automobiles in this line. Although Mr. Sexton says that he is hardly prepared for so great an innovation as the use of an automobile at a funeral, he thinks motor cars will be very useful in the business, especially in towns where there are good roads.

"I do not believe the time has come," he said to THE HORSELESS AGE correspondent, "when they can be used in funeral corteges. The slow pacing black horses suggest so strongly to most people the solemn majesty of death that they will undoubtedly be used for many years to come. There is probably no business in which people object to innovations more than in that connected with the burial of the dead, but I have decided to use automobiles to a certain extent in my business.

"For instance, when I am called somewhere beyond the city limits, I can crank my machine and be there in less than half the time required by horses. I would first have to hitch up (often first rub down a horse) before going out, and this would take as much time as the whole trip by automobile. The machines will be used in bringing relatives to the undertaking establishment to select caskets and draperies, as well as for taking ministers and quartets of singers or choirs to cemeteries. The undertaker himself can reach the cemetery in advance of the procession by means of his automobile, and attend to all necessary details. There are other incidental uses which I have taken into consideration in buying automobiles, but these are the principal."

Mr. Sexton has been president and vice president of the Kansas Funeral Directors' Association and delegate to the National Association for several consecutive years. His purchase of an automobile for use in his business was considered of sufficient importance for an editorial in *The Sunnyside*, an undertakers' journal.

Leavenworth is well adapted for the use of automobiles on account of the level country in which it is situated and the excellent roads which connect it with Fort Leavenworth and the Soldiers' Home, each 3 miles distant, and Lansing, a small city 5 miles distant. The thoroughfare connecting these places is being paved with brick its entire length of 9 miles, which work is largely the result of efforts by prominent automobilists.

Another undertaker who employs the automobile in his business is Mr. Stephens, of the firm of Stephens & Bean, undertakers, of Fresno, Cal. He purchased a Rambler surrey, Type 1, and at first intended to have a special body built for it at the factory in order to convert it into an undertaker's wagon. As they were too busy at the factory to attend to it, Mr. Bean, with the aid of a carpenter, built the body. Several trips have been made in the desert with the car thus equipped, and it is said to have been satisfactory.

F. X Gartland, a well known Philadelphia undertaker, has been interested for several years in the application of the automobile to the undertaking business. He writes us that he has asked a large number of his customers, including some of the most prominent families in Philadelphia, if they would object to the use of automobiles at funerals, providing they came to the door and proceeded to the cemetery as quietly and as free from objectionable odors as horses and carriages. He found none who offered any objection under these conditions.

He believes that if alcohol comes into use for a fuel, instead of gasoline, and new inventions eliminate noise, the automobile will come into use in funeral processions. At the present time steam is, in his opinion, the only motive power that can be considered, because the gasoline engine is too noisy and the odor would be offensive to those traveling behind it. Funeral processions are often obliged to travel farther than would be possible with an electric vehicle without recharging the batteries.

"A funeral procession," he said, "is something that must be kept moving, and motive power must be used that can always be depended upon. There can be no stops upon the road to repair breakdowns. I think most mechanics understand steam engines better than the gasoline motors, and therefore it would be much easier to get a mechanic to run and take care of the car.

"I believe an automobile hearse can be constructed nearly as cheaply as the kind now in use, and I expect to see the day when a funeral procession will consist of an automobile hearse followed by a line of self propelled vehicles."

As was noted in our issue of January 31 last, a motor propelled vehicle has been built for the order of a large Paris undertaking firm, especially for transportation of corpses over long distances.

Motor Buses for New Haven's Aristocratic Orange Street.

A company capitalized at $50,000 is being organized at New Haven, Conn., to operate a line of gasoline buses on Orange street, one of the principal business and residential streets of the city. The New Haven trolley company have made many attempts to secure a franchise for laying tracks on this street, but in every instance they have been blocked by the influence of the wealthy residents, who object to any other means of transportation than a stage line.

H. B. Perry, the promoter of the proposed line, states that three 30 passenger, 20 horse power gasoline vehicles of the side entrance type will be employed. It is proposed to run them on a fifteen minute schedule between the centre of the city and the end of the line. Arrangements will also be made for transfers to the trolley line, and vice versa. It is planned to have the buses in operation by June 1. An attempt to operate a line of electric vehicles on this street was made some years ago, but the horses were soon put back.

Orange street is one of the widest thoroughfares in New Haven, and is paved with asphalt. It is perfectly level and extends from the centre of the city about 2 miles to the foot of East Rock, one of the scenic attractions of Connecticut. It traverses one of the most aristocratic portions of the city.

The New Haven Board of Aldermen recently passed a measure appropriating $20,000 for the improvement of the Cold Spring section at the foot of East Rock, which improvement is said to have much to do with the proposed motor bus line.

Cars for New York Municipal Departments.

Deputy Fire Chief John Binns, of the New York fire department, received his specially finished automobile last Thursday. It is finished a bright red, with black molding, and with a new design of hood. It is capable of a speed of 50 miles per hour. It will be equipped with a regular locomotive bell suspended from an arc affixed to the dash. He has traveled about 4,000 miles since last October in the car he has had, his daily mileage on his rounds being about 25 miles.

Fire Commissioner John H. O'Brien also received a new automobile at the same time. It is planned to buy a number of new motor vehicles for the department.

The New York city Board of Aldermen have voted to allow Bridge Commissioner Stevenson to buy two automobiles at a cost of $6,250. Large letters will be painted on the vehicles denoting the department to which they belong, which, it is thought, will prevent their clandestine use for pleasure.

Combination Police Patrol and Ambulance.

A combination motor police patrol and ambulance is being constructed by the Reo Motor Car Works for the Lansing (Mich.) police department. R. E. Olds offered to contribute one-half the cost of the vehicle if it meets with the approval of the city

council. It will be propelled by a 16 horse power motor, and will have a seating capacity for twelve persons. The entrance will be from the rear and the seats will be placed lengthwise. A stretcher will be carried under one of the seats. One of the seats can also be used for sick or injured persons.

Commercial Vehicle Notes.

A motor bus line is being planned from Provo, Utah, to the Great Salt Lake the coming summer.

The Wichita Automobile Company, Wichita, Kan., have purchased three automobiles for livery service.

The Lidgerwood Mill Company, flour manufacturers, Lidgerwood, N. Dak., have purchased an Oldsmobile for use by their salesmen.

Thomas B. Jeffery & Co. have decided to build a limited number of commercial trucks with a power equipment similar to that of their touring car.

M. R. Culbertson and George F. Irwin, of New York, are discussing plans for a company to operate sightseeing automobiles in Pittsburg.

The Olds Motor Works recently shipped a number of eighteen passenger wagonettes and delivery wagons to Barna, Bulgaria.

L. W. Monk, of Orleans, Neb., has bought an automobile which he will substitute for horse power on his stage line between Orleans and Phillipsburg, Kan.

The postmaster of Detroit has secured permission from Washington officials to install automobiles for the collection of mails. A contract has been entered whereby Oldsmobiles will be used.

The city of Charleston, S. C., has purchased a two cycle car, which will be especially equipped with two Babcock fire extinguishers, and will be used by the chief of the fire department.

Because the Public Service Corporation of New Jersey have refused to build a trolley line between Elizabeth and Rahway, an electric stage line will be started. It will also run from Rahway to Carteret.

The New Jersey Touring Company have begun the operation of three twenty-four passenger sightseeing automobiles at Atlantic City. Each trip is about 30 miles long, and embraces the principal points of interest in Atlantic City and environs.

Joseph Cullen, of Cleveland, Ohio, has recently purchased from the Ohio Motor Car Company, of that city, a sixteen passenger sightseeing automobile. The car will be operated in Cleveland for a time, and then will be taken to Put in Bay Island for the summer and fall.

The Bosch Brewing Company, at Calumet, on the northern peninsula of Michigan, propose to try a motor truck for their heavy work between Lake Linden and Calumet. It is also reported that the C. & H. Mining Company will purchase two 8 ton motor trucks to take supplies to the exploration work in the vicinity of the Delaware mine. There is no railroad connection to this mine, and if the experiment is successful motor trucks will probably be used to a large extent in the copper mining districts in northern Michigan.

The Clark Cartage Company, Bellingham, Wash., is planning to etsablish an automobile stage line to Birch Bay this summer. The company has ordered three cars, and will transact a general automobile livery business.

The American Sight-Seeing Car and Coach Company will begin running six cars in Minneapolis and St. Paul May 1. Headquarters will be at the Hotel Ryan, St. Paul. Three general plans will be followed: Seeing St. Paul, seeing Minneapolis and seeing the Twin Cities.

The automobile bus line that was established about April 1 between Lexington, Ky., and Richmond, 27 miles, was in operation only a few days when it was permanently discontinued. The road over one of the hills on the way was found too dangerous for motor vehicles.

The Commercial Club, of Coldwater, Mich., is interested in a project to establish motor service between Coldwater and Quincy and Coldwater and Union City. The club has investigated several similar lines, and twelve or fifteen passenger cars will probably be purchased. L. E. Lockwood is secretary of the club.

The Camden and Atlantic Automobile Company expect to have four twenty-seven passenger gasoline omnibuses in operation between the Reading Railroad station at Kaighn's Point, Camden, and Atlantic City by July 4. It will be both a passenger and express line. Two round trips—about 220 miles—will be made by each car daily, and a single trip fare of $1 will be charged. The route will be over the White Horse Pike, which is regarded as the best road in south Jersey, if not in the State.

Fraudulent Advertisers Serving Sentence.

Arthur H. Jackson and Dwight E. Jackson, automobile dealers at 313 Nicollet avenue, Minneapolis, are now serving a three months' sentence in the Hennepin County jail, after having paid a fine of $350 each for misrepresenting the value of their machines through the mails They were indicted by the Federal grand jury and found guilty.

The scheme was to insert the following advertisement in the daily press and certain periodicals:

FOR SALE—$600 White Steamer, 1904 make; four passenger; with compound engine, flash boiler, artillery wheels, heavy pneumatic tires, wheel steerer, etc.; guaranteed in first class order. Send $300 and will ship for inspection and demonstration to responsible party.

Those who were unfortunate enough to forward the $300 received an inferior machine of an entirely different make from the one advertised. It was charged in the indictment that the machine shipped was useless as an automobile. The indictment was found on complaint of S. A. Cripe, of La Place, Ill., who had corresponded with the Jackson brothers on the matter. This letter was produced in evidence. It is estimated that $1,500 was made by the advertisement.

Southern Motorists' Federation.

The Southern Motorists' Federation was organized at Atlantic Beach, Fla., April 12. The principal object of the organization will be the construction of a trunk road connecting Richmond, Va., with Jacksonville, Fla.

Officers and directors were elected as follows: President, Benjamin L. Jones, Macon Automobile Club; first vice president, Frank C. Beatty, Savannah Automobile Club; second vice president, Col. Joseph L. Bryan, Richmond, Va.; third vice president, George W. Vanderbilt, Asheville, N. C.; secretary, W. R. Rannie, Jacksonville Automobile and Motor Boat Club, and treasurer, Edward Inman. Directors, George W. Wilson, Clark Howell, J. H. Estell, Major W. A. Hemphill, General Gilmer, John B. Parkinson, W. A. McWilliams, Thomas W. Layless, John W. Anderson, Guy Jordan, Charles M. Murray, R. S. Munger and W. P. Brownlow.

The Omaha Show.

The first automobile show in Omaha, April 4 to 7, demonstrated the remarkable growth of the business in that city, most of which has come about during the past four years. Thirty different makes of machines were exhibited by the five local dealers, and sales aggregating $40,000 are claimed to have been made during the four days. About 10,000 people visited the exhibition, many of them coming from neighboring towns and cities. Among the visitors were a number of dealers in agricultural instruments who wished to establish agencies.

An exhibit of more than usual interest to Omaha people was the gasoline motor truck of the Karbach Automobile Company of Omaha. Mr. Karbach has been experimenting along this line for some time, and finished the truck exhibited just in time for the show. It has a carrying capacity of 3,000 pounds. The company expect to begin building trucks for the market at once.

A show is planned for next year on a much larger scale, as the dealers think that such exhibitions will do a great deal toward establishing Omaha as a distributing centre for automobiles in the West.

The annual meeting of the Massachusetts State A. A. was held last week. The efforts made by the legislative committee in securing the repeal of certain obnoxious town ordinances and procuring more reasonable legislation were considered most satisfactory. These officers were elected: President, Elliot C. Lee; vice president, Franklin Weston; secretary-treasurer, John C. Kerrison; legislative committee, Lewis R. Speare; good roads, John P. Coghlin; membership, W. H. Chase.

LEGISLATIVE and LEGAL

$90,000 for Baltimore and Washington Road.

BALTIMORE.—That there will be a good road for automobiles between Baltimore and Washington is assured by the passage of an appropriation of $90,000 for a modern road in practically a straight line between the cities. Thirty thousand dollars a year will be spent for three years.

The work will be built under the supervision of the State Commission of Highways, of which Governor Warfield is the head. The route of the old Baltimore and Washington turnpike will be followed. The part of the road to be constructed outside the city limits will measure just 30 miles. Inmates of the Maryland House of Correction may be employed. It will be of macadam, and work is to begin immediately.

Frelinghuysen Bill Now a Law.

TRENTON, N. J.—Governor Stokes has signed the Frelinghuysen automobile bill, and it is now a law. It will be in effect July 1. The following is a summary of the chief provisions of the bill:

There shall be a department of motor vehicles established in connection with the Department of State. The Secretary of State is made commissioner of motor vehicles at a salary of $1,500 a year besides that which he now receives. He must appoint an inspector, who shall be chief clerk of the department, at a salary of $1,500 a year. Seven inspectors shall be appointed to aid in enforcing the law. Their compensation is to be $3 a day when employed. The original bill provided for twenty-one inspectors. Local police authorities shall have authority to aid in enforcing the law.

All automobile drivers must be licensed and must prove their ability to operate automobiles. The registration fees for autos shall be $3 a year for machines of less than 30 horse power and $5 a year for those of 30 horse power or more. The license for driving shall be $1 a year for machines of less than 30 horse power and $2 a year for those of 30 horse power or more. The licensee must have his name written on the license, and when required by the authorities must show his license and write his name for identification.

No intoxicated person shall drive a motor vehicle, and no person shall drive a motor vehicle without the consent of the owner.

In the case of an accident caused knowingly by an autoist, he must stop his machine, return to the scene of the accident and give his name and registration number.

The speed limit shall not exceed 20 miles an hour on the open road, and 1 mile in four minutes within 200 feet of any horse.

The proceeds of the department shall be turned over to the State road department, to be applied to road improvements.

Violators of the law may be arrested without a warrant.

The penalties for the various violations shall be from $10 to $500, and imprisonment from twenty to sixty days. For the second and subsequent violations this penalty may be doubled. Ample provision is made for appeals.

ALBANY.—Governor Higgins has signed the amendment to the New York State automobile law giving automobilists the privilege of depositing fidelity or surety company's bonds for bail when arrested.

OLYMPIA, Wash.—In answer to an inquiry from the Insurance Commissioner, asking how automobiles ought to be classified for purposes of insurance, the Assistant Attorney General has replied that they may be classed with marine risks.

BUFFALO.—The Erie County Good Roads Convention last week adopted a resolution favoring the distribution of the State $50,000,000 highway improvement appropriation under a plan that would give one-half the amount to various counties in proportion to the mileage to be improved, and the other half in proportion to the population. A resolution was also adopted urging that $10,000,000 be made immediately available.

NEW HAVEN, Conn.—Automobile owners are preparing a remonstrance to present to the ordinance committee of the New Haven board of aldermen at its meeting next month. Their complaint is based on the ordinance adopted by that body recently which provides that no automobile shall be kept or stored in any building that has not been licensed for such purpose by the fire marshal.

Think Gasoline Didn't Cause Sewer Explosions.

After a week's investigation into the cause of the recent explosions in the garage district in New York, the Bureau of Combustibles of the New York City Fire Department submitted the following report to Fire Commissioner John H. O'Brien last Friday:

NEW YORK, April 14, 1906.

Hon. John H. O'Brien, Fire Commissioner:

DEAR SIR—On Friday, April 6, a succession of explosions took place in the trunk sewer located in Fifty-first street, between Eighth and Tenth avenues. On Saturday I assigned Edward F. Horne, one of our deputy inspectors, and two uniformed firemen to visit all garages in the territory covered by that sewer, viz., from Forty-eighth to Sixty-second street, where are located forty garages, every one of which is conducting its business according to law, and has a license from this bureau. Each garage has a washstand, with sewer connection, where mud and dirt are washed with water from the car. With a few exceptions this washstand is not used while filling car tanks with gasoline, while oiling the machinery, nor while cleaning parts of the machinery.

In garages each car has a station, and under this car is a drip pan. Here the chauffeur cleans his machinery, uses his oils and fills his gasoline tanks.

The use of kerosene in cleaning the machinery is, as a rule, insisted upon; there is no emptying of car tanks except in the repair shop. The gasoline is then put in a safety can and returned to the car from which it is taken. There is no waste of gasoline in garages. The drip pans used in the garage and the repair shop are cleaned at proper intervals.

Some garages use sand in the pans; this sand when oiled is dumped into garbage cans; other garages scour the drip pans at the washstand; no gasoline is ever used to scour the floors of garages.

It is true that machine oil and waste lubricating oil, dirty kerosene oil and other waste liquids, and possibly at times a very small quantity of gasoline, do pass into the drainage system. There is no other way provided to get rid of these articles, but if gasoline reaches the sewer it is by accident, as the garage owner is very careful to watch that he gets the legitimate use of all the gasoline he buys.

We know the extremely volatile character of gasoline, and it is doubtful that the small amount from each garage that reaches the sewer is responsible for the sewer explosions, considering that union of the refuse oils, kerosene, water, etc., in the sewer destroys the life and character of the gasoline.

The conditions would not bring about an accumulation of gasoline vapor, and yet if these explosions occur from compression one should expect such explosions near the source of the gasoline supply, viz., on Broadway, where most of the garages are situated, and again the disturbance would certainly be felt in the traps of the garages. This did not occur.

Sewers are continually giving off gases containing sulphuretted hydrogen, light carburetted hydrogen, free nitrogen, carbonic acid, etc. Some of these gases are known to be inflammable, and under favorable conditions might be explosive. There have been sewer explosions prior to 1899, before garages existed, and occasionally explosions occur now in districts where no garages are found. Ten years ago in Boston a sewer explosion wrecked the Masonic Temple, doing much damage to property.

I respectfully suggest that a cesspool trap of the old school should be installed in each garage, or the old trap that for the past forty years has been used around various oil refineries, either of which would prevent the grease, dirty kerosene and gasoline from getting into the sewer.

That the sewers in the vicinity of garages be provided with warm ventilating pipes, to relieve the sewers of the accumulation of gases.

That the sewers be flushed with a gas dispelling preparation.

That the sewer department use a gasoscope, which will give an alarm when a dangerous condition of the air supervenes.

That the authorities unite to remove gasoline from use as a motive power in vehicles by removing the tax from alcohol, which, mixed freely with water, will not explode.

Respectfully submitted,

GEORGE E. MURRAY,
Inspector of Combustibles.

Dr. Walter Bensel, Superintendent of Sanitary Inspection of the Board of Health, after a thorough investigation came to the conclusion that the explosions could not have been caused by gasoline. His inspectors found that in cleaning machines unused gasoline dropped on the floor. By the process of exclusion, he believed that the explosions must have been caused by

iting gas. He could see no other theory.

investigation that is being made by reau of Sewers in obedience to the on of the Board of Aldermen will submitted to Borough President for some time yet. A chart has ade showing every sewer connection ne garages in the district.

inspection department of the Bureau ers is rather skeptical regarding the partment report. Chief Inspector n Klein said that in the case of pre- xplosions in the sewers it had been to trace the cause directly to il- ing gas; but in these recent cases st careful investigation has failed to the cause. He added that automo- ere cleaned in garages with a cheap gasoline, and he had been told that vas nothing else that is practicable in cleaning them. He thought pos- e explosions might have been caused getting into the sewers and vapor-

pointed out by experts that much s on the color of the flames. Wit- of the explosions differ. Some say ere reddish yellow, while others are nt they were of a bluish color, which indicate electricity was the cause. ses also say they smelled a strong f gasoline after the explosions.

lice Cards for Omaha A. C. Members.

Omaha Automobile Club recently officers as follows: President, Dr. Conner; first vice president, C. ; second vice president, J. F. De e; secretary, F. L. McShane; treas- mil Brandeis; board of directors, L. Cummings, Gould Dietz and . Nash.

lutions were passed denouncing fast , and offering co-operation to the lepartment in apprehending violators speed ordinance.

club has adopted a plan which will the necessity of members being o a police station when arrested for n of the speed ordinances. Each r is to be furnished with a card his name and the number of his e. On the reverse side is an order by the chief of police directing the an arresting the bearer to release omobilist, and to take the card as rance for his appearance in court.

l Roads Wanted in Canada.

question of good roads is beginning erest automobilists and farmers out Canada. In the Province of the farmers are traditionally proud ing built their own "statute labor" es, and are loath to see the untaxed bile raise the dust on them. They hat no taxes are paid into the town ies by motor car owners.

he other hand the automobilists are taking action through their organizations looking to the building of better roads. The Toronto Automobile Club and Board of Trade, as well as the Montreal Chamber of Commerce, are working together to influence municipalities throughout the Dominion to build better roads. If this agitation results in better roads the opposition of the agricultural element to automobilists will undoubtedly vanish.

The Automobile Club and a supply house at Toronto are co-operating to secure the erection of guide posts and signboards on the principal highways of Ontario, and to get out a guide book with road maps and directions. Many motorists use Ontario highways in traveling between Buffalo and Detroit, as the distance is considerably shorter than south of Lake Erie.

To Manufacture Automobile Forgings.

The Cambria Forge Company, Johnstown, Pa., is to be incorporated with a capital stock of $150,000, and a factory is to be erected at that city for the purpose of manufacturing automobile and other drop forgings, and also a certain limited amount of steel car forgings. The incorporators will be John H. Waters, president of the United States National Bank of Johnstown, also president of the National Radiator Works; Curt G. Campbell, secretary of the Citizens Light, Heat and Power Company, of Johnstown, and R. P. Smith, director of the Citizens National Bank, Johnstown. Some of the others interested are J. M. Shumaker, Harrisburg; George M. Wertz, F. J. O'Connor, John M. Rose, E. D. Entwistle, W. Milton Brown, J. B. Lowman, A. C. Stineman, F. W. Otto, George W. Wagoner and Bruce H. Campbell, of Johnstown. They expect to start operations in about six weeks.

Studying New York's Methods of Traffic Regulation.

Francis Hurtubis, Jr., counsel for the Massachusetts A. A., spent several days in New York city recently studying the methods of regulating traffic on the crowded streets and avenues. It is his intention to make some recommendations to Massachusetts automobilists for governing their machines when passing through congested districts.

In this connection it is interesting to note that the regulations governing street traffic in New York are practically the same as those in London. Colonel Piper, former deputy police commissioner of New York, spent some weeks there studying methods of regulating traffic. The system resulting from his efforts has relieved New York streets of much of the danger that formerly attended passage through them. The rules are few and simple, but they are enforced. The police have been most efficient in this respect. Drivers have come to understand that the uplifted hand or the whistle mean business, and they obey the signal.

At the intersection of Broadway or the avenues with cross streets vehicles going up or down must wait until those going crosstown have passed, after which the crosstown vehicles must wait for those going up or down. In this way the old time "jams," in which surface cars, trucks, automobiles, carriages and vehicles of all kinds became hopelessly entangled, have been done away with.

The deflection of uptown Fifth avenue traffic around the Flatiron Building through Twenty-second street to the east side of Broadway has robbed the crossings at Twenty-third street and Fifth avenue of fully 50 per cent. of their former danger.

It is to be understood, of course, that street regulations, to be effective, must be obeyed by all vehicles alike. It is difficult to understand how regulations that would apply only to automobilists would be of much use. Mr. Hurturbis will probably call the attention of the Boston police department to the results of his observations in New York.

Chauffeurs' Club Bars Colored Members.

At a recent meeting of the New Haven (Conn.) Chauffeurs' Club it was voted that colored men should not be eligible for membership. This action was found necessary in view of the increasing number of colored chauffeurs, but it was not meant as a slur upon colored chauffeurs.

The New Haven Chauffeurs' Club was only recently formed, and already has a membership of over fifty. Its bylaws are noteworthy. Any member found driving an automobile while intoxicated or under the influence of liquor shall be expelled from the club. Turning of sharp corners, indiscriminate blowing of horns and chimes, entering garages at a high rate of speed and reckless driving are prohibited. Dismissal is the penalty for persistent violation of these rules.

Chauffeur and Owner Both Indicted for Manslaughter.

The Westchester County grand jury, sitting at White Plains, N. Y., last Monday found two indictments each for manslaughter in the second degree against the chauffeur, John Johnston, and John C. Rodgers, Jr., of New York, the owner of the automobile which ran down and killed Mrs. Betty Kuchler and her sister, Miss Albina Stein, while the aged women were returning from church Sunday evening, April 1. Each offense is punishable by a maximum sentence of twenty years in prison.

King Leopold of Belgium is said to be the owner of the biggest and most expensive automobile stable of all European monarchs. He has seven cars.

MINOR MENTION

An automobile club will be organized at New Haven, Conn., this spring.

The New York city agency for the Duquesne car has been removed to 306 West Fifty-second street.

The Cleveland branch of the Diamond Rubber Company has removed to new quarters at 1514 Euclid avenue.

The Belden Transmission Company are moving from Pittsburg to Cleveland, where they will occupy their own plant.

The Darracq Automobile Company of New England has established its headquarters in the Motor Mart, Park square, Boston.

The Midgley Manufacturing Company, Columbus, Ohio, manufacturers of pressed steel wheels, have found it necessary to build an additional mill.

The National Motor Car Company, of Indianapolis, are planning for the construction of another factory as large as the one they occupy at present.

Albert L. Clough recently demonstrated before the Granite State A. C. at Manchester, N. H., the practicability of using alcohol instead of gasoline in running an automobile.

The body building department of the Maxwell-Briscoe Motor Car Company, at Pawtucket, R. I., have moved to a larger factory formerly occupied by the Hope Thread Company.

A reader living in Ohio asks whether any new road maps for Ohio and Indiana are coming out this spring. He has the old road maps, but finds them unreliable in a great many cases.

A petition for dissolution signed by Louis F. Ivers and twelve other stockholders has been filed by the Rogers Automobile Company, Springfield, Mass. The capital stock was stated as $10,000.

It is reported that the Marvel Automobile Company, Des Moines, Ia., with a capital stock of $25,000, will manufacture a new automobile designed by Frederick Dusenberg. A factory will be built at Des Moines.

The Bay State Automobile Association have abandoned their annual hill climbing contest this year, and have planned to hold races at Readville, Mass., May 30. J. C. Kerrison, of Boston, will be in charge of this event.

The Corry (Pa.) Motor Club was organized on April 12 with sixteen charter members. A board of governors consisting of six were elected as follows: William E. Steele, Eli Barlow, W. Ed. Marsh, Louis E. Brown, H. M. Norton and Geo. H. Crippen, from which the following officers were elected: William E. Steele, president; Eli Barlow, vice president; W. Ed. Marsh, secretary and treasurer. The club will join the Pennsylvania State Federation at once.

The Cincinnati Fall Festival and Industrial Exposition will be held August 28 to September 22.

The Springfield Metal Body Company, Springfield, Mass., have built an addition to their plant, which gives them 48,000 additional square feet of floor space.

The Minneapolis A. C. has announced that it will enforce its bylaws strictly against all members of the club who violate speed regulations. These provide for a warning on the first offense and expulsion on the second.

The Sioux City (Ia.) A. C. has elected the following officers: President, Dr. F. A. Seemann; vice president, W. E. Lockhart; secretary and treasurer, H. B. Hallam; trustees, W. H. Farnsworth, John McHugh and Herbert Pelton.

The Amesbury (Mass.) Reed and Rattan Company manufacture willow seats for automobiles, which are claimed to reduce the weight of a car about 250 pounds. The seats are made after designs of George P. Dennett, of Amesbury.

The Standard Carriage Lamp Company will remove their factory to Charlotte, Mich., where they are building a factory with 12,000 square feet of floor space. They will incorporate under the Michigan laws, with a capital stock of $50,000.

The Peoria (Ill.) Automobile Club has elected the following officers: President, B. H. Onken; vice president, A. E. Augerson; secretary, R. A. Whitney; treasurer, W. H. Rees; directors, L. C. Wheeler, J. B. Bartholomew, M. E. McGruder, S. K. Hatfield.

The London Bible Society maintains that automobiles have caused the price of bibles to advance, because the cost of leather suitable for bindings has doubled in the past year, as the result of the demand for leather for automobile coats and the craze in America for patent leather shoes.

The illustration published in the advertisement of the Premier Motor Manufacturing Company, of Indianapolis, on page xix of our issue of April 11 was their Model L De Luxe car, listed at $2,250, instead of Model F, listed at $1,500, which was described in the advertisement.

At the annual meeting of the Colorado Automobile Club the following officers were elected: Frank L. Bartlett, president; W. H. Bergtold, secretary. Dr. J. W. O'Connor was elected vice president and Lewis Searing treasurer. Members of the executive board, M. J. Patterson, B. B. Brown and Dr. E. P. Hershey.

The Hartford Automobile Parts Company, Hartford, Conn., has been incorporated, and the following officers have been elected: President and treasurer, E. A. Bardol; secretary, A. J. Bourghel, of Hartford; vice president and manager, F. H. Bogart, of New Britain. A plant has been secured at 438 Asylum street, Hartford, and we are informed that the company will devote particular attention to parts for high grade cars. The first product will be a new type of universal or Cardan joint, on which patents are now pending.

The Keystone Wagon Works, Reading, Pa., expect to manufacture automobile novelties, aluminum, metal and wood, in the near future.

F. E. Junge, a member of the Society of German Engineers of Berlin, has established a connection with Professor Diederichs, of Cornell University, and they will devote their attention exclusively to the subject of gas power in all its branches, including automobiles. Offices have been opened at 150 Nassau street, New York city.

Consul General Shanklin, of Panama, suggests to manufacturers of automobiles that there is a good sales opening in the Canal Zone. The streets in Panama City have been paved in several directions, and splendidly built roadways reach to the Sabanas, where are the summer homes of the wealthy people. This affords a route of 15 to 16 miles.

The Société des Jantes Amovibles M. L. 112 Rue de Richelieu, Paris, are manufacturing an automobile wheel rim which in case of a puncture or other injury to the tire can be removed from the wheel with the tire in place on it, and replaced by another rim with tire carried along for the purpose. It is claimed that the removal of the rim need not take over five minutes.

After May 1 the Hartford Suspension Company will be located in their new building at Broadway and Eighty-eighth street, New York city. Their factory will be removed from Hudson street to the corner of Clarkson and West streets, where they will have three times their present floor space. The Gobron-Brillié cars, for which they are the American agents, are due in two weeks.

Elwin M. Stone has withdrawn his interest in the Detroit Auto Marine Company, of which firm he was vice president. New officers were elected as follows: Lou Burt, president; J. F. Leitch, vice president; Harry Burt, secretary, and Crispin Oglebay, treasurer. Directors were elected as follows: Julius Beeman, Lou Burt, J. F. Leitch, Harry Burt, Crispin Oglebay and Henry Ledyard.

We are informed that tests of the Covert automobile jacks recently made by Prof. T. R. Lawson, engineer in charge at the testing laboratory of Rensselaer Polytechnic Institute, Troy, N. Y., showed that the No. 1 jack, weighing 6 pounds, and the No. 2 jack, weighing 8 pounds, will withstand each a pressure of 20,000 pounds, while the No. 3 jack, weighing 12 pounds, will withstand a pressure of 30,000 pounds.

The newly incorporated Rhode Island Machine Company, Providence, R. I., has elected officers as followers: President, John W. Bishop; treasurer, Clayton Harris; assistant treasurer, Edward G. Pinkham; manager, Walter M. Jordan; secretary, Robert M. McLeod. Gears, engines and small parts for automobiles will be manufactured at 428 Kingsley street. Mr.

ordan has been in the gear cutting department of the Browne & Sharpe Manufacturing Company for several years.

The Berkshire Automobile Club, Pittsfield, Mass., has voted to withdraw from the A. A. A.

It is reported that A. M. Rowe, of Marinsville, Ill., has begun the manufacture of automobiles.

The Allyne Brass Foundry Company, Cleveland, Ohio, are adding 9,000 square eet of floor space to their plant.

The Hambrick Motor Car Company, of Huntington, W. Va., will remove to Washington, Ind., where $25,000 is offered as an nducement.

The Austin (Tex.) A. C. has elected officers as follows: President, Dr. Bennett; ice president, Frank Covert; secretary-reasurer, James Bartholomew.

R. F. Downing & Co., Corn Exchange Bank Building, New York, are sending out circulars of interest to automobilists contemplating foreign tours. They undertake o deliver a car at any foreign port.

It is reported that G. P. Altenburg, a Cincinnati capitalist, has expressed his willingness to invest from $50,000 to $100,000 with the Kingston Manufacturing Company, Kingston, N. Y., for the manufacture of automobile trucks.

The A. C. A. calls the attention of its members to the strict enforcement of the speed laws at New Rochelle, N. Y., owing to the death of the two women of that place as the result of being struck by an automobile April 1.

The Fond du Lac (Wis.) Automobile Club has organized with the following officers: President, W. G. Menzel; vice president, G. W. Worthing; secretary and treasurer, Robert Amory; directors, W. C. Reinig, A. Tait and C. C. Tripp.

The Minneapolis A. C. has elected the following officers: President, Frank M. Joyce; vice president, Asa Paine; secretary, John Rhildaeffer; treasurer, R. J. Smith; trustees, Dr. C. E. Dutton, E. J. Phelps, Horace Lowry, W. F. Brooks and F. W. Commons.

Plans are being discussed for a new automobile manufacturing company to operate the plant vacated by the Buick Motor Company at Jackson, Mich., when that concern removes to Flint in the fall. Members of the Durant-Dort Carriage Company will be among those interested.

The Massachusetts Institute of Technology recently made a test of an engine of the type used in the Compound cars, bearing on its fuel efficiency among other things. A certificate has been granted by the Institute to the E. H. V. Company, of Middletown, Conn., makers of the cars and engines.

The Automobile League of Louisiana has organized at New Orleans with the following officers: President, Sam Weis; first vice president, P. S. Milner; second vice president, W. B. Fayssoux; treasurer, J. M. Sherrouse, and secretary, Dr. A. J. Mayer. Governing board, Dr. J. M. Magruder, C. C. Hartwell, Sam Stone, Jr., Otto T. Maier, L. K. Michalson, T. R. Toley and J. M. Burguieres.

Thirty-five cars were totally destroyed by fire at the Imperial Automobile Garage, 52 West Sixty-seventh street, New York, April 8. Among them were cars belonging to Colgate Hoyt, J. F. B. Herreshoff, William S. Devery, Dr. Julian P. Thomas, John Philip Sousa, Raymond Hitchcock and J. Edward Addicks.

The Iowa A. C. of Des Moines has elected the following officers: President, W. S. Donahey; first vice president, D. B. Fleming; second vice president and captain, Dr. W. W. Van Werden; secretary, Harold Wells; treasurer, Grover C. Hubbell; executive committee, L. Aulman, chairman; W. Kitto and W. E. Hamilton.

The Murillo Manufacturing Company, Marion, Ind., inform us that their efforts will be devoted principally to commercial cars, although a four cylinder touring car will probably be included in their line. They expect to have their first light delivery wagon ready in sixty days, and will place 1 and 2 ton trucks on the market in the fall.

The North Jersey Automobile Club has elected the following officers: President, George A. Post; vice president, Dr. Faulkner; second vice president, Benjamin Eastwood; secretary, Robert Beattie, Jr.; treasurer, Fred R. Reynolds; captain, F. Elliott Low; first lieutenant, Christopher Horandt; second lieutenant, Charles E. Frost; counsel, Ralph Shaw.

Applications for space at the open air show of the New York Automobile Trade Association, to be held at the Empire Track May 24, 25 and 26, must be in the hands of the committee by May 8. Allotments will be made May 10. Space will cost 30 cents a square foot. Diagrams and further particulars can be obtained from Alfred Reeves, 29 West Forty-second street, New York.

The Indiana Motor Club has been organized at Indianapolis with the following officers: President, Frank J. Barr; vice president, Guilford A. Dietch; secretary, Frank B. Willis; treasurer, Bert N. Pierce. The board of directors is composed of the following members: Bruce Maxwell, E. A. Strong, Sr., R. H. Hassler, W. G. Wall and Dr. E. H. Katterhenry. A clubhouse to cost $5,000 will be erected at once.

The Erie (Pa.) Motor Club has elected officers as follows: President, Davenport Galbraith; vice president, Frank Payne; treasurer, H. N. Fleming; secretary, W. O. Davis. The board of governors is composed of the following members: Davenport Galbraith, Frank Payne, H. N. Fleming, W. O. Davis, Dr. E. F. Gifford and Fred Densmore. It will join the Pennsylvania Motor Federation, and Dr. Gifford will be the representative.

The six day non-stop motor test on Broadway, New York, arranged for a Wayne car by A. L. Kull, general manager of the New York Wayne agency, was stopped by an accident at 3 p. m. April 12, after the car had been running from Long Acre square to 110th street and back for just eighty-seven hours. At Fifty-eighth street a carriage backed into the car and disabled the radiator. The gasoline consumption was 1 gallon for each round trip of 15.2 miles.

Handbook of "Licensed" Gasoline Automobiles.

The third annual edition (1906) of the Handbook of Gasoline Automobiles, published by the Association of Licensed Automobile Manufacturers, 7 East Forty-second street, New York city, has just made its appearance. Two hundred and sixty-two different models, the product of forty-four different makers, are shown and offered by thirty-eight members and licensees of the association. Of these makes of cars thirty-one are American and thirteen foreign. The new edition also contains the names of the officers and the various departments, branches and committees, with their members. These include the Mechanical Branch, Agency Department, Traffic Department, Patent Department, the Association Patents Company, Committee on Tests, the Executive Committee and the Committees on Trade, Tires Handbook and Shows. A copy of this handbook is sent upon application accompanied by 10 cents in stamps.

Patents Issued April 3, 1906.

816,620. Automobile Turntable.—Edward A. Turner, Chicago, Ill. Filed August 7, 1905.

816,639. Speedometer.—James H. Bullard, Springfield, Mass. Filed December 30, 1904.

816,666. Wheel for Automobiles.—Charles B. Kimball, Cleveland, Ohio. Filed March 13, 1905.

816,696. Mechanism for Vehicle Lanterns.—William B. White, Cleveland, Ohio. Filed February 27, 1904.

816,717. Acetylene Gas Generator.—John B. Dulaney, Ector, Tex. Filed August 3, 1905.

816,741. Lubricating Mechanism.—Carl C. Riotte, Jersey City, N. J. Filed November 14, 1905.

816,775. Acetylene Gas Generator.—Otto M. Brauer, Marshalltown, Ia. Filed February 28, 1905.

816,798. Roller Bearing.—William Houldsworth, Manchester, England. Filed March 7, 1905.

816,817. Valve Controlling Mechanism for Gas Engines.—Henry J. Podlesák, Chicago, Ill. Filed October 22, 1904.

816,884. Detachable Pneumatic Tire.—Charles S. Scott, Cadiz, Ohio. Filed March 23, 1905. Renewed March 5, 1906.

816,889. Flexible Tire.—Albert V. Stichelen, Gand, Belgium. Filed December 16, 1904.

816,935. Steering Mechanism for Motor Vehicles.—Charles M. J. Petiet, Villeneuve la Garenne, France. Filed December 8, 1904.

816,990. Sparking Igniter for Gasoline Engines.—John C. McLachlan, Toronto, Canada. Filed Ocotber 31, 1904.

817,051. Carburetor for Explosive Motors and Engines.—Herman C. Doman, Oshkosh, Wis. Filed March 10, 1905.

817,066. Pneumatic Tire.—Sidney Hunter, St. Louis, Mo. Filed September 21, 1905.

817,104. Igniter for Internal Combustion Engines.—Arthur R. Curtis, Golden, Col. Filed April 10, 1905.

817,125. Means for Blowing Automobile Horns.—George W. Lorimer, Piqua, Ohio. Filed December 12, 1904.

817,132. Storage Battery.—William H. Palmer, Jr., New York, N. Y. Filed February 14, 1905.

Trade Literature Received.

Warner Instrument Company, Beloit, Wis.—Illustrated booklet, "The Cut-Meter."

The Ariel Company, Bridgeport, Conn.—Catalogue descriptive of Ariel motor cars.

Ryan & Lang, Appleton, Wis.—Booklet describing Perfection apparatus for washing vehicles.

Electric Storage Battery Company, Philadelphia, Pa.—Folder describing "Exide" sparking cells.

The Doyle Hose Union Company, Homestead, Pa.—Folder, "The Newest Thing in Hose Connection."

The Motor Tally-Ho Company, Fuller Building, New York.—Illustrated booklet of their touring buses.

R. F. Downing & Co., Corn Exchange Bank Building, New York.—Circulars, "Automobiling Abroad."

The Locomobile Company of America, Bridgeport, Conn.—The Locomobile gasoline touring cars, 1906 catalogue.

Kalisch Air Brake Company, 1315 Chestnut Street, St. Louis, Mo.—Folder describing Kalisch automobile air brake.

Peter Gray & Sons, 88 and 90 Union street, Boston, Mass.—Circular, "A Few Facts About the Powerful Lamps."

National Motor Vehicle Company, Indianapolis, Ind.—Booklet, "What Owners Say About National Cars," sixty-four pages.

Dean Brothers Steam Pump Works, Indianapolis, Ind.—Circular No. 54 Atlantic type boiler feeders or pressure pumps.

Monitor Speed Recorder Company, Cambridge, Mass.—Booklets describing Monitor recorders and giving directions for their use.

Century Auto-Power Company, East Orange, N. J.—Booklets, "Century Kerosene Burners" and "Century Flash Steam System."

Matheson Motor Car Company, Wilkes-Barre, Pa.—Descriptive catalogue of Matheson touring cars and trucks, twenty-four pages.

H. H. Franklin Manufacturing Company, Syracuse, N. Y.—Booklet, "Where the Franklin Is Made," description of factory at Syracuse.

The E. R. Thomas Motor Company, Buffalo, N. Y.—Booklet containing complete illustrated description of the Thomas Model XXXI, forty pages.

The Hess-Bright Manufacturing Company, Philadelphia.—Card illustrating the Hess-Bright ball bearings as used in the Pierce 1906 "Great Arrow."

Robert Instrument Company, 50 Shelby Street, Detroit, Mich.—Folder describing the Robert guaranteed pocket volt-ammeters, ammeters, voltmeters and switchboard ammeters and volt meters.

Garage Notes.

J. H. Severn, Jamestown, N. Dak., is erecting a garage.

Fred Bowman will open a garage at Muscatine, Ia., this spring.

W. H. Starr has opened a garage at 88 Green street, New London, Conn.

David L. Parker has purchased Tanner & Co.'s garage, New Bedford, Mass.

A new garage is to be built for the Abbott Company on Baronne street, New Orleans, La.

Covey & Cook's new garage, Portland, Ore., will be completed by the latter part of the month.

The Locomobile Company of America will erect a garage on Newbury street, Boston, the coming summer.

The Hasbrouck Motor Works, Inc., New London, Conn., will open a garage at 155 Water street, May 1.

The Studebaker Automobile Company, South Bend, Ind., has purchased the W. H. Barger garage on South Lafayette street, in that city.

The Private Garage, Ltd., will be the name of a new incorporation at Toronto, Canada. Prominent motorists of that town are interested in it.

Charles T. Shean, of Springfield, Mass., will erect a garage at the corner of Main and William streets in that city, the work beginning May 1. It will be known as the Dudley Garage and School.

The Harcourt Associates are to erect a garage at Irvington and Harcourt streets, Boston, which will comprise about 108,000 square feet floor space. It has been leased for twenty years to the Bay State Garage Company, a new incorporation, and will be managed by its president, Chester I. Campbell. Six hundred cars will be accommodated.

Trade Personals.

Frank P. Whyland has resigned as superintendent of the Berkshire Automobile Company.

R. Gordon Carew has been appointed New York city agent for the Stearns cars, with headquarters at 121 West Eighty-ninth street.

Harry L. Owesney has been appointed Western supervisor for the Winton Motor Carriage Company, with headquarters at Chicago.

R. E. Robinson, formerly with the Cadillac Company of New York, has been made New York sales manager of the Wayne Company.

Herbert K. Levick, for the last four years sales manager of the Central Automobile Company, New York, is the new sales manager of the Frayer-Miller Motor Car Company.

C. W. Churchill, formerly assistant manager of the Cleveland branch of the Winton Motor Carriage Company, has been appointed manager of the New York branch, succeeding Percy Owen, who resigned to become Eastern sales manager of the Aerocar Company. Mr. Churchill will supervise the erection of the new Winton branch at Broadway and Seventieth street.

New Agencies.

Chicago.—Geyler & Levy, Lozier cars.

Cincinnati, Ohio.—Jos. F. Monfort, Reo cars.

Los Angeles, Cal.—L. H. Johnson, Merkel runabouts.

Springfield, Mass.—Woodward & Reopell, Lambert cars.

Lawrence, Mass.—George H. Pixley, White steam cars.

New London, Conn.—The Hasbrouck Motor Works, Rambler cars.

Cleveland, Ohio.—H. S. Moore, Mora cars (northeastern Ohio).

Chicago, Ill.—The Haynes Automobile Company, at 241 Wabash avenue.

Honolulu, H. I.—O. E. Hall & Son, Franklin cars (for Hawaiian Islands).

Oakland, Cal.—Fred Barker, Tenth and Webster streets, Queen and Moline cars.

Milwaukee, Wis.—The Cassidy-Fairbanks Company, the Cleveland cars.

Wilmington, Del.—The Auto Storage and Repair Company, Stearns cars.

Norwich, Conn.—The Ford agency, 127 Franklin street, J. Stoddard, manager.

Philadelphia, Pa.—Strieby & Stevenson, 322 North Broad street, Paragon cars.

Cincinnati, Ohio.—Robert C. Crowthers, 130 East Ninth street, Compound cars.

Atlanta, Ga.—Atlantic Automobile Company, 89 North Pryor street, Stearns cars.

Oakland, Cal.—Hugo Miller, Eighteenth street and Telegraph avenue, Maxwell cars.

Norwich, Conn.—Smith & Swan, 276 Main street, Cadillac cars and Oldsmobiles.

Wilmington, Del.—The Motor Car Repair Company, 408 Orange street, Maxwell cars.

Milwaukee, Wis.—Hibbard Automobile Company, 187 Wisconsin street, Haynes cars.

San Francisco, Cal.—Pacific Motor Car Company, 425 Golden Gate avenue, Stearns cars.

New York City.—The Snutsel Auto Supply Company, 1534 Broadway, Bianchi (Italian) cars.

New London, Conn.—C. K. Smith, 94 Main street, Pope-Hartford, Pope-Toledo and Tribune cars.

Ottawa, Ia.—J. Kerfoot, Franklin cars (subagency of the Ridell Automobile Company, Des Moines).

Waterloo, Ia.—William Galloway, Franklin cars (sub-agency of the Riddell Automobile Company of Des Moines).

Grand Forks, N. Dak.—Lyons & Co., Franklin cars (sub-agency of the Moulton-Jordan Motor Car Company of Minneapolis).

New Incorporations.

The Reo Car Company, Lansing, Mich., has filed amended articles changing its name to the Reo Motor Car Works.

The Anti-Rubber Tire Company, Los Angeles, Cal.—Capital stock, $300,000 ($205,000 paid in); to manufacture tires.

Lubeck Automobile Company, Detroit, Mich.—Capital stock, $15,000 ($10,000 subscribed and $5,000 paid in); to manufacture automobiles.

Pasadena Automobile Company, of Pasadena.—Capital stock, $25,000, and $30 paid in. Directors, D. F. Robertson, F. P. Harris and R. P. Curtis don.

A. C. Webb Automobile Company, Joplin, Mo.—Capital, $10,000; incorporators, George Playter, A. C. Webb, W. P. Lytle, Lew Ballard and H. G. Packer.

Metropolitan Garage Company, New York City.—Capital, $100,000. Incorporators, H. R. Worthington, Raymond Carrington and P. R. Towne, all of New York city.

Suburban Automobile Service Company, Bissell, Mo.—Capital, $5,000; one-half paid in. Incorporators, Lee Meriwether, Robert J. Bowman and Frank S. Reed.

British and French Motor Car Company, Ltd., Toronto, Canada.—Capital, $50,000; to deal in automobiles. Incorporators, John Palmer, John Palmer, Jr., et al.

Smith Automobile Company, Denver, Col.—Capital, $10,000; to deal in automobiles. Incorporators, M. W. Smith, F. C. Smith and R. W. Smith, all of Denver.

Wehrle Automobile Company, Norwalk, Conn.—Capital, $5,000. Incorporators, R. S. Barclay and Mary A. Barclay, Royaton, Norwalk, and R. L. Wehrle, South Norwalk.

Walden W. Shaw Company, Chicago.—Capital, $20,000; manufacturing automobiles and accessories. Incorporators, Walden W. Shaw, Bronson C. Buxton, Jessie K. Shaw.

Inland Auto Company, of Harrington, Lincoln County, Wash.—Capital, $10,000; to manufacture and sell autos and motor boats. Incorporators, O. M. Graves and H. Conger.

Auto Rental and Repair Company, Chicago.—Capital, $2,500; manufacturing, repairing and renting automobiles. Incorporators, F. W. Richey, J. E. Smeyd and H. A. Pirce.

Hartford Automobile Parts Company, Hartford, Conn.—Capital, $10,000. Incorporators, Fred H. Bogart, of New Britain, and Edward A. Bardol and Andrew Broughel, of Hartford.

Darracq Motor Car Company, Chicago.—Capital, $5,000; manufacturing automobiles and accessories. Incorporators, Joseph B. McKeague, Hosea W. Wells and Charles C. Stilwell.

Automobile Owners' Defense Company, Augusta, Me.—Capital, $100,000; to enforce civil rights. Officers and incorporators: President, G. R. Hadlock; treasurer, W. S. Lee, both of Augusta.

Frayer-Miller Motor Car Company, New York City.—Capital, $1,000; to deal in automobiles. Incorporators, H. W. Johns, Bronxville, N. Y.; F. E. Muscovics and H. H. Knipper, New York city.

Miller-Hopkins Manufacturing Company, Indianapolis, Ind.—Capital, $15,000; to manufacture and sell motor vehicle accessories. Incorporators, William T. Miller, Thomas H. New and Frank Nuckols.

Keystone Motor Company, Harrisburg, Pa.—Capital, $15,000; to deal in automobiles. Incorporators, H. C. Dodge, J. A. Kline, C. C. Conklin, J. E. Sellers, of Harrisburg, and E. G. Irvin, of Steelton.

Heath Dry Gas Company, Saratoga Springs, N. Y.—Capital, $100,000; to manufacture automobiles. Incorporators, E. L. Heath and S. C. Brown, of Saratoga Springs, and F. A. Heath, of Jersey City, N. J.

Colonial Automobile Company, Pittsburg, Pa.—Capital, $2,500; sale of motor carriages. Directors, Max Reinhold, Millvale; Harry M. Miller, D. M. Miller, Pitsburg; Louis M. Shaffer, Hayville; Lawrence H. Keil, Sharpsburg.

THE

Horseless Age

VOLUME 17 APRIL 25, 1906 NUMBER 17

WINTON MODEL-K

Commended by the American Automobile Association Secretary



Mr. Sidney S. Gorham, of Chicago, attorney-at-law and secretary of the American Automobile Association, says:

"My Winton Model K has been in my service since November 20, and I have driven it between 2,500 and 3,000 miles over all sorts of roads, through mud and snow, and under adverse weather conditions, and have found the car entirely satisfactory.

"I am satisfied that it is the best car built at $2,500. It is an excellent hill climber, has speed enough, and is in every respect a comfortable, satisfactory touring car. Its 30 H. P., so rated, is, in my judgment, sufficient to carry the car anywhere any car can go.

"I am very glad to recommend the Winton Model K to anyone thinking of buying a dependable touring car."

Compare the $2,500 Winton Model K with any Car on the market selling at $3,500 or higher.

"THE MOTOR CAR DISSECTED" tells more about automobiles than any booklet in circulation. Copy free upon request, mentioning this paper.

The WINTON MOTOR CARRIAGE CO.

Licensed under Selden Patent. CLEVELAND, OHIO, U. S. A.

Winton Branch Houses in New York, Pittsburg, Boston, Philadelphia, Chicago and London. Winton Sales Agencies in all important places.

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LOOK FOR GARAGE NUMBER MAY 30

TESTED AND PROVED





Diamond Wire Mesh Base Construction

FOR MOTOR TRUCKS AND COMMERCIAL VEHICLES

Gives Satisfaction Where Others Fail

Mr. H. A. KNOX, president of the Knox Motor Truck Co., Springfield, Mass., writes:

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"Yours very truly, H. A. KNOX."

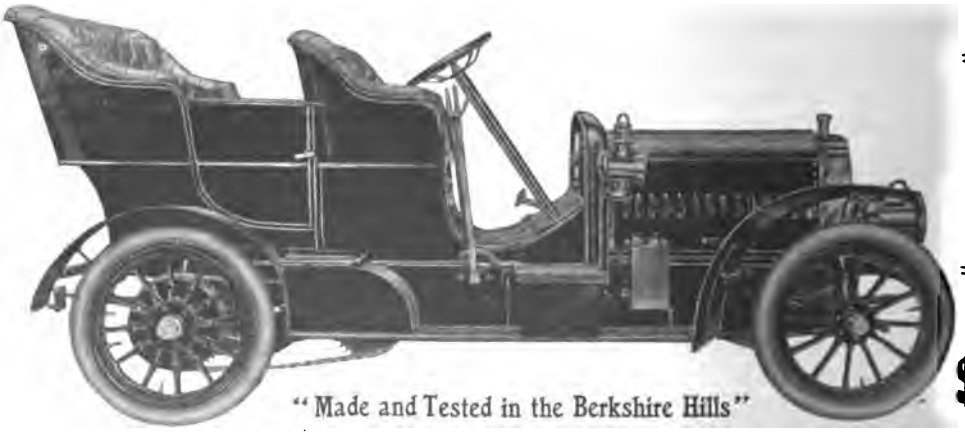
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Up to Date Shop Methods in Automobile Construction.

By W. B. Harsel.

The manufacture of a modern automobile is a problem of greater magnitude than it is considered by the average person, and the present article is intended to enlighten the general public on this subject, as well as to be instructive and suggestive to the manufacturer. Without further preliminary I shall begin a discussion of the manufacturing processes from start to finish, treating in detail the many systems now in vogue.

The first consideration is the selection of the proper material to use, such as machine steel, cast iron, sheet metals, bolts, nuts and frame stock. In all well conducted factories all materials pass through the hands of

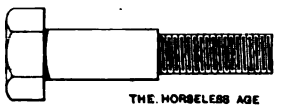


Fig. 1.

a competent inspector, whose duty it is to ascertain that all material delivered is of the quality desired or guaranteed. After this inspection the materials are distributed to the various departments to be worked up into the different parts of the car.

It requires a large number of special machines to work up the material into the many different shapes, as well as the most skilled labor to operate the automatic machines. For instance, suppose that the automobile requires fifteen or more bolts of the shape shown in Fig. 1. A hexagon bar of steel of the exact size as the head of the bolt is placed on supports and passed through the hollow spindle of a turret lathe. The main difference between this and the ordinary lathe is that in place of the ordinary tool post and holder there is provided a so called turret, which is revoluble and holds or grips two or more different tools at a time, as many as are required to finish the piece that is to be produced. For instance, in making the bolt shown in Fig. 1 four tools would be required, viz., one to cut down the bar from the hexagon to the larger round section, another to cut it down to the diameter of the threaded section, a die to cut the thread and a cutting-off tool to cut off the completed bolt. At the end of each operation the tool post is released automatically or moved back from the work by hand to bring the turret mechanism into contact with a cam or similar device, to revolve it and bring the next tool into the working position. When all the operations are completed the finished part is cut off from the bar and drops into a pan underneath the lathe, ready for use.

The advantages of this lathe are such as to command attention. It makes all the parts or pieces exactly alike in shape and size, consequently if the part has been inspected and tested the customer can always be sure to get a new part exactly interchangeable with a broken one. With the common lathe, where the machinist is obliged to caliper and measure each individual part, it would be impossible to secure this interchangeability; besides, the automatic machine produces the parts from ten to fifty times as quickly, so that the cost of manufacture is greatly reduced.

It is safe to say that every part that can be produced on a lathe can be turned out by a more or less automatic process, which is one of the reasons why the automobile can be manufactured so rapidly, and why the small builder cannot be so well equipped to manufacture automobiles as the larger manufacturer, and consequently is not able to compete in price. Owing to the large amount of hand work that a small builder is obliged to put into his cars, the cost of construction mounts up considerably, and when a customer wants a new part it may be necessary for him to send in the old one to have it measured up and duplicated.

In addition to automatic lathes, there are required in an automobile factory shapers, planers, drill presses, boring machines, air and electric drills and a large number of small wrenches, taps, drills, reamers and other tools. As I propose to deal only with the more important equipment, I will next take up the boring mill. This tool is almost universally used for boring out and facing cylinders where more than one are made in a single casting, usually twin cylinders. Boring mills are made in either the horizontal or the vertical form, but usually the vertical type is selected. This consists of a bed, a round table, uprights and a cross rail on which a pair of saddles is mounted having the necessary fixtures, including a boring bar, slotted to receive the tool, or, in many instances, a tool holder or head is attached. The method of operation is as follows: The cylinders are held on the revolving table in a suitable fixture, and the bar is allowed to feed down into the cylinders, the tool taking a cut on the inner circumference of the cylinder. In a horizontal mill the boring bar revolves, instead of the table, as in the vertical mill. Which is the more practical tool depends largely on the shape of the cylinders and the manner of holding them.

Ordinary individual cylinders are in many instances held in a chuck, such as is used on a turret lathe, and special tools are made to suit the particular case. I wish to state right here that the special fixture and jig department of many automobile manufacturers is certainly behind the times. Though it costs a great deal of money to get up and maintain such a special equipment, it ought to be the first consideration in a first class manufacturing plant. For the benefit of the lay public I may state that a jig or fixture is a contrivance by means of which every part of an automobile can be made in duplicate, and in less time than if it were laid out separately. Such fixtures are used on planers, drill presses, boring mills and milling machines, and it is in the use of these fixtures that the American manufacturer is far in the lead of his foreign competitors, as the moment he decides on the shape of a certain part he immediately begins to think of the method by which it can be made most rapidly, accurately and cheaply. As an illustration of the effect of the use of jigs and fixtures I may mention that within the last few weeks I have compared the prices and the output of two very prominent builders of 1½ horse power, two cycle, marine gasoline engines, both engines being of practically the same grade; with the same equipment one builder lists his engine at less than 40 per cent. of the price of the other. This great difference in price is explained by the fact that the one manufacturer has not the shop equipment to produce his engine as quickly and in as large quantities as the other, who has a jig and fixture for every part and turns out over 100 engines per day, and whose mechanics are all working continuously on the same parts, such as pistons, connecting rods, cylinders, etc., and soon become very expert with the tools and fixtures.

I might go on and write pages on the subject of equipment, but what has been said will suffice, and we will now pass on to the assembling of the various parts. It is absolutely necessary to have all parts made so as to properly fit their respective places, in order to avoid fitting by the assembler. Take, for instance, the motor. The crank case, we will say, is planed and drilled, the bearings are fitted with the necessary studs, the cylinder studs are in place, as well as all other parts of the case,



Cylinder Boring in a Vertical Boring Mill.

all of which have been exactly located by means of a gauge, jig or template, and inspected; the cylinders are bored and reamed, the plugs are fitted, and the facings, if any, are dressed; the water connections and such other parts as are usually carried on the cylinder are also located by means of a gauge or template. The pistons are fitted with their rings, the connecting rods and wrist pins are put in place, and every part that can be assembled before the en-

gine is finally put together should be thus assembled, as it saves time and trouble in the end. It is, of course, understood that all of these parts are fitted in their respective departments by skilled mechanics, who do nothing but fit up these parts. This work is usually done during the dull season, so as to have a good start when the season opens. The judgment of the manufacturer is at times heavily taxed to know just with which parts to begin and with which to stop. I have observed in more than one modern factory as many as thirty or forty engines delayed on account of some small part that could not be obtained as promptly as desired. There is practically no excuse for this, as every manager should be prepared to meet all conditions, yet it must be admitted that there are flaws in every system, and one has to learn by experience from year to year.

It is always necessary to have "all around" mechanics to make final adjustments and to do fitting, but the time is near at hand when every part will be made to a standard, and every operator will have his particular piece or part to make, with a special tool for the purpose. I have in mind two new and modern tools to which I wish to refer briefly before passing on to the assembling of the various parts. One of these tools is known as a multiple spindle tapping machine, and is one of the most useful machines one can have in a shop. In appearance it is similar to the ordinary drill press. The main feature of the machine is that it has two or more spindles arranged side by side, and operated by a friction device which allows the tap to go to the bottom of the hole, when it is reversed and backed out. The advantage of this machine is that two or more holes can be tapped without taking the part from the machine or changing the tap in the chuck, as would be necessary if a single spindle were used. I have just installed in an automobile factory a four spindle machine, which taps four holes of different size at the same time, insuring a saving in time and more uniform work, which today is one of the main considerations in manufacturing.



Double Spindle Tapping Machine.

The second machine referred to is called a rivet spinner, which is used to spin a head on a rivet instead of forming it by hammering on a hollow pointed tool. This machine is particularly useful for riveting such parts as lamp brackets, and can be used for many different shapes and styles of rivets, requiring, of course, a separate detachable tool for each shape of rivet, and makes a smooth and neat job, perfectly uniform.

But let us return to the assembling of the engine. All parts having been assembled, as previously stated, and marked or numbered, we start to assemble, say, twenty engines. That number of crank cases is brought and placed on horses or stands, and a certain number of men begin work, going from case to case. We will say one set of men place the crank shaft in the first engine and set the bearings, then go to the next engine, and while working on that another set of men fit the pistons and connecting rods to the first engine. The next operation on the first engine is the setting of the cylinders and bolting them in place, which operation is carried out by still another set of men. After the cylinders are in place the engine is turned over on its stand, and the oil pan is fitted and bolted to it, when the engine is turned right side up again and the gear case is attached. Next the cam shaft gears are put in place, then the cover on the gear casing, magneto, water pump, carburetor connections, exhaust manifold and flywheel. After that cotter pins are inserted at all points where they are required. It is understood that the cylinders are fitted with their valves, valve springs, etc., before they are sent to the assembling room, and that the pistons have their rings fitted and the connecting rods are bushed.

When the first engine is completely assembled it is taken to the testing stand and a new crank case is placed on the horse or stand to assemble another engine, the workmen beginning on this engine when they have completed their work on the first lot of twenty. The first engine is bolted down to the testing stand and connected with a dynamo by means of a coupling and is then run from one to two hours, as may be required, to make adjustments and see that the magneto and water circulation operate properly, and that the engine gives something like the normal horse power; also to adjust the carburetor, which remains constantly attached to the engine. After this test the engine is put in place on the car, and is connected up for the final test. A few manufacturers test the engine on a separate testing chassis, and after this test place it on the car on which it is to serve, but the writer does not approve of this practice, as the mounting of the engine on a frame requires considerable time, and this time might as well be saved.

(To be continued.)



Rivet Head Spinner.

The Two Cycle Gas Engine.

By E. J. Stoddard.

(Concluded.)

The salient feature of this kind of engine is the arrangement for dispensing with valves to a greater or less extent, and covering and uncovering ports at the proper time by the piston itself. In many engines of this kind a poppet valve, either automatic or mechanically controlled, is used to admit the explosive mixture to the crank chamber, which is then transferred to the other end of the cylinder, as above described.

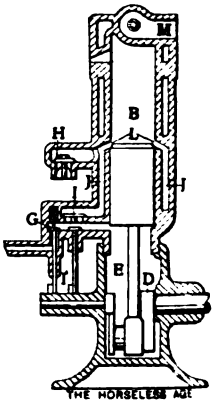


Fig. 1.—Fielding.

The feature of covering and uncovering the ports by the piston is quite old, and has been extensively used. It is shown in reference to the exhaust port of an engine

n British patent No. 760 of the year 1880, nd also British patent No. 4,881 of that ame year. In British patent to Fielding, No. 532 of the year 1881, an engine of his kind is described, which one would almost regard as a modern engine. A cylnder B closed at one end is extended at he other into a chamber E, which contitutes with the piston a compression ump and reservoir for mixture. The rank D is arranged within this chamber; t may, however, be placed outside, and in uch case the piston rod passes through a tuffing box in the chamber cover in the rdinary manner. A valve I, having been pened by a cam I_1 on the crank shaft, air nd gas are drawn into the chamber E y the up stroke of the piston, air entering hrough a check valve H, gas through a ppet valve G. By the down stroke part f the mixture is compressed into a chamer J, and on its completion passes through n annular or other port L into the cylnder. Meanwhile the previous charge has

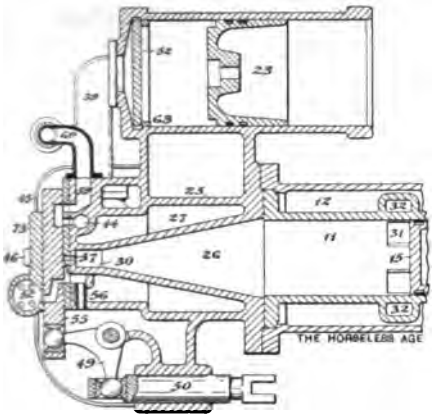


FIG. 2.—CLERK.

been ignited, and the products of combustion have escaped through an exhaust valve *m* actuated by a cam on the crank shaft. The air and gas are drawn into the cylinder by separate air and gas ports. The inlet ports L are operated in the way described with reference to the Sintz engine. The exhaust port *m* is, however, at the other end of the cylinder, and mechanically operated.

In British patent No. 811, February 25, 1881, to Haigh & Nuttall, a gas engine is shown in which the exhaust ports are uncovered by the piston passing over them, and the products are not only allowed to escape, but are drawn out by a rotary exhaust fan connected with said exhaust ports, and the new charge is drawn in through a slide valve, and is compressed by the returning piston.

In Dugald Clerk's engine, shown in United States patent No. 249,307 of November 8, 1881, the exhaust ports are uncovered by the piston in the way described, and the explosive mixture is compressed in a separate cylinder, and is then admitted, forcing out the products of combustion. The explosive mixture enters the working cylinder from the opposite end to

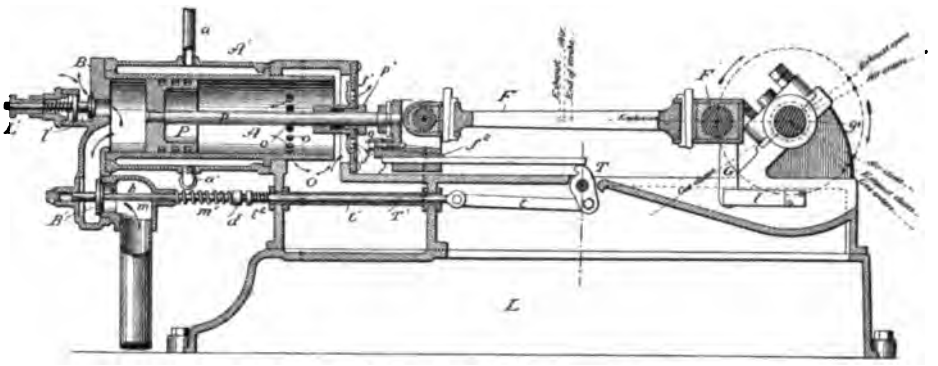


FIG. 3.—MAXIM.

that at which the exhaust ports are located, and is compressed by the returning piston, and fired in the way described. In Fig. 2, which is Fig. 4 of the Clerk patent, 31, 31, are the exhaust ports, which have been uncovered by the piston 15 at the end of its forward stroke; 24 is the cylinder for forcing the charge into the working cylinders 11 and 26.

An interesting form of the two cycle engine is shown in British patent No. 2,058, granted May 1, 1882, to A. M. Porteous. When the piston C moves toward the left it compresses an explosive mixture before it, and forces it through a check valve into the hollow of the piston. Upon the backward stroke of the piston the compressed mixture is carried by it to the other end of the cylinder, and the interior of the piston is put in communication with the cylinder at the right of the piston by a port through the side of the piston, registering with one end of a passage D; meanwhile a second charge has been drawn in at the left of the piston. The charge thus transferred to the right of the piston C is ignited, and exhausted through a port uncovered by the piston at the left hand end of its stroke.

Fig. 3 is taken from United States patent No. 279,657, granted to Hiram S. Maxim, June 19, 1883, upon an application filed December 1, 1882. In this engine a special compression chamber O was provided, surrounding the open end of the cylinder, and the piston rod passed through a stuffing box in the wall of this chamber. The explosive mixture was drawn into this chamber by the motion of the piston to the left, and was compressed therein by the piston movement toward the right until said piston passed over the ports *o*, at which time the exhaust was opened to the piston end of the cylinder, and the explosive mixture rushed through said ports, filling the cylinder, and was compressed and fired on the return stroke.

Similar exhaust ports are shown in United States patent No. 288,396, granted to C. W. Baldwin November 13, 1883, and also in United States patent No. 290,310, to the same inventor.

Fig. 4 is taken from the patent granted to Mr. Maxim January 1, 1884, on the application filed January 16, 1883; the number of the patent is 291,065.

In the Maxim patent No. 291,065 (Fig. 4) *m* are the exhaust ports opened by the piston passing them. B is a cylinder secured to the working cylinder A axially in line therewith, and having a considerably greater diameter than the cylinder A. B_1 is a piston working in the cylinder B, and secured upon the same piston rod as the working piston A_1. Thus at the forward stroke a vacuum is created in the cylinder

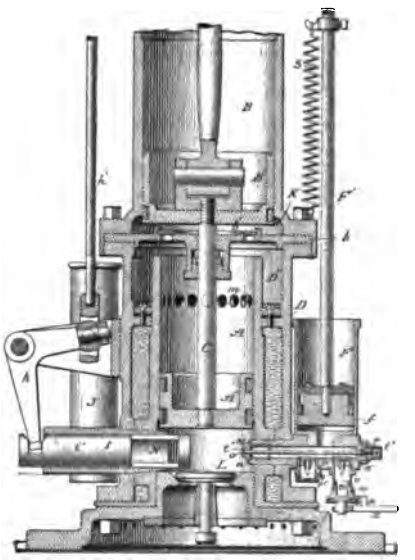


FIG. 4.—MAXIM.

B and space D_1 into which the exhaust gases flow through the ports *m*, when the working piston A_1 has passed said ports. This draws out all the exhaust gases and draws in a fresh charge at the other end of the working cylinder A, which charge is compressed on the return stroke and again fired. Upon the return stroke the burnt gases exhausted from the cylinder B are discharged through a check valve not shown in this figure, and pass up a chimney.

Fig. 5 is from British patent No. 4,816, granted October 10, 1883, to Williamson, Malam and Ireland. The pressure and

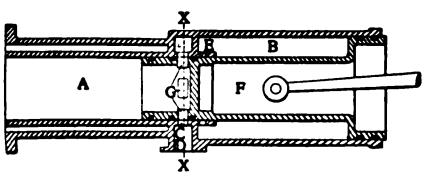


FIG. 5.—WILLIAMSON.

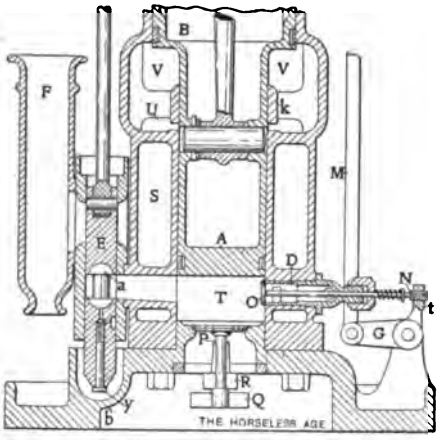


FIG. 6.—MAXIM.

vacuum cylinders A, B are arranged end to end. The charge is exploded in the pressure cylinder A; the products are then reduced to atmospheric pressure by communicating with the air through the ports G in the piston walls registering with the ports C in the cylinder walls. Finally they are allowed to expand into the cylinder B (in which a partial vacuum has been produced) when the ports G have passed beyond the ports C, and register with the ports E leading into the cylinder B. A new charge then enters the first cylinder and the cycle recommences.

In United States patent No. 295,415, granted to Menck and Hambrock, March 18, 1884, is shown an auxiliary exhaust port opened by the piston in passing it.

United States patent No. 301,078, granted to C. H. Andrew July 1, 1884, shows two pistons rigidly connected together, one of which compresses the charge into a reservoir, and the other is the working cylinder, the piston of which passes by an exhaust port to let the product of combustion escape, at which time the new charge is admitted from the reservoir, filling the cylinder and pressing the remainder of the combustion gases out of the exhaust port. This charge is compressed on the return stroke and fired.

Fig. 6 is taken from United States patent No. 302,271, granted to H. S. Maxim July 22, 1884, on the application filed January 19, 1883. It shows a device in the main like that described in Mr. Maxim's earlier patent. In this figure the chimney through which the exhaust gases are discharged is also shown. The piston A passes the exhaust ports U toward the end of the up stroke, exhausting the spent gases into the vacuum drawn by the piston B and drawing in a new charge.

United States patents Nos. 305,464 and 305,467, to P. Murray, Jr., show engines embodying the principle briefly described with reference to the White patent. British patent No. 12,431 of 1884, J. J. Purnell, shows a compression chamber at the forward end of the working cylinder, through a stuffing box in the wall of which the piston rod passes. The explosive mixture is drawn through a check valve into the compression chamber, is compressed on the forward stroke of the piston, and is admitted to the explosion chamber or explosion end

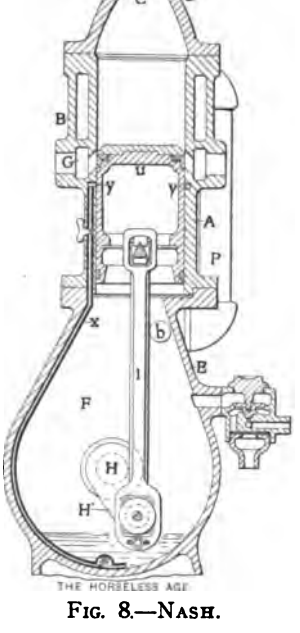


FIG. 8.—NASH.

of the cylinder, when the piston has passed ports through the cylinder wall. The exhaust valve, located at the explosion end of the chamber, is lifted mechanically.

British patent No. 3,471, March 17, 1885. W. W. Pope, shows an engine in which a cycle is completed in one revolution. On the in-stroke of the piston *a*, a charge is

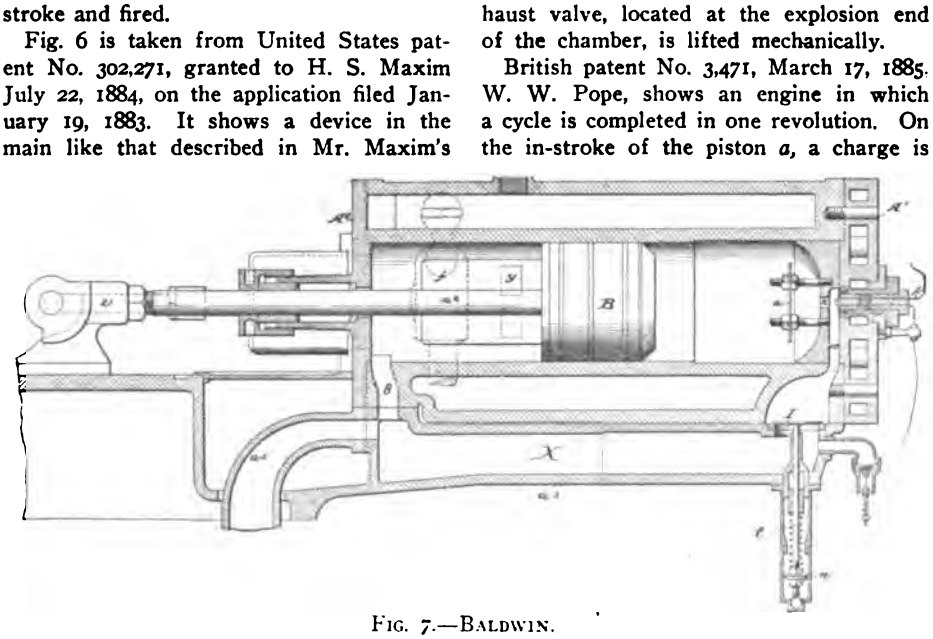


FIG. 7.—BALDWIN.

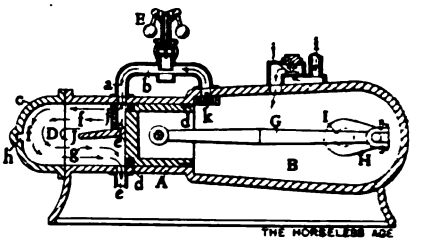


FIG. 9.—NASH.

drawn through the valve *b* and pipe *c* t the front end of the cylinder, while th charge on the other side of the piston i being compressed. On the out-stroke th compressed charge behind the piston i fired and the charge in front forced int the pipe *c;* when the piston uncovers the ex haust ports *d* the pressure in the cylinde falls below that in the pipe *c,* which allow the charge in the pipe to pass through th valve *e* in the cylinder. The piston in re turning closes the exhaust port and com presses the charge. It is, of course, her clearly recognized that it is necessary t relieve the pressure of the exploded gase in the cylinder before the new charge wil flow in.

United States patent No. 322,650, granted to C. Shelburne July 21, 1885, shows a device having an exhaust pump ahead of and connected upon the same piston rod with the working cylinder, like that of Maxim's, above described. Ports in the walls of both the working cylinder and the exhaust cylinder are opened simultaneously by their respecting pistons passing them.

United States patents Nos. 325,377, 325,378, 325,379, granted to C. W. Baldwin September 1, 1885, show engines in which the exhaust ports are uncovered by the piston passing them, and in which the charge is compressed in front of the working piston into a reservoir, and admitted through an automatic valve to the combustion chamber, when the pressure of the ignited gases is sufficiently reduced. Deflecting plates to prevent the incoming mixture from passing immediately to the open exhaust are employed. In Fig. 7, which is taken from No. 325,379, *a* is the deflecting plate.

In April, 1886, United States patent No. 339,325 was granted to Clark Sintz for a gas engine in which the exhaust passes through ports in the engine cylinder uncovered by the piston passing them.

United States patents Nos. 351,393, 351,394 and 351,395, granted October 26, 1886 to P. Murray, show exhaust ports opened by the passing of a piston.

Fig. 8 is from United States patent No. 386,209, granted July 17, 1888, to L. H. Nash. It shows the compression in the crank case, the exhaust through ports in the cylinder wall opened by the passing of the piston.

Fig. 9 is a longitudinal central section of a Nash engine, shown in patent No. 386,211 of July 17, 1888, and Fig. 10 is a similar view of a modified form of the same engine. Figs. 11 and 12 illustrate

other modifications. The specification says, in briefly describing Fig. 9:

"I have shown * * * a gas engine in vertical longitudinal section, the piston being in the position of its extreme forward stroke, and the arrows illustrating the entrance of the charge and its return flow in the cylinder to drive out the waste products of the preceding charge."

Fig. 10 "represents a modification of the means for dividing the combustion chamber." Fig. 11 "represents another modification of the means for dividing the combustion chamber," and Fig. 12 "a cross section thereof." The specification says, lines 36 to 47, page 1:

"In carrying out this operation the means for effecting the division of the combustion chamber may be carried by the piston, and is therefore movable or formed within the cylinder walls as a fixture with identical effect and result, and my invention in this particular is, broadly, a means arranged within the or forming a part of the combustion chamber whereby it is formed into separate spaces or passages for effecting a return flow of the incoming charge upon itself, for the purpose stated."

And lines 94, page 1 to 12, page 2 read as follows:

"My plan embraces a division of the combustion chamber, whether by fixed or movable means, so long as such means effect the in-flow of the charge in a manner to reverse its direction course within the combustion chamber, for the purpose stated when" (Figs. 9, 11 and 12), "such means are shown as being formed upon and moving with the piston and in" (Fig. 10), "such division means are shown as being formed within the cylinder walls. The moving division device may be a diameter projecting plate, J, as in" (Fig. 9) "or a tubular projection, as in" (Figs. 11 and 12). "In either form it is placed upon the face of the piston and projects backward into the cylinder space so as to divide it into two passages or spaces, *f* and *g*, as shown in" (Fig. 9).

And lines 43 to 55, page 2, it is said:

"For small engines these plans will answer very well, and they have the advantage of economy and simplicity; but for large engines the heat of the burning gases is too great to admit of the use of these means for dividing the in-flowing from the out-flowing gases, and therefore I prefer in large engines to form the inlet passage *f* in the cylinder wall, as shown in" (Fig. 10), "so that the in-coming charge will be conveyed directly to the engine cylinder and turned back over the end of the wall J into the combustion chamber space *g*, driving out the products of the preceding charge."

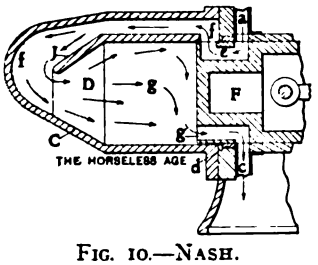


Fig. 10.—Nash.

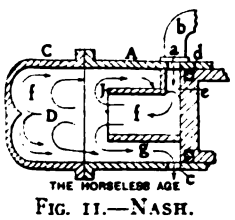


Fig. 11.—Nash.

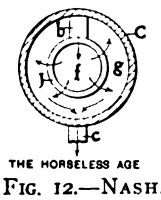
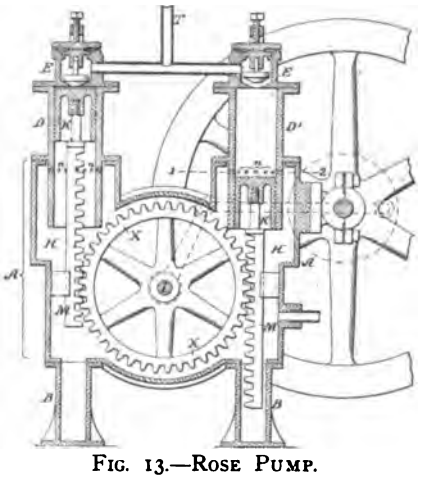


Fig. 12.—Nash.


Fig. 13.—Rose Pump.

In a drawing of the United States patent No. 181,144, granted to John W. Collet August 15, 1876, for a submerged pump A' are apertures through the cylinder walls that act as auxiliary inlet ports after the piston has passed them. There is a check valve on the piston.

Fig. 13 is taken from United States patent No. 309,493, granted to Thomas Rose for a pump December 16, 1884. The Rose specification says:

"My invention relates to an improvement, described and claimed hereinafter, in that class of pumps in which the fluid to be forced voluntarily enters the barrel through openings in the same when the piston is at the limit of its inward movement; and the main object of my invention is to so construct a pump of this class that, while it can be used for pumping water and other liquids, it shall be especially applicable to the pumping of gas. * * * There are a series of openings, *n*, in each barrel of the pump, and when the piston of each barrel is at the limit of its inward movement these openings afford a direct communication between the inlet chamber and the interior of the barrel. The pistons are without valves." * * *

SUMMARY.

The Nash patent No. 386,211 describes a device having a passage in the cylinder walls, through which the compressed explosive mixture passes into the combustion chamber and describes the usual deflecting plate on the piston, like that of the Sintz patent, as forming a modification, or alternative form, of said passage.

The Ridealgh & Fairman German patent shows an exhaust port set in advance of the inlet port with one form of said passage. The Day English patent, Fig. 13, shows this relative arrangement of the exhaust and inlet ports with the Sintz passage or deflecting plate. In Fig. 13 M is the explosion chamber, O the deflecting plate, N the exhaust, L the passage for the intake. The exhaust port is obviously in advance of the intake—that is, in using the deflecting plate and inside passage, instead of the passage in the cylinder walls with the specified relative position of the ports.

Even without the Day patent, what new idea is there in the Sintz device?

A court has said one of the criterions of invention is that on first seeing the device it produces the impression of a surprise. In view of the German patent, does the Sintz patent produce any such effect? And even if it did, is not the Day patent a perfect anticipation?

The Rose patent shows that cylinder apertures for inlets to gas pumps were well known before Sintz's device. What novelty is there in putting them into the pump to a gas engine? And even if there were, we see the same principle applied in gas engines, as above noted.

In forming one's judgment upon this question he should remember that it is necessary that a combination should produce some effect as a whole; it is not even sufficient that there should be one new element, unless that new element gives a new effect or mode of operation to the entire combination.

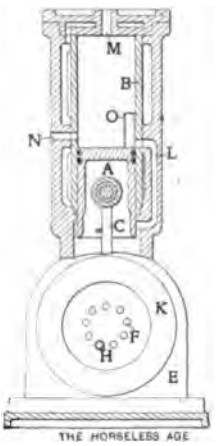


Fig. 14.—Day.

As long as each element acts in its own appointed way, performing its function in the combination irrespective of the other, there is no patentable novelty in the combination. See the opinion of the Court of Appeals of the District of Columbia in the case of Hawley, 121 O. G. 690.

Automobile Situation in Manitoba.

The firm of Joseph Maw & Co., Winnipeg, Man., say that the demand for automobiles in that part of Canada is quite active, and that they have found it difficult to obtain deliveries from factories. The streets of Winnipeg are fairly good within the city limits, and are quite passable outside of the city in fine weather, but in wet weather it is out of the question to travel over the Red River Valley roads with any degree of satisfaction with an automobile. Fifty or 60 miles west of Winnipeg the soil is lighter, so that the roads are very good; that is, in their native state. Three firms in Winnipeg handle automobiles.

Lubrication.

By C. E. T.

A visit to the automobile salesrooms in most any city will reveal a large number of second hand cars that were taken in exchange for others because they were worn out or too expensive to keep in repair. A close observer will quickly recognize that the condition of most of the so-called worn-out, high grade cars that find their way back to the dealers is due to gross neglect. There are so many elements in the proper use and care of cars that it would be impossible to suggest any fixed set of rules to govern the acts of the drivers and caretakers that would cover every troublesome point they have to deal with in the various makes of cars, but there are some points which are common to all makes, among which is that of lubrication.

The subject of lubrication may not appear a very large matter, yet it is a great factor in making a car run smoothly and reducing the cost of repairs, as well as adding to the life of the machine. To learn the proper use of lubricating oil one must consider the nature and composition of the oil itself, as well as the machine that it is to be used upon. Oils are divided into three classes, according to their chemical composition and properties, viz., fatty or fixed oils, essential or volatile oils and mineral oils.

Fatty oils are of either animal or vegetable origin, and among those that are most commonly used for lubrication may be mentioned sperm, lard, meat-fat, tallow and various fish oils. Of the mineral oils petroleum forms the basis of that in most general use. Petroleum may be divided into two classes, residual and distillate oils. The residual oils are products remaining after the light grades have been distilled off, and some of these remaining products are used in the manufacture of lubricants. The petroleum tar that remains from the residual oils is again distilled, deodorized and decolorized by chemical treatment, and manufactured into greases, paraffine and neutral oils. These last products are called distillate oils.

During recent years much has been written upon the subject of lubrication from a theoretical standpoint, all of which is of value for the scientifically inclined and presents an interesting field for study. Many testing machines and instruments have been used in laboratories to determine the coefficient of friction, and have proven that the same set of lubricants will give different results under variable conditions of pressure and speed. This goes to show that scientific tests are of little value to determine what lubricant should be used for practical work.

The most practical method of making a selection of lubricating oil is by actual trial upon the machine to be lubricated, and that grade of oil should be selected which most reduces the friction and stays longest upon the bearing without depositing any foreign matter. A bearing should always be bright and clean, and any oil that leaves a film of varnish-like deposit causes a loss of power and extra resistance to the revolving oil and should be discarded at once. Lubricating oils should be of sufficient consistency to keep the wearing surfaces apart. Bearings that are badly worn require a heavy oil, one that will act as a cushion and stay where it is put. This point might be best understood by recalling the fact that the oil globules are larger and stronger in heavy oil than they are in light oils, and that these oil globules revolve and work the same as the steel balls in a ball bearing. When the bearing is worn and the space is large oil should be used that will form large enough globules to fill the space around the bearing and sustain the weight upon it and then the oil will revolve around like steel balls. Using light oil on a worn-out bearing is like substituting lead balls for steel in a ball bearing. Light oil globules, like lead balls, will flatten under pressure and slide over the surface instead of revolving, which will give unsatisfactory results. Light oils can be used to good advantage where there is only a small space around the bearing and the pressure to sustain is not great. For general use a moderately heavy, non-gumming oil should give the best results in automobile lubrication.

To select a suitable oil for lubrication is sometimes quite difficult, for the reason that there is but little to guide the purchaser outside of a practical test and common sense. Gravity and viscosity are no measure of the value of oils, for the reason that the compounders of oils cannot make such oils as are needed at such prices as purchasers are willing to pay. About every dealer has a standard oil and thinks it the best, but no one oil can be compounded that will meet all requirements. The cost of oil should not be considered to the detriment of good results. Oils prepared by the aid of acids will attack brass and should not be used. Neutral oils are by far the best. Compounding mineral oils with the proper amount and kind of fixed oils adds to their lubricating value.

Cylinder oil should be moderately quick acting, and should preferably be a pure mineral product, although a slightly compounded oil sometimes works satisfactorily; it should possess both body and spreading qualities, and remain upon the valves and walls of the cylinder without evaporating, without leaving a resinous deposit. A badly worn engine requires a heavier oil than an engine in good condition. The feeding of oil to the cylinders should be proportioned to the condition and speed of the engine.

The application of oil to any part of the machine requires the utmost care; every oil hole and cup should be wiped before applying the oil, so that no dust, grit or foreign substance will be conveyed by the oil to the bearing.

Book Review.

Motor Vehicles for Business Purposes, by A. J. Wallis-Tayler, published by Crosby Lockwood & Son, 7 Stationers' Hall Court, Ludgate Hill, London, and D. Van Nostrand Company, New York. Price, $3.50.

An introductory chapter on the subject of commercial vehicles generally is followed by chapters on resistance to traction and power required, and these are followed by generally quite brief descriptions of a large number of vehicles. One wonders what class of readers the book is intended for, manufacturers or users. The leading chapters, on traction resistance and power required, would indicate that the author addresses himself primarily to manufacturers, but the rest of the book is generally so devoid of detail that it would be of little use to the prospective commercial vehicle builder. It would be of even less use to the commercial vehicle user, as nearly all the types of vehicles described are now obsolete. In order not to make this too apparent the author does not give any dates. His first example of a petrol cab is the "Leo," designed by Leon Lefebvre toward the end of the last century, in 1897 or 1898. The description makes it appear as though this was a modern vehicle and still being manufactured. The same applies to the next example, the Triouleyre petrol cab. This article contains the following quaint description of a gasoline motor: "The motor * * * consists of a cylinder with a double casing, an explosion or combustion chamber and a frame upon which is mounted the driving shaft." On page 69 we are informed that "electric cabs built by Messrs. Morris & Salom for the Electric Vehicle Company, of New York, have been sent to both London and Paris and run on the streets of these cities with more or less success." Considering that Morris & Salom built their cabs in 1896 and 1897, it would seem that their vehicles must have more than the usual durability, if they are still running in London and Paris.

Almost the entire contents of the book are clipped, and even the clipping was done with little judgment, as appears from the above comments. In the latter portion of the book are some descriptions of English heavy vehicles of fairly recent design, and this portion might possibly be found of some value by the English reader, but how is he to judge which of the cars described are fairly up to date and which are entirely obsolete?

From the title page of the book we learn that the author has written books on subjects connected with bicycles, roads and streets, wire rope tramways, ice making machinery, cold storage, tea machinery, sugar machinery, sanitation of dwelling houses, bearings and lubrication, etc., etc. The familiar saying about the "Jack of all trades" therefore probably applies in this case.

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...EVERY WEDNESDAY...

Devoted to Motor Interests

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Garage Number.

Our issue of May 30 next will be a special number devoted entirely to the housing, care and repair of automobiles; in other words, public and private garages. Among the special subjects which we expect to deal with in this number are the laying out of new buildings for garage purposes, with the necessary pits, turntables, washstands, runways and special elevators, entrance doors, etc.; methods of lighting, heating and ventilation; garage equipment, including oil and fuel storage systems, battery charging sets, cleaning outfits, compressed air plants, portable cranes for moving engines and other heavy parts; repair department equipment, including special machine shop appliances, tire vulcanizing outfits, etc.; checking and accounting systems for public garages; rates charged for repair work, housing, washing, recharging.

There are undoubtedly among our readers many with long experience in practical garage work to their credit who feel competent to write upon topics connected with garage practice, and to all such we extend an invitation to contribute to this number. All matter accepted will be paid for. It will be preferable to select some special subject for discussion, rather than to write on the general subject of garages. All contributions should be in our hands by May 15.

"Running Down" Competitors' Manufactures.

It is a generally accepted maxim of business that in dealing with a possible customer the salesman should devote himself to explaining, in the most convincing terms, the merits of his own goods, rather than in expatiating upon the defects of his competitors' lines. Unnecessarily calling attention to the demerits of any class of goods is, in the end, detrimental to their sale, and the salesman who decries the wares of a rival may not only prevent the latter's securing the business, but may deter the customer from making any purchase at all.

It is, unfortunately, not uncommon to find automobile agents, under the stress of intense business rivalry, indulging in the practice of "running down" their fellows, and, in their conversations with prospective purchasers, dwelling almost as fervidly upon the demerits of their competitor's cars as upon the merits of their own.

This practice is not only contrary to business ethics, but detrimental to the welfare of the trade. It is not uncommon for an intending automobile purchaser to be so unfavorably impressed by the bad things said of various makes of cars by rival agents that he actually begins to doubt whether there is such a thing as a good car, and very likely indefinitely postpones buying.

The buying public may be relied upon to find out for itself the defective points of motor cars, without special efforts for its enlightenment in this respect being put forth by agents.

If the adverse statements made by agents in regard to competing cars were always within the bounds of truth they might perhaps be no more harshly characterized than as evidences of business jealousy and bad taste, but it is feared that there is a deal of harmful misstatement served out to the public by motor car salesmen.

It is especially in regard to innovations in technique that misleading and perhaps even malicious statements are too often circulated. Any feature of a competitor's car which widely departs from usual practice is likely to be at least harshly adverted to, if not ignorantly decried, by the less honorable representatives of rival makes of cars. Such novel methods as air cooling, the two stroke cycle and change speed gears of other than the usual type have

been the objects of an enormous amount of generally unwarranted abuse on the part of hostile dealers, but it is a fact that no amount of condemnation can permanently prevent the success of any technical method which shows merit.

It should be rememberd that these methods, which are at present novel and perhaps crude in their embodiment, may become the accepted methods of a few years hence, and it does not behoove the automobile dealer to condemn them, as he may, in the near future, be fated to handle and recommend cars employing them. Much less does it behoove him to wilfully mislead the public mind in regard to such innovations.

It is undoubtedly true that the majority of agents refrain from dilating upon the shortcomings of other cars and are willing to allow new methods of automobile practice to be worked out, without prematurely condemning such attempts, but it can hardly be denied that there is a remnant which, by their failure to impose upon themselves the ordinary restraints of truth and business honor, sadly lower the tone of the automobile trade and beget doubt and confusion in the mind of the buyer, if not actually injuring the business as a whole.

Spark Coil Efficiency.

It is of the greatest importance to the automobile art that the ignition problem at large is at last beginning to be seriously studied by electrical engineers as an important electro-technical proposition. In a recent number of the *Electrical World* appears a research by Prof. Henry A. Perkins, which is of the kind that, if persistently and intelligently followed out, will lead to an understanding of ignition phenomena and an appropriate solution of the problem.

Prof. Perkins' investigation deals chiefly with the heat developed by the discharge from a commercial jump spark coil, under various conditions of sparking distance, battery voltage and rate of vibration of the trembler. The energy supplied to the coil primary being measured, the efficiency of conversion under different conditions was obtained. The discharge was arranged to take place between platinum terminals within a closed glass tube and the heat dissipated was measured by an electrical resistance method.

When the coil was energized by six dry cells and was passing 0.6 ampere of current in the primary, the heat given out by the spark in jumping a gap of one-eighth inch was found to amount to about 0.82 watt, or about one-seventy-fifth of the heat given out by an ordinary 16 candle power incandescent lamp. Under these conditions an efficiency of about 18 per cent. was realized—that is, but slightly over one-sixth of the electrical energy supplied the coil reappeared as heat in the spark. It was found that both the heat of the spark and the efficiency of conversion increased with an increase in length of the spark gap, the efficiency ranging from 13 per cent. with a one-fortieth inch gap to 42 per cent. with a gap of nine-fortieths inch. The latter efficiency was the highest obtained for the particular coil under test, and, considering the conditions under which coils are used in practice, is undoubtedly much higher than generally attained in service. An efficiency of 20 per cent. is probably a high value for coil economy in practice. Such low efficiencies of conversion as here found are decidedly discouraging so far as battery economy on multiple cylinder cars is concerned, and Prof. Perkins is rather doubtful as to the probability of future improvement in this regard.

If it be found that more heat than generally supplied by commercial jump spark coils be actually required at the sparking points, in order to produce thoroughly satisfactory charge inflammation in multiple cylinder engines, and that spark coil efficiency cannot be substantially improved, it would seem that the only satisfactory solution of the high tension ignition problem will be the employment of coils of larger output supplied with current (either directly or indirectly) from mechanical generators.

The author quoted concludes from the fact that both coil efficiency and output increased with the spark length that the distance between the sparking points should, in practice, be as great as will permit the discharge to pass under the compression employed. This conclusion may be somewhat hasty, and it is especially to be regretted that the experiments in question were performed with the spark gap in air at atmospheric pressure and not under a pressure which would have duplicated the pressure conditions existing in the combustion space of a motor. It is quite possible, however, that the mere length of the discharge, distinct from its heat content, may have a beneficial effect upon celerity of ignition, by bringing a larger quantity of gas into contact with the igniting agency.

It is to be hoped that determinations may soon be made of the heat given out per spark by a successful commercial contact spark plug under average compression, and that this value may be compared with the heat evolved by the jump spark under practical conditions.

When this is done it will be more definitely known whether the energy delivered by jump spark coils must be increased in order to properly effect ignition. If this should prove to be the case it will seem incumbent upon coil makers to increase the output of their coils, increase their efficiency, if possible, and seek a source of energy which shall be cheap to operate and unfailing in its performance.

Two Gallon Fuel Efficiency Contest.

In another part of this issue will be found the complete rules of the 2 gallon efficiency contest of the Automobile Club of America, which is to be held Saturday, May 5. The most interesting feature, perhaps, of these rules is the formula to be applied in classing the cars. The general basis of classing is the fuel consumption per ton mile, but it is recognized that large cylinders naturally have a greater fuel economy than small cylinders, and the mechanical efficiency of a large machine embodying many refinements is naturally higher than that of a small car, and for this reason a sort of handicap has been placed on single and double cylinder motors, and an addendum introduced in the formula to give small cars an equal chance with large ones. Two cylinder cars will be credited with only 75 per cent. of their actual weight, and single cylinder ones with 70 per cent. In a first attempt of this nature the handicaps or allowances must naturally be more or less guesswork, and the contest committee express the hope that in another year's contest the handicaps can be made much closer by studying this year's results. It appears to us that the two cylinder machine has been handicapped rather heavily, as compared with the single cylinder; for, if halving the number of cylinders may be expected to reduce the fuel consumption 75 per cent., as is implied by the handicap placed on the two cylinder car, it would

seem to be reasonable to credit the single cylinder car with only 75 per cent. of 75 per cent., or about 56 per cent. of its weight.

As with the handicap placed on the single and double cylinder cars, there is considerable uncertainty as to the proper value for the addendum to the weight introduced in the formula. In the case of a car weighing with passengers 1,600 pounds, this addendum amounts to a majoration of its performance of 50 per cent., while in the case of a car weighing with passengers 3,200 pounds, it amounts to a majoration of only 25 per cent. The greater the value of this addendum the better it would be for the small machines.

The contest is one of considerable practical interest, and the rules seem to have been worked out with much care, and to be calculated to lead to accurate results. The expense of competing in the contest will be very small, especially to manufacturers having cars and drivers in New York, and it is to be hoped that the industry at large may support the event.

Commercial Vehicle Information.

With the increasing interest in commercial automobiles and the growing activity in the fields of their production and use, an increased amount of space in the reading columns of THE HORSELESS AGE will be devoted to this type of car. This announcement does not in any way signify a new departure, as we have always laid the greatest importance on the practical applications of the motor car, and published a special number on Business Automobiles as early as February 6, 1901, and another July 5, 1905. The very fact that we have always confined ourselves to the more practical aspects of automobiling, and avoided trivialities such as sport and society items, enables us to thoroughly cover the field of both commercial and pleasure vehicles in our columns. There is a very close relationship between the two types of vehicles, and the principles underlying their construction and operation are the same. A carburetor that will work well on a pleasure car will also serve efficiently on a commercial vehicle, and the same thing applies to almost every other part. For this reason it is almost certain that the commercial vehicle industry will in the future be largely controlled by the present pleasure car builders, as is the case today.

While we will devote increased space to the commercial vehicle in the future, it is not our intention to boom it, as appears to be the tendency of the special press. We shall print full and detailed descriptions of all new cars appearing on the market, general technical articles containing hints on design, operation and care, and unbiased, truthful reports of actual experiences with commercial automobiles, thus following the same lines as we have pursued in dealing with the pleasure automobile. Owing to the fact that THE HORSELESS AGE has actively advocated greater attention to commercial applications on the part of manufacturers for a number of years past, and has closely followed and recorded all developments in this field, we now count among our readers a large number who are specially interested in motor delivery wagons, trucks, omnibuses, etc., and we propose to retain their interest and gain that of others by offering an increased amount of useful and reliable information on the subject.

Process of Finishing Cars.

The finish of an automobile body of the better class is a matter involving a multiplicity of details of which the average observer of the finished product has small conception. The bodies come from the wood shop coated with a grayish substance known as priming, the object of the priming being to protect the wood from atmospheric changes while waiting for the painters. This priming is carefully removed when the body is sent to the paint shop and the whole surface carefully gone over with sandpaper and given a coating of lead paint. The next process is known as puttying and glazing, all minute seams and any depressions or imperfections in the surface being carefully filled. The body is then given a coat of what is known as "half and half," composed of lead paint and a filling compound known as "rough stuff." After this is thoroughly dried the entire surface is given four coats of clear "rough stuff." Next follows a coat of dark colored paint called guide stain. The body is now rubbed down to a perfectly smooth surface and any traces of the guide coat remaining would indicate imperfections in the surface. Should any such appear they are carefully corrected. The first coat of color is now applied and the whole body again rubbed down with sandstone and lump pumice and once more examined for imperfections. If the ultimate color of the vehicle is to be black or green the first coat of color is the same as that of the final color, but if it is to be lake, maroon, carmine, blue or brunrouge the ground color is usually somewhat lighter than the finishing color.

The first coat of color is carefully rubbed down with curled hair and felt and the second coat applied.

All colors other than black or green require three coats of color and a coat of glazing, the glazing being a transparent color, although not properly a varnish. After the body is rubbed to a satiny finish over the last color coat it is given a first coat of rubbing varnish, which is rubbed down with pumice water and felt. Then comes a second coat of varnish, followed by another rubbing. The striping is then applied, after which the body is sent to the trimmers, who attend to the upholstering and other details which come under their supervision. Following this the body is returned to the paint shop, placed in a dustproof room and given a final coat of varnish. It then goes to the "hang up" job and it is placed upon the chassis, after which a special painter goes over the whole and, with small brushes, gives any necessary finishing touches to the body and chassis. The whole process takes a good deal of time owing to the number of necessary dryings and rubbings between the applications of the various paints and varnishes, about six weeks usually being required from the time the body is received until the finished car is ready for delivery. The process here described is that applied in the paint and trimming department of the Electric Vehicle Company, of Hartford.

Graphite Lubrication Tests.

We have been furnished with the results of some tests on the lubricating properties of graphite, made by Professor Goss, of Purdue University. The graphite used was mixed with kerosene, as some "vehicle" is necessary, and kerosene having only a low lubricating value does not greatly affect the lubrication due to the graphite. The first test was made with pure kerosene, and all the subsequent tests were made with kerosene mixed with Dixon's flake graphite to the consistency of a thin paste. With kerosene as lubricant the maximum load which the bearing would carry was 50 pounds per square inch, and the lowest friction coefficient .00547. Next, a mixture by weight of two parts kerosene and one part graphite was made, which, when applied, momentarily increased the friction coefficient, but later reduced it to 54.1 per cent. of that found with kerosene, and increased the maximum load which the bearing would carry to 110 pounds per square inch.

In order to ascertain the endurance of the graphite as a lubricant all the parts, including the rubbing surfaces, were rinsed with kerosene, and the machine operated again with only kerosene as a lubricant, but this time with a load of 111 pounds per square inch. Under these conditions the lubrication was aided by particles of graphite adhering to the rubbing surface, which could be noticed by examining the surface with a microscope. After eight days of running no diminution in the running effect could be discovered.

ELECTRIC IGNITION

The Spark Coil.

(Concluded.)

In the practical use of a coil we require a device which performs the function corresponding to the brushing of the primary lead against the battery terminal by hand in the above described experiment; that is, rapidly making and breaking the primary circuit. It is also very desirable that this contact maker or interrupter should be of such construction that it makes and breaks the circuit a number of times in rapid succession, thus producing a number of sparks at very short time intervals, which insures greater certainty of ignition than a single spark. This succession of makes and breaks was secured in a number of early machines by what was known as a trembler or mechanical vibrator. A typical device of this kind, the De Dion trembler, is shown in Fig. 7. In this illustration A is a base plate of insulating material (hard fibre) carrying a post B, to which is secured a long spring steel blade C, provided at its free end with a nose D. The latter bears against the surface of a cam E, consisting of a circular disc with a notch in its circumference. The cam is secured to a short shaft F passing through the base plate and driven from the engine shaft at one-half the speed of the latter by gear wheels G G. The spring blade C carries near its middle a platinum contact point H, which is ordinarily kept at a slight distance from the platinum tipped point of the contact screw I passing through and secured in the post J, which in turn is secured in the base plate A. The cam E turns in the direction indicated by the arrow, and when it comes around to a position where the nose D drops into the notch in its circumference the spring C is set into vibration and causes a number of rapidly succeeding makes and breaks. Platinum or platinum-iridium contacts are used because these metals are not so easily burnt away by the extreme heat of the electric spark.

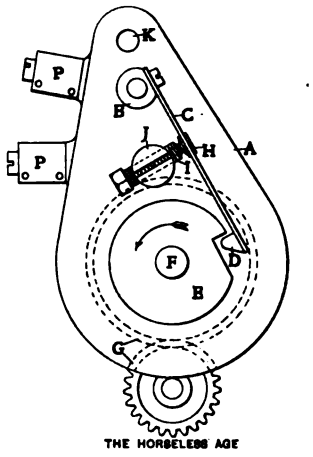


FIG. 7.—MECHANICAL VIBRATOR.

It is here considered that the engine is of the four cycle type and passes through one cycle during two revolutions of the crank shaft or one revolution of the cam shaft F. Hence there will be one series of sparks per cycle, or every two revolutions of the engine, as is required for ignition. The cam E is secured to the shaft in such a manner that the sparks occur just before the beginning of the power stroke, after the charge has been admitted to the cylinder and compressed therein. Provisions are, however, made for allowing the time of ignition to be varied with relation to the engine cycle. The base plate A, it will be noticed, is mounted concentric with the cam E, and is so arranged that it can be rocked one way or the other by means of a link and lever attachment secured at K. It is obvious that by moving the base plate in the direction the cam rotates the time of ignition is retarded, and by moving it in the opposite direction the time of ignition is advanced. The mechanism here shown is protected by an aluminum cover, held to the base plate by thumb nuts. The electric connection to the posts B and J is made by means of binding screws P P at the side of the base plate.

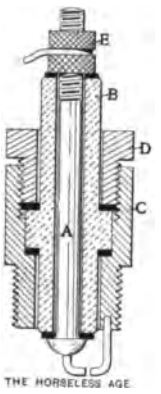


FIG. 8.—SPARK PLUG.

THE SPARK PLUG.

Another element in the make up of a simple jump spark system is the spark plug. A typical form of plug is shown herewith. It consists of a central rod A, which is clamped into a porcelain insulator B, which, in turn, is clamped into a metal housing in two parts, C D. Asbestos gaskets or washers are interposed between the metal and porcelain to prevent cracking of the latter, due to unequal heat expansion of the two materials, and also to give a gas-tight joint. The outer shell C is provided with a screw thread, and screws into the wall of the combustion chamber. The rod A and the shell C carry at their inner ends short lengths of platinum or nickel alloy wire, which are bent toward each other and come to within a distance of one-thirty-second inch of each other. The central terminal A is provided at its outer end with a binding screw E.

The simple jump spark system here referred to is completed by an electric switch, which admits of opening and closing the circuit at will. The various parts comprising the ignition outfit are now connected together electrically as shown in the diagram (Fig. 9). It will be noticed that the current from the battery flows through the primary of the coil from where it is led by a wire to the trembler, and from the trembler it returns through the switch to the battery. One terminal of the secondary winding of the coil is connected to the spark plug, and the other is grounded, and as the outer shell of the spark plug is in contact with the mass of the engine, and therefore grounded, the secondary circuit is complete except for the one-thirty-second inch gap at the spark plug terminals.

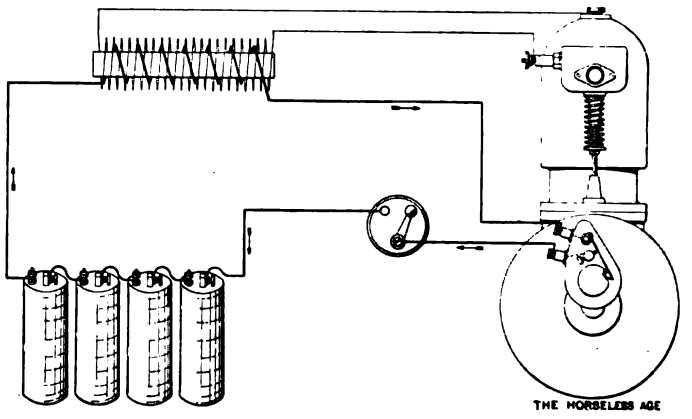


FIG. 9.—DIAGRAM OF CONNECTIONS.

The action of the outfit may now be easily understood. Every time the spring of the trembler is set into vibration a series of current impulses is sent by the source of current through the primary of the coil, and a series of high tension electric impulses is thereby induced in the secondary winding of the coil, each of which impulses causes a spark to jump at the spark plug terminals. It may here be pointed out that the theory that a series of sparks are produced by this apparatus every time the timer spring is set into vibration is not universally credited, some holding that only one spark is produced.

THE MAGNETIC VIBRATOR.

Although the mechanical trembler in the form here shown was used on high grade motors for a good many years, it was finally discarded for the reason that

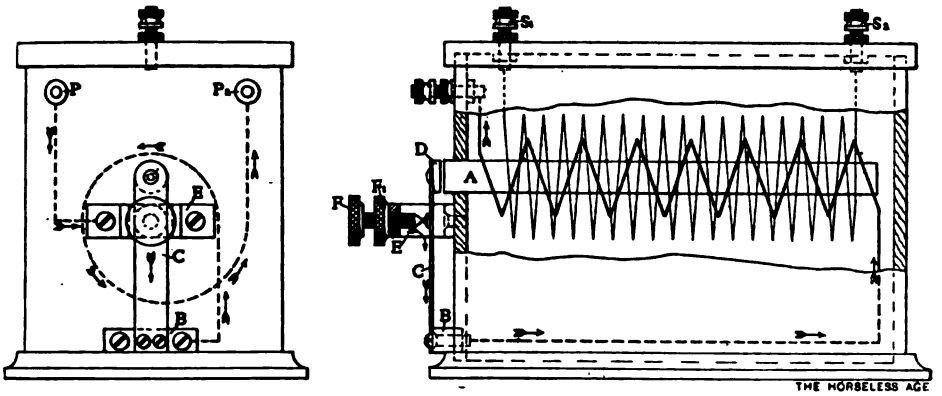


FIG. 10.—MAGNETIC VIBRATOR.

it requires very frequent and accurate adjustment, and also because the spring blade had a tendency to break and the spark points would become burnt, or be kept apart by pieces of road material, etc., lodging between them. Spark coils are now generally fitted with magnetic buzzers or vibrators, as shown in Fig. 10, which illustrates the original and simplest form of this device fitted to an ordinary boxed coil. One end of the primary winding is connected to the binding post P_2 on the end of the case, and the other leads to a metal block B secured to the end of the case. To this metal block is screwed a flat steel spring C, having riveted to its outer end a small cylindrical block of soft iron D, called the armature. This armature D is located exactly opposite the end of the soft iron wire core A, and is normally held at a little distance from the core by the steel spring C. The steel spring C is spanned by a brass yoke E secured to the end of the coil box by means of screws. This yoke is drilled and tapped at its centre to receive the contact screw F, which can be adjusted in it and locked in adjustment by the check nut F. The two platinum tipped contact points are normally pressed together by the spring C. The yoke E is connected to the primary binding post P_1 by a wire.

Now suppose a battery to be connected to the two posts P_1 and P_2. The positive or carbon terminal of the battery may be considered to be connected to P_1, in which case the current will enter at this terminal. As indicated by arrows, it will flow through the wire connection to the yoke E, through the contact screw F, across the contact at the points to the contact spring C, to the metal block B, through the primary winding of the coil to the binding post P_2, and from there back to the battery. As soon as the current begins to flow through the primary winding of the coil, it magnetizes the soft iron wire core A, and the latter attracts the armature D and the outer end of the spring C, thereby drawing the contact point on the spring away from the point of the contact screw F, and interrupting the primary circuit. The flow of current through the primary winding is thereby stopped, and an electric impulse induced in the secondary winding, and if the terminals of the latter are sufficiently close together a spark will jump across the gap.

As soon as the current in the primary winding ceases, the core A loses its magnetism, and the armature D and spring C are returned to their original positions by the spring force of C, and contact is established again between the platinum point on the spring C and the point of the contact screw F. The current then flows again through the primary winding, the armature D is again attracted, and the circuit broken at the contact points, which gives another spark in the secondary. This process, or cycle, requires only an extremely short time, less than the one-hundredth part of a second, and is repeated indefinitely as long as the source of current is connected to the primary binding posts P_1 and P_2. The rapidity of the break and of the vibration of the spring C can be varied by adjusting the contact screw F.

By varying the adjustment of the contact screw, not only is the number of sparks in a given time varied, but also the strength of the individual sparks. Suppose, for instance, that the contact screw F is screwed so far out that the spring C merely bears against the point of the contact screw when at rest. Only the slightest force is then required to draw it away from the point of the screw, and the circuit is broken as soon as the current begins to flow in the primary and long before it reaches its maximum value. But if the current in the primary winding only attains to a small value, the inductive effect in the secondary can only be small, and only a small spark is produced.

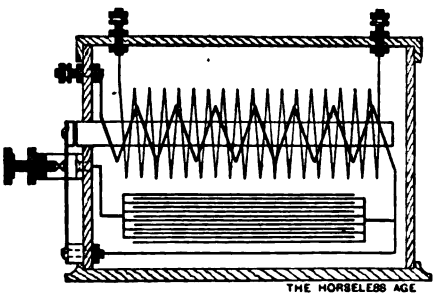


FIG. 11.—DIAGRAM OF COIL COMPLETE, WITH VIBRATOR AND CONDENSER.

Owing to the self induction of the primary winding of the coil a condenser must be connected across the vibrator, as shown in Fig. 11, to prevent abnormal sparking at the vibrator contact points. This condenser is sometimes placed in the bottom of the coil box, as here shown, sometimes wrapped around the coil, as it were, and sometimes put up in a special box, the idea in the latter case being to facilitate repairs to either the coil or the condenser.

Jamaica Doesn't Want Motor Tourists.

In reply to a letter of the Jamaica Motor Union advocating a diminution of the import duty on gasoline, the Assistant Colonial Secretary very emphatically states that no such inducements will be offered to draw wealthy visitors to the island. The letter reads in part as follows:

"I am directed to observe that it is by no means demonstrated that a wealthy man bringing his automobile is more profitable to the island in general than a less wealthy or equally wealthy visitor who hires in the island all his means of transport. A priori, it seems certain that the last mentioned is more profitable to the island, though the first mentioned is far more profitable to the steamship companies and their agents represented in the Chamber. The livery stable keepers are not, it is believed, directly represented in the Chamber.

"The present duty on gasoline amounts to about 5 shillings a day on the consumption (say 8 gallons) of an ordinary tourist's auto car. This sum is a mere bagatelle to a wealthy man who can afford to pay freight on an auto car; if he be too stingy to pay that sum (he being free of all cost for all use of roads and bridges erected at a great cost by the people of Jamaica and possessing an engine which makes him almost independent of the railway, also constructed at their expense), Jamaica can well do without him, even though the shipping interest may regret his absence. Automobiles imported for temporary use—i. e., not exceeding six months—are already exempted from all import duty.

"Under existing circumstances persons who well know conditions prevailing in Jamaica, e. g., the Titchfield Hotel Company, have imported motor cars after having first assured the government that unless it made changes in their favor such importation would not take place. If the owners of 150 auto cars desire to visit Jamaica in the next five years for touring purposes they will certainly bring their machines, notwithstanding the present duty on gasoline."

For the above information we have to thank E. Nuttall, honorary secretary of the Jamaica Motor Union, which body is making every effort to improve the conditions for motoring in the island.

NEW VEHICLES AND PARTS.

1906 Moon Touring Car.

The Moon Motor Car Company, of St. Louis, Mo., are manufacturing a 30-35 horse power touring car for the season of 1906. The engine used is a four cylinder 4½x5 inch Rutenber, which has already been described in these columns. The wheel base is 106 inches and the tread standard. Ignition is by jump spark from storage batteries carried in a box on the running board, a quadruple coil on the dash, and a Rutenber timer on a vertical shaft at the rear of the engine. The engine is cooled by the usual gear pump, with the circulation into the cylinders at the top, down one side of a central partition in the water jacket, up the other side and out at the head to a Briscoe radiator, which supports the ball bearing aluminum fan. This radiator is supported on a sheet steel cross member which fits its under side, and is not held alone by the brackets at the ends. A Hill precision oiler at the right of the engine, belt driven from the engine shaft, forces oil through sight feeds on the dash to each of the end bearings of the engine, and into the crank case, where splash lubrication takes care of the cam shaft and pistons.



Elevation of Moon Chassis.



Plan of Moon Chassis.

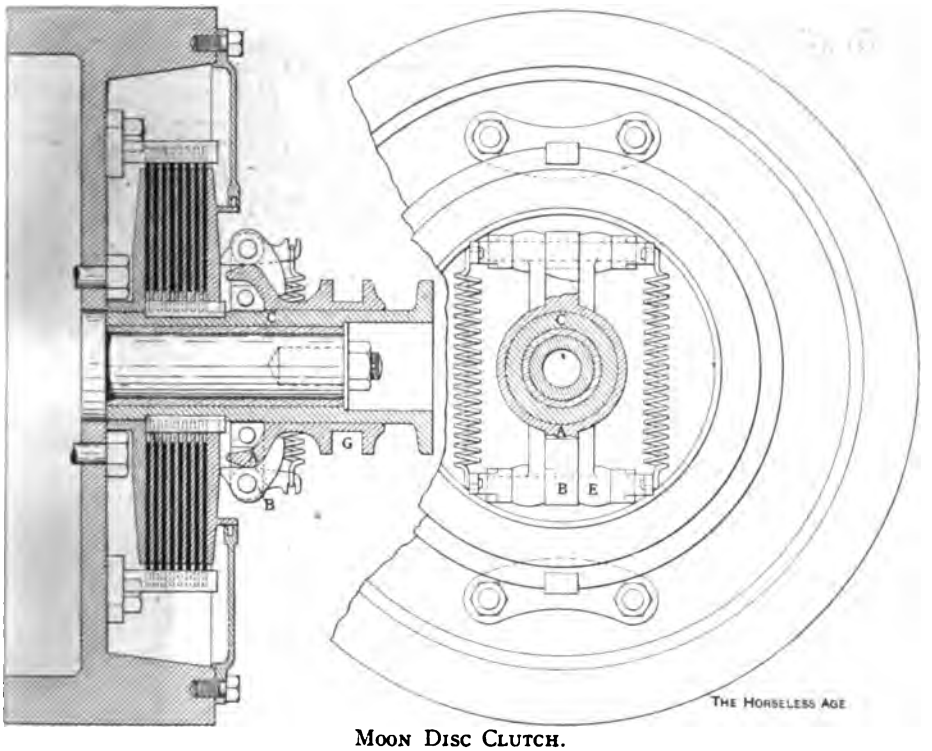
The side entrance touring car body is made of wood, well finished and upholstered. The tonneau doors are 21 inches in width and hinged at the rear, giving free access to the rear seat, which accommodates three persons comfortably. A large tool box, the full width of the frame, is provided under the rear of the body, and under the rear seats, accessible from the inside, is a luggage space. Under the front seats is located the 18 gallon gasoline tank, with a separate 4 gallon auxiliary compartment. The feed is by gravity to a Schebler carburetor.

The frame is made of cold pressed steel three-sixteenth inch thick, of the popular channel section, 4 inches in depth, for about 60 inches, and tapering to 2 inches at the extreme ends. It is strongly braced by channel section cross members and broad gusset plates. The forward and rear ends of the side members are of box construction, with special steel drop forged spring supports riveted in position. The engine and transmission are supported on a sub-frame of channel section pressed steel, with straight side members, and the opening of the channel downward. The ends of the sub-frame are supported on the front and middle cross members of the frame. The spring hanger studs and running board supports are special steel drop forgings. The dashboard is made of pressed [illegible] backed by wood. The hood and [illegible] are sheet iron; the springs are [illegible] both front and rear, the front [illegible] inches in length and 2 inches in [illegible] placed under the frame. The rear [illegible] are 2x50 inches in length, shackled [illegible] rear and supported on the rear axle [illegible] point forward of their centre, and [illegible] side of the frame. The front axle [illegible] of 2 inch steel tubing, with [illegible] forged ends electrically welded [illegible] tion. The steering pivots are [illegible] forgings, with a bearing surface of [illegible] es; the steering knuckle arm is 5 [illegible] so that its end is behind the axle [illegible] tected from striking obstacles in the [illegible] it is connected by a drag link, [illegible] usual spring ball and socket joints [illegible] able for wear. The cross link has [illegible] ends and is placed behind the front [illegible] The rear axle is of the live type with [illegible] gear differential at its middle, encased [illegible] cast steel housing. The ends of the [illegible] ing are formed of steel tubing. The [illegible] is fitted with American ball [illegible] throughout, and is strengthened by [illegible] truss rods, one on the under side [illegible] at the back. The truss rods are [illegible] into the housing at the middle and [illegible] other ends are held by nuts to split [illegible] which are clamped around the axle [illegible] ing. These split collars are cast [illegible] with the spring saddles. The wheels [illegible] 34 inches in diameter, run on ball [illegible] ings, and are keyed to the axle [illegible] straight keys.

A shaft drive with two special [illegible] joints transmits the power through [illegible]



Moon Touring Car.



MOON DISC CLUTCH.

pinion, supported by ball bearings, to the rear axle, the reduction being 3 to 1.

CLUTCH.

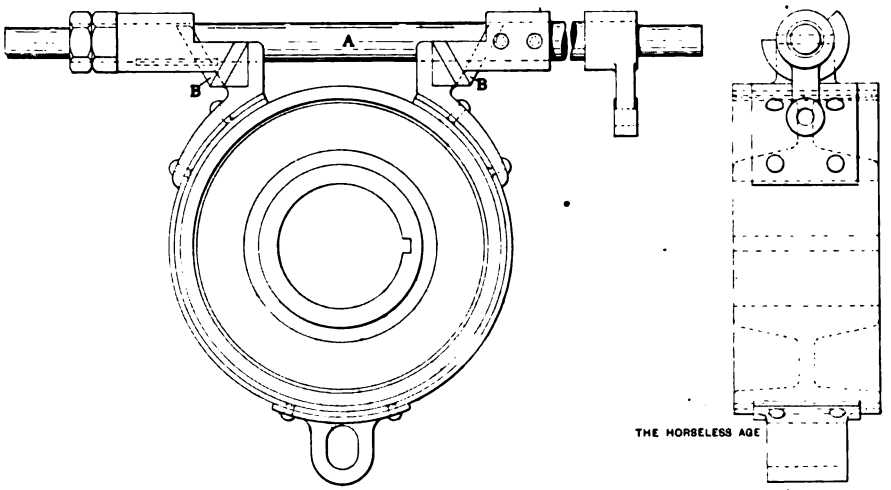
The clutch is of the multiple disc leather faced type, and is located inside of the flywheel and covered by an aluminum dust case. There are three steel plates, each 9 inches in diameter, faced with specially prepared leather cut from a single sheet, copper riveted to the plates. The leather has a bearing surface of 2¾ inches in width from the 9 inches diameter inward. These driving plates are made to turn with the flywheel by two rectangular, rigidly connected driving pins of three-quarter inch by one inch section, which are running fits in slots at the outer edges of the plates, the latter being thickened to three-eighth inch by small pieces riveted on at the places where they bear against the driving pins. There are two plain steel plates and two outside cast steel plates which are driven by friction against the leather faced flywheel plates and drive the transmission shaft by being splined at three places to a sleeve C, which has a bronze bearing on the prolonged rear end of the crank shaft. The rear end of this sleeve is connected to the universal point: Screwed on to the outside and revolving with the sleeve is the frame E, shown in the end view, which supports two short opposite and parallel shafts. The ends of these shafts carry notched arms which are connected by two helical springs; at the middle of each of these shafts is an integral bell crank arm B, which, owing to the spring tension, keeps the clutch plates together. The usual type of yoke for disengaging the clutch works in the slot G in a sleeve which rotates, but is free to slide lengthwise, and carries the two integral arms A, which press against the middle prongs B to disengage the clutch. This clutch is run dry, and it is claimed by the makers that the wear on the special leather employed is almost inappreciable.

CHANGE GEAR.

A full universal joint is placed between the clutch and the change gear, which is of the three speed sliding gear type. This gear is carried in the usual horizontally divided aluminum case, the upper half of which forms the four channel section arms, which are clearly shown in the plan view of the chassis. The top is fitted with a very large hand hole plate retained by a yoke and hand wheel. The sliding gears and the 1½ inch squared shaft are made of nickel steel. The shafts run in bronze bearings fitted with oil rings, such as are used on electric generators, and are also covered by caps at the outside ends to prevent leakage of the oil and to keep out the dirt. At the inner ends they are provided with an oil groove and a washer to prevent the gritty oil from the case getting into the bearing. The direct drive is obtained by the forward end of the sliding gear pair meshing with an internal gear on the clutch shaft. The sliding gear pair are moved by a forked bronze arm pinned to a round five-eighth inch diameter steel gear shifting rod, which slides in bronze guides set into each end of the case, with stuffing boxes to prevent oil leakage. This shifting gear rod projects at each end of the case, where offsets are fastened to it, which carry a flat bar on the outside of the case. This bar is provided with notches cut into its upper side, into which a liberal sized pin drops when the gears are in mesh, so that the gears cannot be shifted without disengaging the clutch which lifts the pin out of the notches. The forward end of the squared shaft is reduced in diameter and has a bearing of about 3¼ inches in a bronze sleeve inside the end of the clutch shaft. This sleeve is provided with an oil groove, which carries oil into a small space at the end of the shaft. The gears are keyed to the lay shaft and spaced by thin steel sleeves around the shaft.

CONTROL AND BRAKES.

The engine is controlled by the usual arrangement of spark and throttle on a stationary sector mounted on the steering wheel, and by an independent accelerator pedal at the foot of the steering column. To the left of this is the clutch pedal, connected by suitable linkage to the interlocking pin. The right pedal controls a transmission brake which has a cast iron drum of 6 inches diameter and 3 inch face, upon which a contracting steel band with a belting face is made to act by the peculiar cam shaped collars, as shown in the drawing. The brake pedal rotates the cross shaft A with its pinned-on collars BB of bronze, which act as cams to draw the ends of the band together. The bearing surface of the collars BB is helical in shape, so that a partial rotation of their shaft is sufficient to clamp the band on to the drum. This transmission brake when interconnected with the clutch, contrary to the usual practice, first puts on the brake



MOON CAM-ACTUATED STRAP BRAKE.



F. N. Stevens' Revolving Pullman Chair Car Body, Closed and Open.

and then, if moved further, releases the clutch. The usual side lever operating in a notched sector controls the rear hub brakes, and also disengages the clutch. These emergency brakes are internal expanding, belting-faced steel bands engaging pressed steel drums which are bolted through the spokes and hub flanges. A small shaft parallel to the rear axle carries at its end a cam for spreading the bands and has its bearing in a bracket which is riveted directly to the axle casing. These brakes are encased in aluminum and dust tight. At each side of the rear axle is a special shock absorber, which, with the Moon universal joints, was described in our New York Show report.

Some Samples of Modern American Automobile Body Work.

Among wealthy users of pleasure automobiles is a class who are always ready to spend money lavishly, provided they can obtain cars that will gratify the desire for something different from the ordinary, commonplace types, and give expression to fastidious tastes in design and equipment.

The effort to cater to this peculiar demand has heretofore been largely confined to foreign builders, and many Americans have gone abroad for their cars, with the belief that what they wanted could not be produced in this country. It is true to some extent that American manufacturers have neglected to cultivate this particular field, but not for lack of skill, artistic ability or capacity for efficient workmanship. This is obvious from the fact that a considerable number of cars have been produced by American manufacturers that are conceded by the best judges to equal in all respects the best from abroad as regards elegance of design, richness of finish and attention to all the minute details that go to distinguish such cars from standard types.

The requirements of this class of cars are exacting, and call for the recognition of some factors in the construction of a chassis that are often overlooked by the manufacturer who is concentrating his efforts upon the production of a popular vehicle. As a rule graceful lines and plenty of elbow room for the occupants of the car are insisted upon, and these cannot be satisfactorily supplied unless the designer is allowed abundant room on the frame to build the body. It is not the length of wheel base that counts, nor the length of frame, but the actual distance between the dashboard and rear end of the frame upon which the body is to be fitted.

For this reason some of the finest cars in this country have been built on foreign frames, in which the space occupied on the forward part of the frame by the hood covering the mechanism has been economized to the fullest possible extent.

The car shown in the photographs, which was specially designed and built for F. N. Stevens, of the American Locomotive Automobile Company, is a magnificent example of the type of cars now under consideration. It was built by the Brunn Carriage Works, of Buffalo, N. Y., on a Stevens-Duryea chassis. The two pictures showing the car with the top up and down, while they give a fair general idea of the graceful and roomy design, cannot do justice to the rich effect produced by the elaborateness of the finish in every detail.

The interior of this car is equipped with every requisite for comfort, including electric indicators, French megaphone speaking tube, French cigar lighter, toilet case and mirror, etc. A push button illuminates the interior at night by means of an electric dome light, and the luxuriously soft upholstering is of maroon goatskin finished in the best style of the carriage builder's art.

The car will accommodate five persons comfortably. The rear seat, which is 54 inches wide on top of the upholstery, seats three passengers, and two revolving Pullman chairs in the centre of the car provide ample sitting room for two more.

The panels are painted red, with black and red vertical stripes, following the best style of Parisian painting, and the finishing of the gear is French vermilion. The doors are provided with locks so that wraps or other articles may safely be left in the car. A feature of this body, from the



Landaulet Body on Stevens-Duryea Chassis.

Gen. G. S. Fields' Mercedes, With American Limousine

ers' point of view, is that it is built of wood, and weighs only 800 pounds.

This car has attracted much attention, and callers at the Stevens residence are frequent for the purpose of inspecting it. Unfortunately, most of them are disappointed, as Mr. Stevens is now in Europe and left the car locked in his private garage, with strict injunctions upon the keeper to show it to no one unless they possessed the talismanic password left with the builders.

A car somewhat similar in its equipment and finish is that of Gen. George S. Field, of Buffalo, N. Y., shown in another photograph. This car was also specially designed and built on a Mercedes chassis. The interior will seat five people, three on the rear seat and two on folding seats. The panels are maroon, with black molding, and the gear French vermilion, the upholstering in maroon goatskin. This is a limousine body. Its weight is 798 pounds.

The small landaulet shown in another photograph was exhibited at the Buffalo Automobile Show. This was built on a Stevens-Duryea chassis to carry two passengers. It is painted blue, with vertical stripes; light blue on body panels; gear, light primrose yellow, and upholstering in blue cloth. The weight is 638 pounds.

Perhaps the quality of these American built bodies will be better appreciated from the following incident related to the writer. Frank H. Goodyear, president of the Buffalo and Susquehanna Railroad Company, recently ordered a car to be built for him abroad. Upon his return home atfer inspecting some of these domestic products, he came to the conclusion that he could get what he wanted here better than in Paris, and cancelled his foreign order, paying a heavy forfeit, for this purpose of placing his order with a home builder.

The Dietz High Pressure Automatic Lubricator for Automobiles.

The Dietz lubricator for automobiles was designed to overcome the objections common to other devices of this kind, such as unreliability in cold weather, or in the use of heavy oils or a mixture of oil and graphite. As in other force feed lubricators, a small plunger pump is used to force the oil to the parts to be lubricated. The principal difference between this and other lubricators of this class is in the construction of the pumps and their valve gears. Instead of the automatic ball valves usually employed in pumps of this kind, which are claimed to be extremely uncertain in their action, especially when the oil is cold or when heavy oils are used, the Dietz lubricator employs a mechanically operated valve gear, using poppet valves in place of the ball valves, both for the inlets and outlets of the pumps. The valves are opened at the proper point of the stroke by cams located on the main shaft, and are closed by heavy spiral springs as soon as released by the cams.

As the efficiency of any pump is mainly determined by the efficiency of its valves,

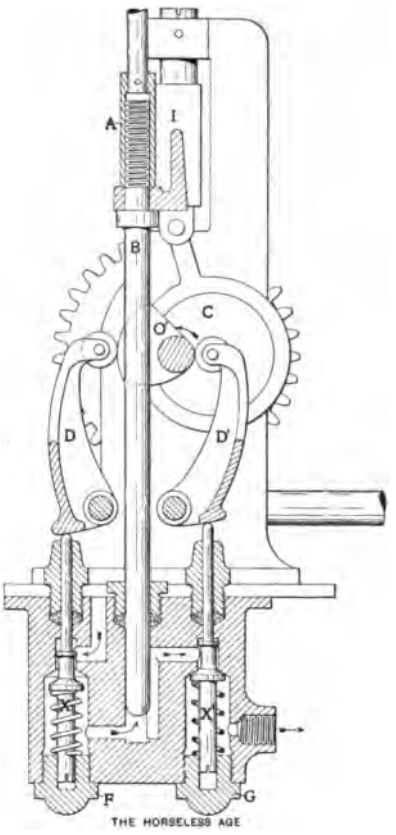


FIG. 1.—SECTION OF DIETZ LUBRICATOR.

it is claimed that with a mechanically operated valve gear, irregularity of the working of the pumps is eliminated. In the Dietz lubricator the feed, after having once been regulated, remains constant, no matter what the temperature or consistency of the oil may be. Another feature of this pump is said to be that it will handle any mixture of oil and graphite readily, without clogging of the valves, and without requiring any further attention than the filling of the reservoir.

Following is a brief description of this lubricator, which will be built with two, four, six or eight feeds, having an independent pump for each feed.

The stroke of the pump is adjustable from nothing to one-half inch while the machine is in operation. This adjustment can be made without the use of any tools and from the outside of the reservoir.

The drawing shows a sectional view of one of the pump cylinders with its valve gear. It shows the position of the parts in the middle of the suction stroke of the plunger. By means of a thumbscrew located on top of the reservoir and reaching into the sleeve the stroke of the plunger may be adjusted and the feed varied accordingly. The four plungers are indicated by the letter B. C C are the eccentrics and eccentric straps driven by the worm wheel and worm and operating the plungers through the crosshead I. O and O' are cams, cast in one piece with the eccentrics. The cams operate the levers D D, which in turn operate the poppet valves located in the valve chambers X and X'. The valve chambers may be opened for inspection and the valves withdrawn by simply unscrewing valve caps F and G, which are located on the outside of the reservoir.

Fig. 2 shows the construction of a four feed pump with the reservoir removed. A A are sleeves for the plunger adjustments. Fig. 3 shows the lubricator complete, with the usual sight feed for each pump and plunger adjustments.

It is the intention of the company to manufacture these lubricators with two, four, six and eight feeds, and to make the capacity and size of the reservoirs and other details to meet the requirements of different specifications.

Severe tests of several of these lubricators have been made recently, and preparations are now under way by the Pearl Manufacturing Company, 344 and 346 Oak street, Buffalo, N. Y., to manufacture these lubricators on a large scale. This company also manufacture the Dietz high pressure automatic lubricators for stationary and marine practice, which have been on the market for some time.

Some New Tools.

Among a number of small tools recently announced by Patterson, Gottfried & Hunter, 146 Centre street, New York, is an adjustable emery wheel dresser, which is designed to work on the rest in front of

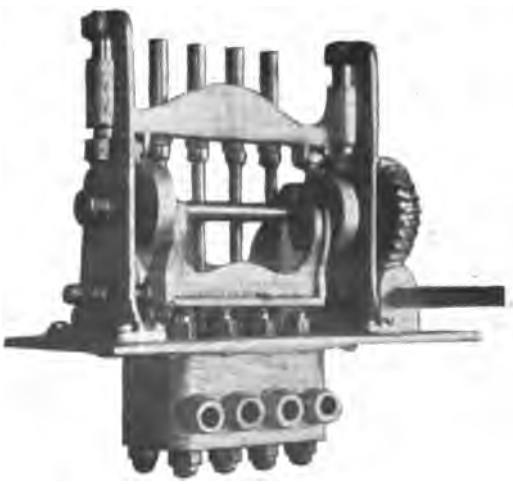


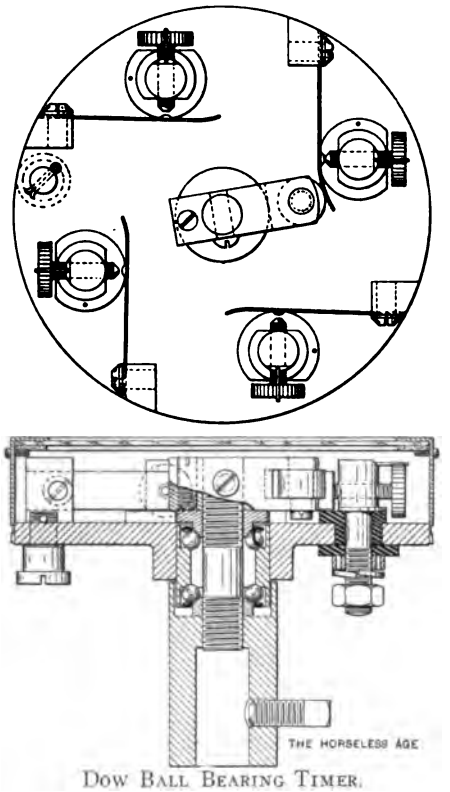
FIG. 2.



FIG. 3.

the wheel, and to be moved back and forth on the face of the wheel in a sliding motion on the rest. It is claimed that in this way only the high spots are taken off and the face of the wheel is straightened. Another advantage of this dresser is that the man operating it stands to one side instead, of in front of the wheel, thus avoiding injury from flying particles of emery, or from the wheel if it breaks. The device is adjustable to any size of rest and takes the ordinary emery cutter.

Another new tool, said to be particularly in demand by automobile repairers, is a ratchet tap wrench, which enables a workman to tap holes close to walls or beside projections. The wrench is provided with a cross handle, which is securely fastened in the socket into which the end of the chuck fits and in which it is held by a small set screw. The end of the chuck has two grooves at right angles, forming four teeth, which engage that portion of the handle which passes through the head, thus giving a very simple ratchet movement.

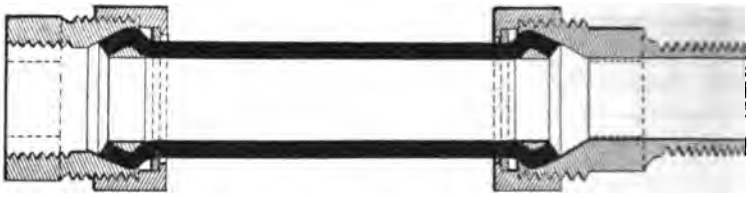


DOW BALL BEARING TIMER.

A new concave and convex gauge just marketed consists of eight tempered steel gauges measuring from one-eighth to one inch. One end of each gauge is accurately ground to measure the concave arc of the circle, the diameter of which is stamped on each gauge, and the other end measures the convex arc of the same circle. This tool is said to be especially adapted for pattern makers' use in grinding round nose tools, etc.

The Dow Ball Bearing Timer.

A new timer for high tension ignition has been brought out by the Dow Portable Electric Company, of Braintree, Mass. It is similar to their former instrument, the contact being between the point of a contact screw and another point carried on a bent spring blade, which is forced against the screw by a revolving arm carrying a steel roller at its outer end. The casing is made entirely of aluminum, with a glass front of almost the full diameter. By means of a spring lock the casing can be readily removed to give access to the contact screws for adjustment. The contact screws are positively locked in position. The chief improvement is in the use of two ball bearings of the adjustable type, the balls being held in cases which admit of removing or replacing them all at once, and obviate the possibility of losing one or more. The connections are made at the back of the instrument, split spring washers being provided under the nuts to prevent them from jarring loose. A steel sleeve provided with a set screw is screwed over the end of the timer shaft and serves to establish driving connection with the cam shaft or any special shaft that may be provided for the purpose.


DOYLE HOSE UNION.

Northern Delivery Wagon.

The new delivery car of the Northern Motor Car Company, herewith illustrated, has the following body dimensions: Width, 56 inches; length, 5 feet 6 inches; height, 18 inches. It has a carrying capacity of 1,500 pounds. The gear reduction from the motor to the wheels is 4 to 1.

The Doyle Hose Union.

An improved design of hose union claimed to be specially adapted for automobile purposes is manufactured by the Doyle Hose Union Company, of 810 Ann street, Homestead, Pa. The construction is evident from the sectional view shown herewith. It is claimed for the coupling that it will not leak, pull or blow [illegible] that there is no reduction in area [illegible] part of the coupling, hence no wire drawing, and that the device can be used for steam, air and water.

Skidding Not Caused by Negligence.

The Wandsworth and Putney Gas Light and Coke Company recently sued the London Road Car Company for £9 1s 1d for damage done to lamp posts by the negligent driving of the motor omnibuses. The omnibus company paid £5 17s 6d into court in regard to part of the claim, but as to the rest they pleaded that the damage arose owing to side slip on account of the greasy roads and denied liability.

Henry Watts, who appeared for the gas company, said that although the claim was comparatively small, the case was one of considerable importance. Gas companies were continually having their lamps damaged by motor omnibuses, and his client's loss under this head amounted to several hundred pounds a year. His contention was that the side slip was caused by the brakes being applied too suddenly, and that amounted to negligence on the part of the drivers.

After hearing the evidence Judge [illegible] decided that it was impossible for him to find that the drivers were negligent. It was explained in each instance that the omnibus skidded, the road being slippery and greasy through the wet weather, but he did not feel satisfied that the application of the brake necessarily caused the skidding, or that it implied negligence. He therefore gave judgment for the London Road Car Company, and in view of the importance of the case awarded costs on the higher "A" scale.



NORTHERN LIGHT DELIVERY WAGON.

WINTER EXPERIENCES.

Winter Experience With the Automobile in the Practice of Medicine.

By W. P. Glendon, M. D.

The weather during the winter just past has been ideal for using the automobile to visit the sick, and I have only a few times been compelled to resort to the horse on account of the inclemency of weather. In attending to a practice extending over a wide range of territory I have been brought to a forcible realization of the value of the motor car for a doctor. During previous years the amount of work during the winter compelled me to spend the greater part of the time on the road, but having such a speedy method of transportation at my disposal, I have done the work this winter comfortably, and without the hurry and worry that has always been so prominent a feature heretofore, and I find myself able to keep my office engagements—a very important consideration to the physician who encourages office practice.

CRACKED WATER PIPE.

There are certain difficulties and dangers, however, incident to the use of a car in cold weather, and chief among them, of course, is the liability of freezing of the cooling solution. Early in the season I noticed in The Horseless Age a formula for preparing a chloride of calcium non-freezing solution, and decided to try it. I found by actual experience that a solution of the chemical with a gravity of 1.020 would withstand any temperature we had this winter, and with the thermometer registering 10° and 12° above zero it only thickens up to the extent of forming a soft snow ice that does no harm to the circulating system. Being lulled into a feeling of false security, however, by the unusual mildness of the weather, and thinking the chemical might tend to corrode the metal parts of the machine with which it came in contact, I drew it off and substituted water, and as a precautionary measure I had this removed from the radiator after finishing the day's run. One cold morning, after having the water put in, the car was allowed to stand about a half hour before I was ready to start on my daily rounds, and the mischief was done. In total ignorance of anything being wrong I started to make a visit to a patient about 7 miles away, and had not proceeded very far when I noticed a pronounced knocking in the motor, and immediately shut off the power and started an investigation. When the engine continued to run after the switch was thrown I suspected the nature of the trouble, and turned my attention to the cooling system. The radiator was cold, and on looking under the car I saw a large stream of water issuing from the feed pipe of the engine. After passing my hand along the side of the pipe I felt a fissure about 1½ inches long. It looked like a desperate case at first; but I dressed the injured member with some rubber adhesive strips, a liberal supply of which a doctor who practices surgery has always with him, and succeeded in making the break almost water tight.

DAMAGING EFFECT OF FROZEN ROADS.

On another occasion riding over rough, frozen roads opened a joint in the radiator at the line of union with the feed pipe, and the whole water supply was speedily exhausted; but I ran the car slowly, and the engine did not heat much. So I find that after all a water cooled car can be run in an emergency in cold weather without water, and without much danger of overheating. As one's experience grows these minor difficulties are of less frequent occurrence, and the lessons learned are useful in enabling one to guard against them in the future. Running a car over rough, frozen roads is not entirely devoid of injurious effects on the machine, and the tires especially are liable to suffer from such treatment; but by careful running and selecting the best and smoothest part of the road these damaging effects may be greatly mitigated. Aside from the frequent loosening of the nuts and bolts, and the consequent resort to the wrench, I cannot see any signs of serious injury to the mechanism of my car; but it requires frequent cleaning and adjustment in order to keep it in the pink of condition. The experience gained along these lines proves to me the wisdom of using a large, strong car in order to get the best and longest service, as I feel quite sure that this winter's service would have wrecked the runabout that I formerly owned.

MUD PROTECTION AND LUBRICATION.

I am convinced that the removal of mud and dirt from the body and gears at the end of each day's run amply pays for the time and trouble, and as a labor and money saving device the canvas cover that I had made to protect the works and chain has proven its worth many times over. I have been using the present chain for the last six months, and it shows very little wear, while the life of the chain on the car first owned was about three months. I am partial to the use of graphite on the chain, and have found that the best chain lubricant consists of a mixture of graphite and engine oil of the proper consistency to work nicely, and as a result of this treatment the chain is always bright and clean and never runs dry. It is also surprising how much less noise a chain will make when it is lubricated properly. I do not attempt to economize in the use of oil during cold weather, and use it more freely than in summer. I do not use any diluent with it, but keep the can in the cellar near the furnace where it will remain in a liquid condition, and then, by having it put in the machine in the morning before the time for going out, I am sure of having the engine receive sufficient oil at the start, and after the machinery is limbered up the heat keeps the oil at the proper consistency to flow freely. The free use of oil saves bearings and prevents scored cylinders, and attention to the details here enumerated will keep the car out of the repair shop. Of course, these things mean time and trouble; but the doctor's car must be in condition to be depended on at all times, and eternal vigilance here is the price of safety.

STALLED IN A QUAGMIRE.

The consumption of gasoline is for obvious reasons greater in cold weather than in summer. When the roads begin to thaw after a cold spell and get soft and sticky, there is no danger of exceeding the speed limits. When the car is in motion everything seems under a strain and the movement is dull and sluggish, and riding under such conditions is exceedingly unpleasant. Great care is necessary under such circumstances to avoid getting stuck, and here it is that the need for greater power is keenly felt. Only one such unpleasant experience, however, has fallen to my lot. One morning in January, when the roads were soft after a thaw, I was making a call at a farmhouse that lay back some distance from the main road. The approach thereto was over a narrow road with a corn field on one side and a sweet potato patch on the other. About half way up to the house, in a sort of basin in the road, was a puddle of mud and water, and as the car was already laboring hard through the mud I was afraid to venture any farther, for fear of getting stuck, so I stopped the car and walked the remainder of the distance to the house, and this is where I made a mistake, for I should have known that soil that will hold water will not be miry, and had I continued on until reaching the high land I could have turned without any trouble and would have avoided the unpleasant experience of being towed out of the hole. While making that call my mind was more occupied with the thought of extricating the car from its predicament than with the patient; but I did not have any feeling of doubt about its remaining quietly where I left it, as I have often felt when leaving a horse standing, wondering whether it would be there when I returned.

After taking a review of the situation, the road not being more than 7 or 8 feet wide, there was nothing to do but to make a selection of the sweet potato field or the corn field to make the turn in. I chose the former, and the car had no sooner left the road than the wheels sank nearly to the hubs in the soft mud. I spent a busy half hour trying to get the pesky thing out, but to no effect. When the motor was started the hind wheels revolved idly; that is, they did when the clutch did not slip, and then they did not revolve at all, but the engine kept on running just the same, and the car refused to budge. I attempted to jack up the car sufficiently to get a board under the hind wheels, but the ground was too soft, and I was compelled to abandon that scheme. Notwithstanding the fact that the morning was tolerably cold and frosty, these exertions, as may be imagined, stimulated an activity of the circulation that called for

the removal of overcoats, and finally casting pride to the winds I was compelled to call on the farmer to help me out of the plight. He was sympathetic enough to tell me that he thought I was a long time in getting turned around, but if he had known his help was needed he would have hastened to my assistance sooner; but I am satisfied that he was enjoying the unwonted sight from his point of vantage behind the barn. His team easily drew the car around on terra firma, and there was no further trouble, but I resumed my journey a sadder but wiser man. I had about made up my mind that my car would pull out of any kind of a hole, but this experience was a jolt to my pride, and the awakening was a very rude one. It is well said that ill news travels fast, and it was many days ere I heard the last of the episode. In view of the costly experience that some have had in getting towed out of tight places, however, mine was very cheap, as a "thank you" paid the bill, and since that time I have been very careful how I travel "by roads" through fields, as I would rather walk a quarter mile or so than take any more such chances. That was my first and last experience with actual horse power as applied to the automobile, and in that case the two actual horse power applied through the medium of a hay rope to the front axle proved far more effectual than the 18 rated horse power of the motor applied to the rear wheels. That the term horse power is certainly a very flexible one and capable of a wide range of application, especially in the catalogue of the manufacturer, goes without saying.

INCREASES PRACTICE.

Not only has the car proved a valuable acquisition in increasing my working capacity, but it enables me to answer emergency calls with dispatch, and gives me the opportunity of increasing my field of practice. Several weeks ago, on a cold night, I was summoned to a case of confinement at a house about 7 miles away, and within one-half hour of the time of receiving the message I was at the bedside of the patient. After rendering my services I soon made the return trip, and was able to get a fairly good night's rest. A drive of that length, even with a good horse, would have consumed a large part of the night.

My experience with horses has been similar to that of others, no doubt, and it is, that when a doctor needs one every one who happens to have one to sell has just what he wants, and it is just no trouble at all to get one that will road 10 or 12 miles per hour, or any other old gait, until he owns it, and then he will soon learn that a horse that will road 8 miles per hour and keep it up is an exceptionally good one. The only one I ever owned that would travel 10 miles per hour is one that I now have, the one that consumes gasoline and that travels on four wheels.

I have experienced very little trouble with the ignition system, but I find there is a great difference in the life of the dry cells, some become exhausted in a short time, while others will last for months and give good service. I use each set alternately until they become exhausted, and then connect them in multiple series, and it is surprising how much service can be had from cells that are apparently exhausted. The frequent stops required in my business allow the cells to recuperate, and after they become useless for ignition purposes I use them to furnish current for my office illuminating outfit. I have already found it a useful expedient to jack up the car at night and rest it on trestles, thus relieving the tires of the dead weight over night, as it will result in a saving of tires and lengthen their period of usefulness. The tires used at present are apparently in good condition after a hard winter's use, and they seem to be in condition for another half year's use.

We have had one or two snowfalls during the winter, and I find it a very uncomfortable and hazardous proceeding to drive a car during a snow storm. The glass front soon becomes encrusted with snow and sleet, thereby cutting off the view and making it necessary to look out the side of the car in order to see the road ahead, and one feels far from comfortable to be shut up in a car under such conditions. With curtains on and only a moderately thick lap robe, one can ride comfortably warm in extremely cold weather. In the teeth of a stiff wind the curtains are a very heavy drag, and my car will not make very rapid progress under such circumstances.

MOTOR STARTING WITHOUT A CRANK.

I had some little difficulty in starting the motor in extremely cold weather, but a teaspoonful of gasoline poured in each cylinder, followed by one or two brisk turns of the crank, was generally productive of results, and after once getting the engine warmed up there was no further trouble in that direction. Necessity is the mother of invention, and one does not have to operate a car long to realize the truth of this saying, and to acquire the habit of relying on his own resources. This is exemplified by the following experience that I had recently. One day after making a call I reached in the bottom of the car for my starting crank, and to my consternation found that important part of my outfit missing. It looked as if I was "up against it good and hard." I first tried to make the crank from a corn sheller do duty as a starting crank, and failing in this I next pressed a monkey wrench in service, but such treatment failing to produce the desired results I happened to think of the expedient of raising the hind axle, throwing the clutch in gear and turning the wheels. I was thus able to turn the flywheel over and succeeded in starting the engine without any further trouble. I retraced my journey and never before had such a difficult search for a "crank."

I am satisfied that automobiling, whether for business or pleasure, constitutes one of the healthiest recreations, and I further believe that as a treatment or preventive against tuberculosis it is fully as efficacious as any plan of open air treatment now advocated or practiced. Sailing through the air on a crisp wintry day and saturating the lungs with life giving oxygen is just about as invigorating and conducive to health as anything can well be, and I am sorry that the expense of purchasing a car prevents its use by so many people who could be so much benefited physically.

PERIODICALLY INSPECTED.

I notice that many of your correspondents care for their own cars, but my time is so thoroughly occupied by professional duties that, as much as I enjoy tinkering with the machinery, I do not have the opportunity for looking after the detail work of caring for it, and consequently entrust that part to my hired man, and, in addition, I have a practical mechanic to inspect it periodically, to see that all necessary adjustments are made, and, in fact, endeavor to prevent the possibility of trouble rather than wait for it. To such care I attribute my freedom from trouble. During the last six months I have not been delayed on the road, and have not had any mechanical difficulty whatever. My expense account has run about as follows: Beginning October 5, gasoline at a price ranging from 10½ to 12 cents per gallon, $19.40; lubricating oil, $7.60; heavy grease for main engine bearings, $1.25; cotton waste (a very essential article), 75 cents; repairs, consisting of a leather facing for the reverse clutch band, $4.25. I do not enumerate the amount paid the mechanic for his service in looking over the car, as this work could be done by my own driver, but I prefer to have this work done by a skilled hand, and the amount so spent is a very unimportant item in the expense account. At this time I am unable to make even an approximate schedule of the tire expense.

CONCLUSIONS.

In view of the daily experience of physicians from all over the country, there can be no further doubt of the superiority of the automobile over the horse as a means of transportation for the doctor, and while realizing the fact that there is no ideal physician's car on the market, yet there are lots of cars that will do the doctor's work and give satisfactory service. In summing up my conclusions concerning this matter I am more firmly convinced of the necessity for using a large and powerful car for hard and continued service in a country practice. I know of other doctors in this vicinity who have been using smaller cars for their work, but none of them have used them to the exclusion of the horse as I have, and they have all had troubles of various kinds that I have been free from. I know that in the matter of tire expense the smaller car has the advantage, but for standing the strain of running through mud and over rough, frozen roads, size and strength are needed to resist the shocks that such usage entails.

OUR FOREIGN EXCHANGES.

The Small Inventors' Show.

The second annual "Small Inventors'" Show was opened in Paris on March 31. This show is arranged for new inventions relating to "sports," the authors of which have not sufficient means to pay for a stand in the great annual automobile show. In this show, which was held in the building known as the Great Wheel, spaces as small as 10 square feet in area could be obtained, and no stand had more than 100 square feet of floor surface. The exhibition was opened by representatives of the Minister of Commerce and of the chief of police of Paris. An outdoor track was provided for demonstrating cars.

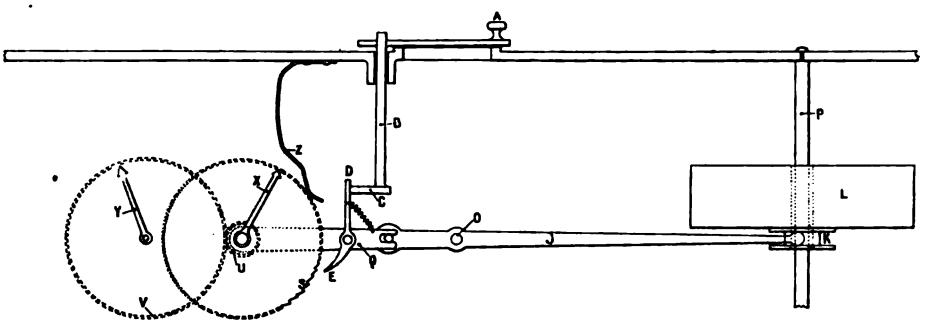
Among the exhibits was the "protecteur Robert"—a fender for automobiles designed by A. Bain. This fender consists essentially of two parts. The lower part consists of a semi-circular shield, with vertical rotary bars, and is designed to push any obstacles in the path of the car out of the way. The upper part consists of two pneumatic bumpers, similar in appearance to railroad car bumpers. In case the car strikes an obstruction these bumpers compress air, and immediately stop the motor by closing the throttle and applying the brakes.

Another, probably somewhat more practical invention exhiibted was a side lever starting device for vehicle motors. The lever, at the side of the driver's seat, gives motion to a screw of very steep pitch, which meshes with a nut forming the inner part of a roller ratchet clutch of the "one-way" type. This clutch is connected by a chain to the motor shaft. The clutch is claimed to render back kicks of the motor in starting impossible. The strongest feature of this device is undoubtedly its simple operation, as all that is required is to move the hand lever back and forth.

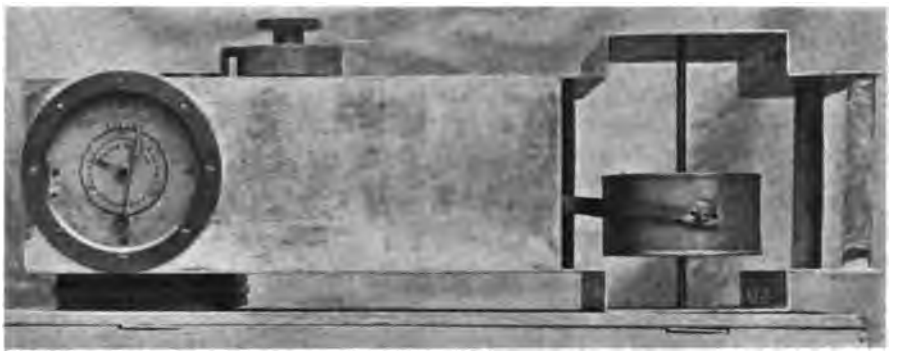
A new tire exhibited consisted of an outer shoe, made of leather and rubber, and entirely filled with cork and sponge pieces, which are cemented together by means of a rubber solution.

Among the most interesting inventions shown was a gasoline tank gauge which indicates at any moment the amount of gasoline in the tank, and also the number of gallons or litres which have been used since a certain period. Referring to the half-tone and sketch herewith, there is provided within the tank a float L, which always follows the fluctuations of level in the tank. This float moves on the rod P in the centre of the tank in such a manner that any inclination of the tank does not affect its position. The tank is made with pockets at top and bottom so that the range of the float is equal to the height of the tank. The float is connected by means of an arm J pivoted at O, arm Q, pawl E and ratchet S to the index hand X. The float acts on the pawl and ratchet mechanism only while the tank is being filled, so that any disturbing effect due to jolting of the vehicle is precluded. The tank is provided with a cover plate A turning on a shaft B, which at its lower end carries an eccentric C bearing against an upwardly extending arm D of the pawl E. This mechanism is so arranged that when the cover of the tank is open, the pawl E is allowed to engage with the ratchet wheel S, and when the tank is filled the rising of the float advances the ratchet wheel S and the indicator hand X connected thereto. When, after filling the tank, the cover plate is closed, the eccentric C moves pawl E out of engagement with the ratchet wheel S, and the motion of the float has no effect on the registering mechanism. As shown by the photo, there are two scales, one registering litres and the other centilitres. The device serves to an extent as an odometer, and shows whether the car has been used without the consent of the owner.

Among the vehicles exhibited was the Hugot voiturette, which represents an at-



BURTART GASOLINE REGISTERING MECHANISM.



GASOLINE TANK, WITH LEVEL GAUGE.



BELT DRIVEN CAR WITHOUT DIFFERENTIAL.

tempt to provide a simple and cheap vehicle conforming fully to the requirements of the French Government. The motive power is furnished by 6 horse power single cylinder De Dion motor under a bonnet in front, the shaft of which carries a pulley 5.6 inches in diameter by 6.4 inches wide. The power is transmitted by a belt to a double concentric countershaft on which there are three pulleys, 12.8 inches in diameter by 2 inches wide each. The central pulley is loose, while each of the two outer pulleys is fast upon one of the countershafts. The countershafts carry at their outer ends sprocket pinions of eight and sixteen teeth respectively, from which the power is transmitted to the rear wheels by chains. The drive is, therefore, by one wheel only, and the differential gear is eliminated.

Automobiles in East India.

Bombay is the motoring centre of India, not Calcutta, for in the latter the streets are too narrow. Moreover, stringent regulations are enforced, the speed being rigorously restricted to 10 miles per hour. There is no speed limit elsewhere in India. May, June and July being the hot months, the general exodus takes place from Bombay to the mountains. The journey is made via Poona, and thence generally to Mahableshwar. In the ordinary course, after changing at Poona, there is a very slow 40 mile journey on an old narrow gauge line, followed by a tedious and unpleasant 28 mile drive in a two wheeled two horse drawn tonga, the district being so hilly that the horses have to be changed every four miles.

By the motor service which is to start this month a saving of over six hours will be made on the journey from Poona, and in the 74 mile trip the vehicles will have climbed 7,000 feet. The Beaufort wagonettes, of which thirteen are to be used in this service, are of German construction throughout, and have four cylinder engines of 18-22 horse power. The bodies are painted scarlet, and upholstered in leather of the same color, seating accommodation being provided for eleven persons. Light luggage can be carried on the canopied tops, but for heavy luggage five Beaufort lorries are to be provided.

Trade Versus Clubs in England.

Quite a number of the automobile organizations in England held meetings at the recent Agricultural Hall Automobile Show, one of the shows not recognized by the leading trade organization. When these meetings were announced the Society of Motor Manufacturers and Trades issued a circular letter to all the bodies concerned, urging them emphatically to give official support only to their (the society's) show at Olympia. This letter has resulted in a reply from the management of the Agricultural Hall Show, headed "Intimidation of Motorists," in which the action of the society is strongly criticised. To explain the present situation it may be stated that with a view to securing official attention the society in February, 1904, invited the Ladies' Automobile Club to its Crystal Palace Show on one special day, and at one or both of the two Olympia shows repeated the invitation, and also gave valuable facilities to the Motor Union, the Automobile Club, the Motor Boat Club, the Automobile Association and other motoring bodies. The practice of obtaining support for a show by inviting official bodies to meet at it found favor in the sight of the organizers of the Agricultural Hall Exhibition, and, in consequence, in addition to the Ladies' Automobile Club, the Motor Union, the Automobile Association, the Motor Van and Wagon Users' Association, the Automobile Mutual Protection Association and the British Motor Boat Club met at the Agricultural Hall.

New Method of Determining Heat Value of Liquid Fuels.

In a paper recently read before the Birmingham section of the Society of Chemical Industry W. Rosenhaim described a method of determining the calorific values of volatile liquids, such as gasoline, by absorbing them in a pellet of celullose, then wrapping the pellet in tinfoil, and finally burning the whole in a current of oxygen. The wrapping of the pellet in tinfoil is necessary to prevent evaporation of the liquid between the operation of weighing it and that of its combustion in the calorimeter. Unless this precaution is taken a pellet soaked in gasoline will lose 19 per cent. of its weight in five minutes and 40 per cent. in a quarter of an hour, while when wrapped as stated the corresponding figures are 0.7 per cent. and 1.3 per cent. respectively. In deducing the calorific value of the gasoline after combustion allowance is, of course, made for the calorific values of the cellulose and tinfoil. Two determinations of the calorific value of gasoline made in this way gave 0.9970 and 0.9950 calories per gramme, equivalent to about 17,950 B. Th. U. per pound, while a corresponding experiment on methylated alcohol gave its calorific value as 11,190 B. Th. U. per pound.

Italian Automobile Services.

During the year 1905 twenty-two companies were formed in Italy to trade in or manufacture automobiles, with a total capital of over $5,500,000. Further projects are the installation of a public service of forty automobiles for the city of Milan, the concession for the same having been granted to the "Société Italienne pour Entrepris et Transports Automobiles." The town of Belluno is to be provided with a service by the same company, and other districts of Romagno, Venice and Emilia are expected to follow suit. The Provincial Council of Mantua is considering the installation of an automobile service on the six railways of the province. The Communal Council of Ivrea (Piedmont) has approved the project for a motor car service between that town and Biella. The Communal Council of Govona has taken the initiative in the formation of a syndicate between the neighboring communes for a service for passengers and goods. The municipality of Turin is experimenting with automatic sprinklers. The Provincial Council at Caserta has granted the concession to a local company for a motor omnibus service in the district. In Sardinia the Government has subsidized a motor car service between Palan, Tempio and Sassari.

Foreign Notes.

The London General Omnibus Company on March 1 announced that within three years from date its entire equipment would be changed to motor propulsion.

A motor cab service will be inaugurated in Nuremberg, Germany, early in May by a recently incorporated company. The beginning of the service is practically coincident with the opening of a general exhibition which lasts till October.

The Society of Motor Manufacturers and Traders held their annual meeting at Maxwell House, Arundel street, London, on March 30. Sidney Straker was re-elected (for the second time) president of the society. S. F. Edge and E. M. C. Instone were nominated vice presidents.

According to reports from abroad, a new stock company has been organized in Vienna by interests associated with the Daimler Motoren Gesellschaft of Unterturkheim, to manufacture electric vehicles on the Lohner-Porsche system on a large scale, chiefly for export purposes.

The Technical Institute in Aschaffenberg, Germany, which already comprises a school for chauffeurs, has decided to shortly add a department for automobile body construction. The object is to familiarize practical carriage trade workmen with the requirements in automobile body construction.

The Association of German Bicycle and Automobile Dealers has issued a circular letter to its members asking for suggestions as to how the existing evil of paying commissions to professional chauffeurs in connection with the purchase of tires can best be remedied. It is claimed to be almost impossible to sell a set of tires to an owner without paying his chauffeur a substantial tip.

The German Automobile Association has addressed a petition to the Reichstag praying for discontinuance of the discussion on the motorists' liability bill on the ground that it would be advisable to await the results of the recently inaugurated automobile accident statistics compilation. It is also urged that statistics should be gathered regarding accidents due to all forms of street traffic, instead of those due to automobiles alone.

COMMUNICATIONS

A Home Made Concrete Garage.

Editor HORSELESS AGE:

With regard to the 15x15 foot cement garage mentioned in my article in the Doctors' Number, I would explain that, the contractor's price being too high for me, I concluded to hire men and build the garage myself. I accomplished the task in eight days, with two laborers, a carpenter and a cement worker, and a teamster for excavating and hauling sand.

It took me a day to find out that my presence was continually necessary if I expected a day's work. My carpenter seemed to delight in going about every hour a distance of one-quarter of a mile for a drink of water, instead of using the hydrant nearby. This practice I put a stop to by placing a pail of ice water within easy reach.

The building being on the side of a hill, it became necessary to make an excavation, and to save time the team which carried away the dirt returned with a load of sand from the bed of a nearby creek. For a foundation for the walls a trench 18 inches deep and 14 inches wide was dug and filled with grouting, consisting of brick bats and stones of like size. The walls are 7 inches thick to a height of 4 feet, and the rest (4½ feet) is 6 inches thick. If there was no pressure against the walls from the embankment I believe that 5 inches would be sufficiently thick. I consider that Portland cement and clean sand are necessary to effect a good job. In this connection my experience taught me that dealers are not always reliable, and I should have been furnished second or third grade cement but for the knowledge of my workmen. At the lumber yard I obtained enough lumber, 1 inch thick and the proper length, with 2x4 scantlings for braces, to make a form 3 feet in height. The total height of the walls is 9½ feet. A height of 3 feet was formed at a time, and this required forty-eight hours to set and dry, after which an additional height of 3 feet could be put on. When the walls were up all the lumber was piled up carefully to dry, a heavy oak plank being laid on to prevent their warping. The roof was covered with galvanized iron and properly painted. For making the roof I used the 2x4 scantlings, spiking them together to make them long enough. These were covered with the boards used in erecting the walls, so that I saved the lumber and still had an excellent roof. The roof has a fall of 10 inches from the front to the back.

The floor was made of old brick topped off with cement. It was made with a depression in the middle for hydrant water, and with a fall of 1 inch from the back to the front for the wash water to flow out. But this little slant came near bringing me to grief a short time ago. Having failed to retard the spark and set the brakes before cranking, my car as soon as the motor was started was making rapidly for the wall of my neighbor's brick house on the opposite side of the street. A quick reach for the switch avoided a collision, however.

The house is made with one small door on the north and windows on the south and west respectively. These windows contain three 12x14 inch panes of glass each. For the entrance I used large barn doors the full width of the house. They are hinged to swing inward, and each door also folds upon itself, which I find a great convenience, as I have no trouble from snow outside, and am also able to utilize all the space inside. Such a door is also cheaper than a sliding door. Considering the warmth in winter, the coolness in summer, and the convenience of the house being right at my back door, I think I have an ideal garage, and it was pronounced such by an expert from the Cadillac factory.

WILLIAM M. BALDWIN.

Route to Asheville, N. C.

Editor HORSELESS AGE:

Regarding the route to Asheville, N. C., wanted by Mr. Linkroum, will say (being at the Asheville end), that the trip can be made, but it is not a trip that you can make in a record breaking time, as the roads after you leave Staunton or Lexington, Va., will all be clay roads, and in only fair shape, and the nearer you get to Asheville, until you cross the mountain, the rougher the roads get to be, being less thickly settled.

We have a young man with us in Asheville who made the trip in a two cylinder car. He made the trip for pleasure and in search of health, and made the entire trip from Paterson, N. J., to within 45 miles of Asheville without mishap, but there he had some mechanical trouble, and, being unable to repair it, shipped the car to Asheville. He was practically a novice when he started on the trip, so the roads could be covered easier by an experienced driver. But the machine, and especially the tires, would show considerable wear and tear by the time he reached here. Mr. McConnell, the young man who made the trip, is temporarily out of the city, but upon his return we will see if we can get him to write up his trip. E. C. SAWYER.

Editor HORSELESS AGE:

I have read with some interest your article about the route to Asheville, N. C., and beg to submit herewith a few facts that will prove interesting to all who come this way.

From Baltimore to Frederick, Md., are fairly good pikes. The best one is the old Government Pike. After reaching Frederick very fine pikes lead to Hagerstown. Or a magnificent pike will bring you to Jefferson, W. Va., then to Harper's Ferry over a dirt road, very hilly in parts, but any car can take the grades. From Harper's Ferry to Charlestown is a fine pike. From Charlestown to Berryville, Va., and thence to Winchester, Va., will be found as fine roads as one would care to ride over. From Winchester to Staunton is the celebrated Valley Pike, good at all times. At Staunton you meet the dirt roads again—good in dry weather, the opposite in rainy.

Another very fine route is from Frederick to Hagerstown (splendid pike all the way), Hagerstown to Martinsburg, thence to Winchester. This pike is very fine and I am sure will please any man who takes the trip.

The run from Jefferson over to Harper's Ferry presents very fine scenery, but in and around Harper's Ferry it is hard to surpass. No finer pike is found than the one from Berryville, Va., to Winchester. At this season the old Valley Pike is in splendid shape. New metal will go on the road from this time until about the middle of the summer. Then for a few weeks or months it is good in short patches. The new rock is very hard on tires. Yet I have gone over the road many times, and one can always find a narrow strip on the edge if he will use care.

The trip from Winchester to Staunton cannot be surpassed in this country. The section is the most charming every mile of the way, and especially so at this season of the year. C. B. RICHARDSON.

"Running in" Refitted Bearings.

Editor HORSELESS AGE:

Having read the very able article on "Spring Overhauling" in your issue of April 4, I would like to make a small criticism of one of the suggestions offered by Mr. Clough. In that part of the article treating of the renewing of bearings, the directions given say that when bearings are renewed or rebabbitted they should be given their initial test by having the engine run from an outside source until all tendency to heat is past. This method of bringing bearings to a "bearing" has not, in my experience, proven to be practically successful, for the reason that there is in that case no pressure on the moving parts, and therefore not enough friction is generated to show whether the bearing is right or not.

I have handled gasoline motors and steam engines, and have had expert charge of breaking in new engines where the pressure exerted under full power ran as high as 45 or 50 tons [?—ED.] to the square inch of projected area of crank pin brasses, and have known several instances where new or newly fitted bearings running without load developed no heat, but the addition of load produced a bad case of heating in a very short time. A collar bound brass, a brass with too much bearing, or a connecting rod or crank shaft out of line will invariably heat under load, but may not when running light.

I had occasion some time since to have

crank shaft bearings and connecting rod brasses overhauled and refitted on a two cylinder opposed engine, and when the repair shop hill was rendered found that I had to pay for running the bearings five hours in a lathe for the purpose of getting them down to where they would run cool. The engine was mounted in the car and started, and inside of ten minutes it was necessary to shut down on account of hot bearings, although the engine had not been run at an excessively high rate of speed nor had the car moved one foot. In fact, the heating was so bad that the bearings had all to be eased off before I dared to put the car on the street. Within two weeks after this it became necessary to renew a crank shaft in a similar engine, and this time I went to the shop and saw to the fitting of the bearings myself, and when the crank shaft was put in I refused to allow it to be lathe-run, but put the engine in the car and ran it under moderate load and at low speed for a couple of hours, giving it plenty of oil. I then put the machine into active service and experienced no difficulty whatever with the bearings. To sum up, one or two hours' running of the engine under its own power will do more to bring brasses and bushings to a bearing than all the "outside source running" you can give, as it is only under the first condition that the engine will be subject to all of the varying strains and stresses which in conjunction with improper brass fitting tend to produce overheating.

FRANK X. HANCHETT.

Aluminum Paint Finish.

Editor HORSELESS AGE:

I have a car, the body of which is aluminum, which I am thinking of having finished in aluminum. Have any of your readers had any experience with this finish, and if so how does it wear? I am told by some that in time it turns yellow, but am anxious to use it, as it does not show dust and mud. What color would be suggested for the wheels? A discussion of this subject would, I am sure, prove interesting to many of your readers. JAMES NIXON.

Automobile Schools.

Editor HORSELESS AGE:

The recent timely agitation regarding automobile schools in the newspapers and automobile journals brings upon us the necessity of convincing those interested that we do a legitimate business and make every effort to furnish thorough and complete instruction. We can give evidence of our responsibility whenever asked.

The enclosed questions, selected from a list of 135 similar ones, give an idea of the nature of the matter taken up. Every scholar individually performs the operations referred to in the questions when the answer admits of such demonstration; in other cases he receives full explanations by the aid of the apparatus.

About half those who have registered with us are owners of automobiles, and in several cases have used their own machines in connection with the instruction. We give a full course of instruction, or answer any of the questions on our list, as may be desired.

MANHATTAN AUTOMOBILE SCHOOL,
By Forrest R. Jones.

[The questions referred to are of a practical nature, and the knowledge necessary to properly answer them is certainly valuable in the operation of a car.—ED.]

Explosion Engine Queries.

Editor HORSELESS AGE:

I have a four cylinder four cycle vertical gasoline motor, which I believe develops all the horse power obtainable with the cylinder dimensions. However, I would like to raise the horse power if possible while still preserving a good design. Kindly answer the following questions: Is the stroke proportional to the bore? Is the lift of valve proportional to the valve area? Is the area of valve proportional to the area of the piston? Is the length of the connecting rod proportional to the stroke? Is the compression raised in proportion to the horse power? Also what is the difference, aside from appearance and distribution of weight, between the methods of arranging all the valves on one side and inlets on one side and exhaust on the other? G. E. G.

[The stroke is usually from one to one and a half times the bore, the short stroke giving a light motor and the long stroke a motor of greater fuel enconomy. The lift of the valve is usually made proportional to the diameter of the valve. The area of the valve is proportional to the area of the piston. The length of the connecting rod is proportional to the stroke, but depends also on the bore. The compression is independent of the size of the motor. When all valves are arranged on one side, only a single cam shaft is required, and only a single pair of cam gears, which affords simplicity of construction. In general the compression chamber surface will be somewhat smaller when all the valves are arranged on one side, and the fuel efficiency may therefore be expected to be somewhat greater.—ED.]

Two Cycle Motor Cycles.

Editor HORSELESS AGE:

Replying to the inquiry printed in your issue of February 28, on page 353, regarding motor cycles fitted with motors operating on the two cycle principle, probably the only firm in Europe making such machines is a German concern (Komet Fahrrad-Werke A. G., Dresden). The original type of motor cycle of this firm has been on the market for several years. The two cycle motor transmits its motion either to the front wheel by friction or to the rear wheel by a belt, according to the model. The transmission to the front wheel by friction permits of constructing a motor cycle with lady's frame. Nevertheless, the 1906 model of this firm is fitted with a more powerful motor, 3½ horse power, of the four cycle type, the use of the two cycle motor being limited to the smaller sizes, 1½ horse power and 2½ horse power. CARLO RIZZARDI.

The "Kicker" Discussion.

Editor HORSELESS AGE:

"Kicker" and Mr. Pembroke seem to agree that a steam car is "the freakiest of all freaks," and it seems that they as well as others who condemn steam as a motive power base their position on experience with the antiquated type of steam cars. "Kicker" says there are the open flame near the gasoline, its stored pressure, the considerable heat in hot weather, its one thousand parts liable to get out of order, etc., which make it quite inferior to the gasoline car. The flame is in a closed burner, some cars (mine included) successfully use kerosene and it is not under pressure except what is in the auxiliary tank, less than 1 quart. The only uncomfortable heat is in the sun shining on the seat while occupied. Users of steam cars would like to know how "Kicker" finds one thousand parts to get out of order, even including boiler flues, all pipe connections, all parts of the engine, etc. Mr. Pembroke mentions the odor from a steam car. How about the gasoline car? The steam car is far ahead as far as odor is concerned; it is a far better hill climber, it is free from noise and vibration, easier to control. If a light steam runabout costing $825 can run from Providence to Boston, 44 miles, and outdo a $3,000 gasoline car, it shows that steam can do something. Another model costing $1,000, with a 23 inch boiler, went 5 miles in about seven minutes, starting with 587 pounds of steam and finished with 587 pounds of steam. This car can run 40 or 50 miles without stopping for water. How will a $1,000 gasoline car compare? Or a $2,000 or a $3,000 car? It is said that all you have to do with a gasoline car is to give the crank a few turns, and off you go. There are times, however, when all you have to do for half an hour or more is to turn the crank, and also to turn off some stormy language; in such a case it is hotter and harder work than getting a steamer ready. "Kicker" is off again when he says that the steam car will give good service to run about near home, but not for long runs. "Kicker" should read some of the accounts of steamers in endurance runs, and accounts of a trip from New Jersey to Rangeley Lake, in Maine. The trouble has not been with steam as a motive power, but due to the flimsy construction, too small boiler and engine. With a good sized boiler and a ruggedly built engine, with variable stroke plunger pumps, running one-half the speed

engine, one would have a car that r. H. W. Beach in his article in THE LESS AGE of April 18, has covered ints so well there is hardly much to say. It is evidently a fact, as he that the opponents of steam cars heir opinions on experience with an- d steamers. R. I. 276.

Two Cycle Engine Types.

HORSELESS AGE:

you please inform me through your e columns of the distinction between o port and three port, two cycle en- and where I could get a treatise on ign of two cycle engines?

H. L. H.

the two port, two cycle engine the is admitted to the crank chamber a suction actuated, spring returned valve. In the three port, two cycle it is admitted to the crank chamber a port in the cylinder wall, which vered by the piston when approach- upper limit of its stroke. In addi- ch type of engine has two ports, for nission of the charge to the cylinder e exhaust of the spent gases there- espectively, which are opened by the when nearing the lower limit of its

The supplement to Roberts' Gas Handbook, by the Gas Engine Pub- Company, Cincinnati, gives some ition on two cycle engine design.—

New Power Tire Pump.

HORSELESS AGE:

time ago I wrote you regarding ump with which I was experiment- h a view of determining its practi- ue, if any. You replied that the would cause me trouble, and gave addresses of several spring makers, g that I ask them if such a spring e made. All have replied that such g can be made, and, furthermore, l machine shop here has made me g which works all right apparently. interest you to know the construc- nce I enclose rough sketch. levice is fastened permanently to a ent part of the car, as near as pos- one of the cylinders. A pipe from ef vent opening, with a valve in it, ected to A. Upon the explosion of in the engine the lower piston B, and upper piston D move up and ie air from the chamber above D. E just allows C to pass through it hence cool air is drawn in and forced out through the holes shown just below it, by the motion of the piston, keeping the spring cool. During the exhaust and suction strokes of the engine the spring forces the piston back and draws in air at the inlet valve, which is similar to any spring pressed ball valve. A series of small holes are in the cylinder, so that the air piston uncovers them at the bottom of its stroke, insuring a full charge of air in the cylinder. I have put no radiating fins of any sort on my model, but I think the addition of them would improve the device. However, the heat seems to be of no consequence while the pump is running, but as soon as it is shut off the thing gets pretty hot all over. I have pumped up a tire till it was as hard as stone apparently, but, having no gauge, could not tell just what the pressure was.

The stroke of the pump is 3 inches and the bore 1½ inches. The cylinder need be finished only 4 inches from each end.

R. C. DEWEY.

Canadian Road Maps—Acid Cure Cements.

Editor HORSELESS AGE:

Replying to "S. H.'s" inquiry in April 18 number of your journal, an excellent road map of western Ontario, extending east of Toronto, can be procured of J. G. Foster & Co., 12 Lombard street, Toronto, or Cloke & Son, Hamilton, for 25 cents. Scale, 6 miles to the inch. I will furnish anyone with directions from Detroit to Hamilton, Toronto, Niagara-on-the-Lake and Niagara Falls, with odometer distances, on request.

The acid cure preparation cannot be excelled for inner tube repairs. It never lets go on account of heat. An outer covering put on a worn or badly cut outer casing by its use is a most satisfactory, lasting and good looking repair. A. M. HAYNES.

Are Automobile School Graduates Handicapped?

Editor HORSELESS AGE:

Is instruction received in an automobile school of no value to the would be chauffeur? My past experience leads me to answer no. However, I am open to conviction, and would like to know of what value others hold education so obtained.

I formerly held the opinion that a man who passed through a good school would be preferred to the porter graduate of a garage, but, alas! I am a wiser and poorer man now, and am looking for a garage that will pay me $3.50 a week and give me a year's reference at the end of four weeks. When I get this I am assured of a good position at $25 per week and expenses on the road. This reads like a fairy tale to some, I am sure, but it cannot be obtained by producing the first class certificates from two of the leading schools; I might say the only two schools in the city, as they are the only two requiring references of students and reputed to have the backing of more or less prominent manufacturers. I have tried it and know whereof I write.

Being the holder of ten years' references from some of the most prominent families in the city, of good appearance and good character, possessing youth and excellent health and eyesight, I believe everything is in my favor, except the fact that I passed the examinations and received the "diploma" of these schools. Every minute I can get I study the trade papers so as to be up to date, but all to no purpose.

Is it reasonable to suppose that I, a poor man, would pay $150 and more to secure an education as a chauffeur without being in deadly earnest and learning all the schools have to teach me? I have advertised and answered advertisements, and have almost secured a position, but when I show my certificates from the schools it is all off. The first question I am asked is, "Is this all the practical work you have had," and, being conscientious, I answer, "Yes, sir." "I will let you know in a few days" is as close as I get to the job.

The next applicant for the position is a former employee of Messrs. Muffler & Co., and has been polishing brass, sweeping out and rushing the can for the mechanics. Needless to say he has had practical (?) experience, so he is asked his terms. The former incumbent has told him what wages he received, so it is no harm to ask the same. A telephone talk with Muffler & Co., of course, is satisfactory, and he gets the job for a while. As he is indebted to his former employer, needless to say the repair bill rapidly grows larger and Muffler & Co. are paid for their trouble.

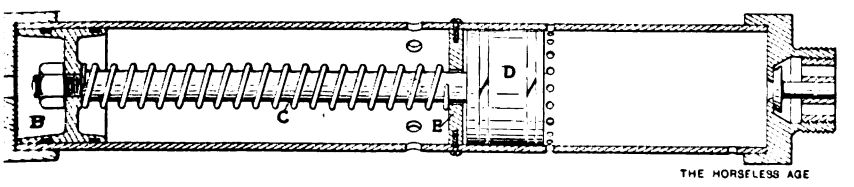
My experience may be of value to some industrious and thrifty man who is seeking a chauffeur's berth, and I hope it may put him "wise" to the game.

A CHAUFFEUR (NOT).

Cause of Racking Noise.

Editor HORSELESS AGE:

One day last summer I had a funny experience while driving a small 8 horse power runabout of a well known make. The car I speak of has a sliding gear transmission, with a spring on the shaft between the clutch in the engine flywheel and the transmission. When going down a hill I did not throw out the clutch as usual, but thought I would use the engine as a brake. The transmission was in high speed, with



SECTIONAL VIEW OF DEWEY'S POWER AIR PUMP.

no gears in mesh, and when the car started faster than the engine there was a queer racking sound, as if from the large spring.

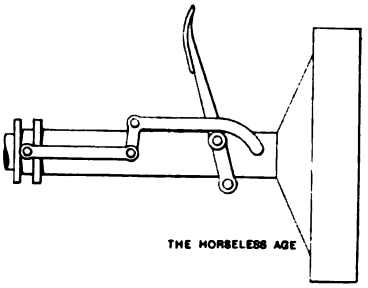
Can you or anyone tell me why this happened? "WAITING."

[The racking sound was presumably due to backlash or play in the high speed jaw clutch, and in the bearings of the engine.—ED.]

Clutch Wrinkles.

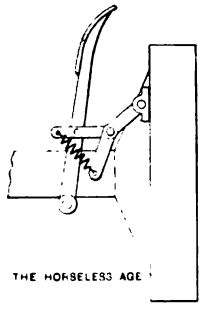
Editor HORSELESS AGE:

I was very much interested in an article in one of your January numbers in which it was pointed out that very stiff clutch springs are being used on some of the cars. A friend of mine had a French machine with a very powerful clutch spring, and we eliminated all trouble in operating the clutch pedal by the use of a sort of wedge roller lever, as shown in the accompanying



drawing. When this device was applied to the car the clutch pedal required only about one-third the pressure as before, without changing the spring or making any other important modifications. I saw this idea applied to a car in London, and it is not original with me.

Another clutch problem that I had to solve may be of interest to some of your readers. This machine was fitted with a large internal cone clutch, the cone having a bearing on the end of the crank shaft. The cone was an aluminum casting, and its friction surface was lined with cast iron, which engaged the steel friction surface of the flywheel, this latter surface being provided with oil pockets to insure a very gradual picking up of the load, as the oil is squeezed out between the surfaces in contact when the clutch is allowed to engage.



The trouble with this clutch was that when it was disengaged the cone continued to spin for a considerable time, which was very annoying on grades, as in such a case the car would lose its momentum before a change of speed could be effected. Besides, it was very injurious to the gear teeth. The cause of this trouble was the great inertia of the clutch cone combined with the friction of its bearing on the end of the crank shaft, which had a tendency to carry the clutch along. I overcame the difficulty by rigging up a clutch brake with a tension spring so arranged that when the clutch was disengaged the brake was applied to the cone, thus making it possible to stop it quickly. After this improvement was made the gear could be shifted without any noise whatever. The arrangement is illustrated in the accompanying cut. H. P. C.

A New Cooling Liquid.

Editor HORSELESS AGE:

I have just passed through my first winter's experience with an 8 horse power, single cylinder, water cooled runabout. I used it practically every day and some nights, and have never had a breakdown or freeze-up. Last fall I filled the water tank with a solution containing:

Zinc chloride..... ¼ lb.
Glycerine .....1 gal.
Water .....2 gals.

This seems to be perfectly safe from freezing and my machine has stood outdoors two or more hours at a time. My garage is not heated, either. Next winter I believe I shall put a 40 per cent. solution of wood alcohol in, however.

The cost of running, including $5 per month for washing the machine, has varied from $12 to $13 per month. Two months ago I bought a $14 storage battery, which is certainly a good investment, as it will soon pay for itself in saving on dry cells, and besides it does much better work.

My machine is equipped with top and storm front and I go out in weather that I would not think of taking a horse out in. LESLIE W. SCHWAB.

Queries.

Editor HORSELESS AGE:

I am rather a new subscriber to THE HORSELESS AGE, so may have missed a discussion of the merits and faults of the various types of ball bearing, but it seems that most of the cars use non-adjustable ball and roller, and very few the adjustable ball. What are the advantages or disadvantages, as viewed by the present day "authorities," of the latter bearing?

Where a torsion tube is used as housing for propeller shaft what is the practical disadvantage? C. E. BOTTOMLEY.

[The adjustable or cup and cone type of ball bearing is open to the objection that the balls frequently break and the ball races cut and become worn. The advantage of these bearings is their low friction coefficient, as compared with plain bearings. The non-adjustable type of ball bearing is generally considered an improvement on the adjustable type; in the former the load is squarely on the balls, and there is no wedging action, consequently less friction and wear.

The disadvantageous feature of a torsion brace tube around the propeller shaft is that it admits of the use of one universal joint only. Now when power is transmitted from one shaft to another at an angle therewith, through a universal joint, if the former shaft runs at a perfectly uniform speed of rotation, the speed of the latter will vary periodically, passing through two maximums and two minimums during each revolution. If two universal joints are used and the shafts ahead of and behind the propeller shaft respectively are parallel with each other, they will run in perfect unison as the second universal will smoothen out the unevennesses due to the first.—ED.]

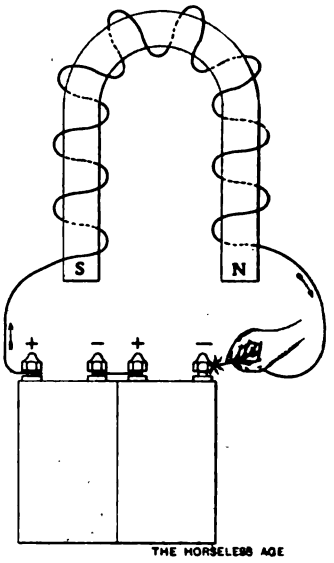
Remagnetizing Weakened Magnets.

Editor HORSELESS AGE:

Will you kindly tell me if the permanent horseshoe magnets of the ordinary magnets can be successfully remagnetized, and if so, how is it done?

BARRETT'S CYCLE SHOP.

[Wrap the magnet with a layer of tape or cloth and then wind magnet wire around it over its entire length, several hundred turns of anything between Nos. 13 and 20 B & S gauge. Then connect one end of the wire to one terminal of a fully charged storage battery and touch the other end for a moment to the other terminal of the bat-



tery. It is essential, however, that the wire be connected to the battery in the right way, so the current will magnetize the magnets and not demagnetize them. First, find out which is the north pole of the magnet (this can be done by means of a magnetic needle, the north pole of which is attracted by the north pole of the magnet) and the positive or terminal of the battery. Then connect the positive battery terminal to that end of the wire that the current from the positive terminal flows around the magnet in such a direction that a screw turned in the same direction would advance toward the north pole. The rough sketch makes this plain. If a number of four volt storage batteries are on hand they might be connected in series, especially if the wire used is comparatively small.—ED.]

COMMERCIAL APPLICATIONS

The Automobile in the Telephone Business.

Leland Hume, general manager of the Cumberland Telephone and Telegraph Company, Nashville, Tenn., informs us that his company appreciated the advantages of the automobile as applied to the telephone business at a comparatively early date. They now own and operate fourteen machines of the runabout type that are used daily by the "trouble men" and installers. Six of these machines are used in and around Nashville, where the country for a radius of 100 miles is traversed by splendid macadamized turnpikes, along which the company owns and operates long distance and local telephone lines.

When a line is found out of order, and the trouble is 20 miles from Nashville, it can be reached in an hour and a half. Under the old mode of conveyance by horse and wagon two-thirds of a day was required to reach the trouble, and the man was lucky if he got there and back the same day. As a result the use of the automobile has been of great advantage to telephone subscribers and users, because it minimizes the time that any telephone remains out of order.

General Manager Hume uses an automobile almost entirely in inspecting the long distance lines in Kentucky and Tennessee, and in visiting the 150 different telephone exchanges operated by the company in these two States. The far famed Blue Grass region of Kentucky has turnpikes similar to those around Nashville, making the use of the automobile practicable and pleasant.

Each automobile runabout costs about twice as much to maintain and operate as a horse and wagon, but it accomplishes three times the work, hence it is a money saver.

He relates a recent instance illustrating the service of the automobile. It was extremely important that an officer of the company should reach a town 85 miles distant to attend a specially called meeting of the city council, at which franchises were to be considered. The railroad schedules made it impossible to accomplish this trip by rail. The automobile was brought into requisition, and the official left Nashville at 4 p. m., reaching the town at 8 o'clock, just in time for the meeting. This is only one instance of many where the automobile has been used to great advantage in emergencies. Mr. Hume adds that the company are now seriously contemplating the use of automobile trucks for their heavy hauling.

New Car for Detroit Post Office.

A new Oldsmobile delivery wagon has just been placed in service by the Detroit post office between the main office and Station F at the corner of Russell street and Lyman place. This is the second machine to be run between these points. The car is painted red, white and blue, and is handsomely lettered. The weight of the machine is 3,300 pounds. It is equipped with the Olds standard Type F, 18 horse power engine, double cylinder, vertical motor. The cars make seven trips daily, the distance being 4.1 miles, and they cover it in seventeen minutes, although the Government schedule time is twenty-two minutes. The cars are operated by chauffeurs from the Auto Express Company.

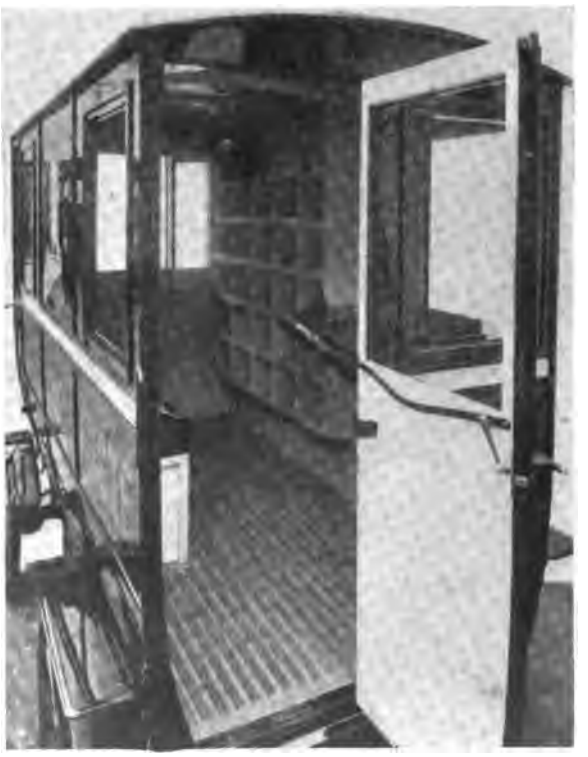
Milan Mail Automobiles.

For the collection of letters in Milan, the General Director of the Royal Mails has at present in service two different types of electric vehicles, which, according to a statement made by the postmaster of Milan to a HORSELESS AGE representative, are both giving excellent results as regards celerity and economy. Further particulars about these vehicles were obtained from the firm which attends to their maintenance.

The first two vehicles were placed in service in June, 1903, and in September, 1905, each of them had covered more than 76,000 kilometres (45,600 miles), equal to about 100 kilometres per day, without having ever required greater care or additional repairs than were provided for in the first instance. Following are the specifications of this type of vehicle (Figs. 1 and 1A): Wheel base, 76 inches; tread, 58 inches; wheel diameters, 32 and 36 inches; frame dimensions, 114x46 inches; weight, including accumulators, 3,120 pounds; steel tubular frame; two motors of 2 horse power normal load capacity each; electric brakes and expanding brakes on the rear wheel hubs; mileage on one charge, 50; maximum speed, 15 miles per hour; minimum speed, 3.6 miles per hour; useful load, 1,540



ORIGINAL MOTOR WAGON OF THE MILAN POST OFFICE.



INTERIOR, SHOWING SORTING BOXES.

pounds; maximum grade on the routes, 6 per cent.

The vehicles ordinarily carry three persons, viz., a driver, a mail sorter and a mail collector. During the trips the stamps are cancelled, and the letters are sorted according to the twenty-six districts into which the city of Milan is divided. The interior of the body is arranged like a small office, containing a table and sorting boxes on one side and two seats on the other. For evening work they are provided with two small incandescent lamps, and for hot summer days there is a small fan attached to the ceiling, which is also operated electrically.

The second type of mail automobile has been placed in service more recently, and serves for the transportation in quantities of ordinary mail matter; it also carries three employees, viz., the driver, mail sorter and mail collector, but on account of the large quantity of mail collected by this vehicle it is only possible to cancel the stamps during the trip to the railway mail station.

The numerous tourists who will this year flock to Milan to attend the International Exposition of Transports held on the occasion of the inauguration of the new Sempione line will also have opportunity to see several other fine types of electric vehicles in operation, viz., hotel omnibuses, small trucks and private carriages. Attention may be called to a new form of body for hotel omnibuses (Figs. 3 and 4), which, for its height, has very low and wide seats and very large windows, a feature which is still very rarely found in this type of vehicle.

Motor Buses in the Adirondacks.

A stock company, to be called the Adirondack Company, proposes to operate a line of automobile stages from Westport, N. Y., to Elizabethtown, and from Keene Centre to Lake Placid, N. Y., in the Adirondack region. Large sixteen passenger buses will be employed, and will carry passengers, freight and express. It is said that a dozen or fifteen cars may be in service by the latter part of the summer of 1907.

Between Keene Centre and Lake Placid is the Cascade, noted for its scenery. The road is exceedingly narrow there, the grade being heavy, and in some places are deep gullies, often making it extremely difficult for vehicles to pass. It is hoped that part of the $50,000,000 appropriated for good roads by the State of New York will be expended here.

The Adirondack Company will begin operating their vehicles in part of this section the coming summer, but will have to wait until the Cascade road has been widened, which has been promised by the summer of 1907, in order to complete their plans.

Commercial Vehicle Notes.

The Berkshire Automobile Company are building a 3 ton motor truck.

It is reported that Pittsburg will try an automobile chemical fire engine soon.

A motor bus line is being planned for operation on Broadway, Long Branch, the coming summer.

An auto bus line is planned from the end of the trolley tracks on Northwestern avenue, Racine, Wis., to Horlickville the coming summer.

Three motor buses will be operated on the new line between Manitowoc and Kewaunee, via Mishicott, Wis., to be opened May 1. The line may be extended to St. Nazianz and Kiel.

The recently formed Syracuse (N. Y.) Automobile Livery Association have adopted a uniform rate for the renting of automobiles. For a four passenger car $4 an hour and $25 a day is charged. For each additional hour after the first the price is $3. For three passenger cars $3 an hour is charged and for one passenger cars the price is $ an hour.

A Knox motor bus has recently been tested as a patrol wagon by the Philadelphia police department. It was then sent to the Pennsylvania General Hospital for a four days' trial.

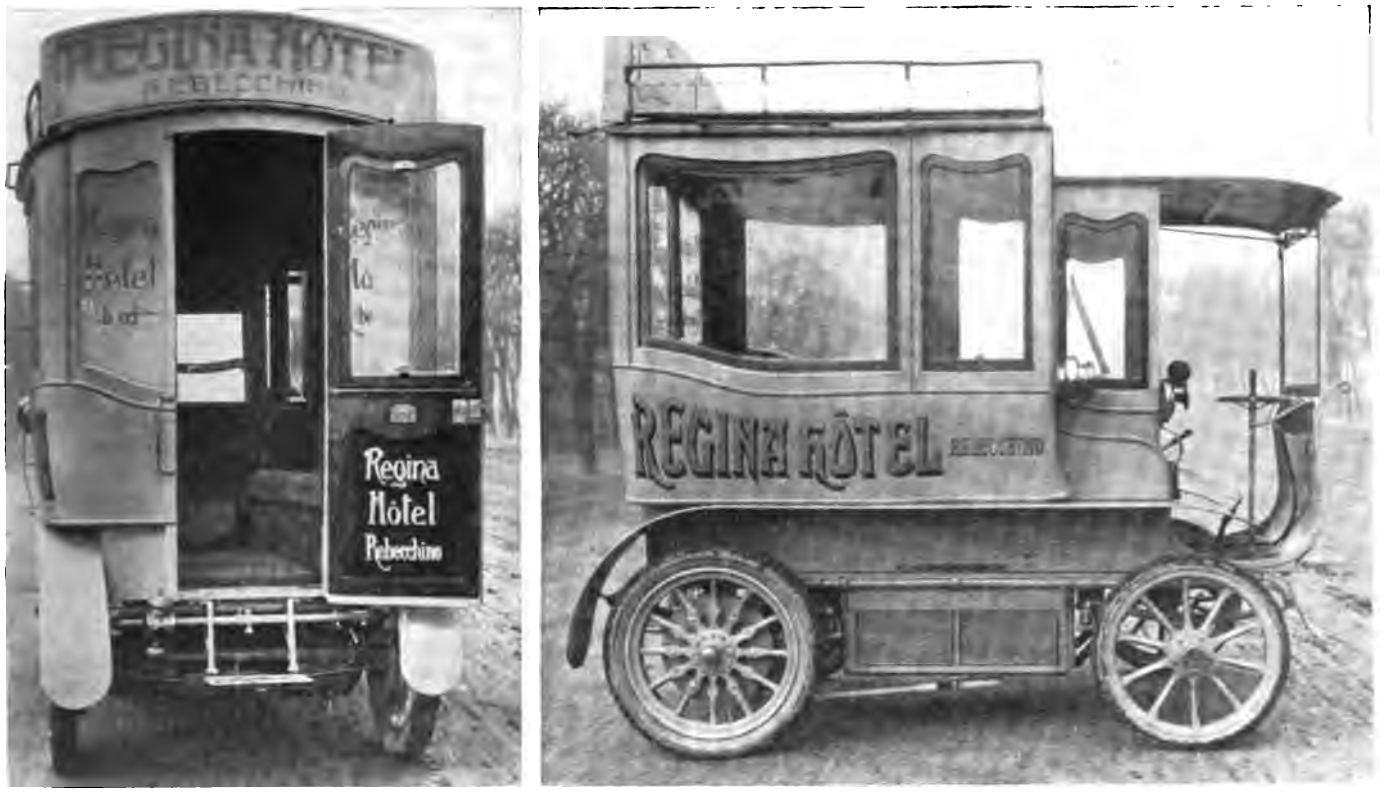
The Citizens Transit Company, of Detroit, have added two new "Seeing Detroit" cars to their present service. These cars will be able to travel 15 miles per hour and possess a seating capacity for thirty people. The route has been extended a long distance on the boulevard, and many improvements have been made in the arrangement of the trips.

The Manhattan Auto-Car Company of New York, with offices at the Hotel Saranac, Broadway and Forty-second street, New York city, is a new concern for the operation of sightseeing automobiles about the city and to Coney Island. They have six twenty passenger Mack Brothers gasoline buses, which make the trip from Forty-second street to Coney Island in one hour.

David Jeram, who substituted a gasoline motor bus for horse power on his stage line from Latham's Corners and Loudonville to Albany, N. Y., the middle of last March, has found the motor so practicable for his purposes that he has ordered another motor bus, with seating capacity of twenty-two passengers and standing room for a dozen more. He is also planning to start other routes. He had run a horse power stage line for many years, but has carried greatly increased numbers of passengers since substituting the motor.



MILAN MAIL COLLECTING AUTOMOBILE, SHOWING INCLINED SHELVES FOR SORTING.



NEW ITALIAN ELECTRIC HOTEL OMNIBUS.

Didn't Say Automobilists Were Speed Monomaniacs.

Daily newspapers in all parts of the country have been printing an account of a novel defense set up by the Ocean Accident and Guarantee Comporation, Ltd., of London, to avoid payment on a $10,000 accident policy on the life of M. L. Hancock, a wealthy man of New Orleans, killed in an automobile accident at Los Angeles, Cal., several months ago. According to these articles the insurance company contended that all automobilists were insane on the subject of speed; in other words, that they were the victims of monomania, and consequently were irresponsible persons.

Inquiry at the American head office of the company at 350 Broadway, New York, if any such sweeping allegations had been made regarding automobilists in general elicited a prompt denial. The following statement of the matter has been sent out to the agents of the company to counteract, if possible, the misrepresentations of the daily press:

An article has been appearing in several papers, stating that the Ocean has refused to pay a large claim for the death of an automobilist. Such newspaper statements as we have seen have not only misstated the case in respect of the Ocean's refusal to pay, but have given an entirely wrong impression of the general position taken by the corporation. The assured was killed while racing his machine through the streets of Los Angeles at a speed which is said by witnesses to have exceeded 40 miles an hour. The darkness made this speeding more than unusually dangerous, and the results were the wrecking of the automobile and of another vehicle which it ran down, the violent death of the owner of the automobile, and the injury of several others who accompanied him. Add the above that the automobilist in question came to his death after gaining an unenviable notoriety throughout the country for recklessness and speed mania, and for which he had been punished by the courts. Among his boasted feats were a race against Scotty's special train from Los Angeles to Pasadena, a race against Knabenschue's airship, and various other exploits of a similar nature. The policy issued to him by the Ocean was a special one, and contained a clause providing that half the amount of the policy should be paid in the event of death due in any way to racing. This sum was promptly offered by the corporation in settlement of his claim, but the beneficiaries refused to accept it and are suing for the full amount.

In filing an answer to this suit the corporation made no reference whatever to automobilists in general, but merely to the assured in particular. As a matter of fact the corporation has no hesitation in accepting automobilists as personal accident risks, and under any but extraordinary circumstances, such as are involved in the present case, will expect to pay all claims in full in accordance with its well known practice.

This is simply another illustration of the notorious disregard of the truth on the part of the greater number of daily newspapers. Some New Orleans correspondent sees the possibility of a good "story." The editors find it is good "copy," because an important insurance company brands a large class of people as monomaniacs. Whether the company actually did such a thing is evidently a secondary consideration. There probably are some speed monomaniacs, but automobilists as a class obey the law.

Another Rise in Gasoline Prices.

The Standard Oil Company, on April 16, announced a further advance in the price of gasoline and refined oil of one-half cent per gallon. The new quotations, which were in immediate effect, are: Ohio State test refined oil, 9½ cents; water white Ohio State test, 10½ cents; varnish makers' and painters' naphtha, 12½ cents; deodorized stove gasoline, 13½ cents; 74 to 76 degrees gasoline, 16½ cents; 80 degree gasoline, 19½ cents; 87 degree gasoline, 20 cents; 88 degree gasoline, 21 cents.

Auto Import Statistics.

Though the recent estimate, founded on the New York Custom House figures, regarding the number of automobiles imported into this country last year was almost 200 in excess of the actual number, there were still 896 cars imported during 1905, of which 827 were entered at the port of New York. The corrected figures are given in an official report obtained from the Department of Commerce and Labor by the Association of Licensed Automobile Manufacturers. The correct figures showing where the cars went and the duty collected upon them are as follows:

1905 IMPORTS.

Consigned to	Cars.	Value.	Duty.
Boston and Charleston	29	$99,585	$44,813.25
Chicago	16	58,510	26,329.50
Cuyahoga, N. Y.	1	1,713	770.85
Georgetown, D. C.	1	3,046	1,368.00
Grand Rapids, Mich.	1	2,100	945.00
Kansas City, Mo.	1	2,482	1,116.90
Louisville, Ky.	1	3,860	1,737.00
Newport, R. I.	3	13,539	6,092.55
New York city	827	2,930,402	1,318,680.90
Philadelphia, Pa.	13	57,613	25,925.85
St. Louis, Mo.	1	1,988	894.60
San Francisco, Cal.	2	5,336	2,401.20
Totals	896	$3,180,174	$1,431,075.60

During 1905 automobile parts to the total value of $231,606 were imported.

LEGISLATIVE and LEGAL

Automobiles as Common Carriers.

By Xenophon P. Huddy, LL.B.

History repeats itself. To-day we again find vehicles used as common carriers on the public streets and highways the same as in centuries past. Before the advent of railroads the highways constituted, with the exception of waterways, the only thoroughfares for carrying passengers and freight. In these days of business activity it seems almost an anomaly to see the business of common carrier conducted to any extent without tracks or rails. Nevertheless, even to-day a considerable number of automobiles are engaged in the carriage of passengers and freight, and there is bound to be a great deal of such public carrying business on the highways in the near future.

Take, for example, automobile cabs and sightseeing vehicles, which are to be found in almost every large city. They constitute common carriers just as much as the railroads which extend from the Atlantic to the Pacific. Public motor buses running on our city thoroughfares, in suburban districts and between country towns, are also common carriers. By offering to carry all passengers requiring transportation, they place themselves in a class with street cars running on tracks. In New York city a line of automobile buses or cars was established only a short time ago, the vehicles of which are in appearance and in the accommodations offered very similar to street railway cars. With reference to freight transportation, many express companies have already begun to substitute motor cars for horses, and the motor car is already very extensively used in the transportation of goods.

The term common carrier is one of significance. In law it is more or less a technical term, and when applied to automobiles it immediately places the twentieth century conveyance in a position of great importance. Additional responsibilities are assumed by the owner when the automobile is a common carrier. Automobiles used as common carriers may be divided into two general classes, namely, common carriers of passengers and common carriers of goods or freight. From present indications, the former class will be developed in this country much more quickly than the latter.

That the automobile has affected common carriers of passengers in many ways cannot be denied. An appreciable reduction in the passenger earnings of the railroads has been noted in both England and America, but, remarkable to state, this reduction has up to the present time, at least, not been caused by the automobile assuming the relation of a competitor. Now, however, the motor car may take the place of the railroad in the transportation of both passengers and goods; but it does not necessarily follow that this will act detrimentally to railroads in all cases, for without doubt automobile lines will be operated as feeders to the main lines of railroads where the laying of tracks for branch lines is impracticable.

A common carrier of passengers is by law compelled to carry all who ask for the service, at least to the extent of the facilities, and proper, suitable and comfortable accommodations must be furnished. The utmost care is by law required for the safety of passengers, and the owner of the service is liable for the acts of a chauffeur or any other person in charge of the vehicle, for negligent injuries to passengers happening without any fault on the part of those carried. In reference to the safe carrying of freight or goods, the common carrier is a guarantor—an insurer. If the goods placed in his charge are damaged the carrier is absolutely liable. He is bound to deliver them in the same condition as received.

The Situation at Albany.

Albany, N. Y.—The bill of Senator L'Hommedieu, to amend the motor vehicle law by imposing a State tax on motor vehicles and providing for the collection thereof, has finally passed the Senate, thus fulfilling the prediction of Mr. L'Hommedieu, made at the beginning of the present session. It will be remembered that the bill has been twice amended and twice recommitted to the Committee on Taxation and Retrenchment.

The bill originally provided for a tax on the basis of the horse power, but this basis was afterward changed to that of the weight. A corresponding change was also made in the filing statement, the weight of the machine, to include tires, lamps and all other equipment, being required to be mentioned. The final bill provides for a tax of $1 per vehicle and an additional 50 cents for each 500 pounds or fraction thereof, the tax to become due on the 1st of June of each year. The filing fee remains $2. The proceeds of the tax are to go into the State treasury and be expended under the direction of the State engineer for highway improvement.

Assemblyman A. E. Lee, whose bill, with amendments, is now identical with that of Senator L'Hommedieu, with whom Mr. Lee co-operated, declared to a correspondent that his bill would be passed beyond a doubt. He said it would probably come up for consideration in the Assembly the latter part of next week, and certainly before the present session was suspended. Those who opposed the bill in the Assembly last year are prepared to remain true to their word to Senator L'Hommedieu, that they would support the bill this year if it were amended to suit their wishes. The bill was recommitted to the Committee on General Laws after the first reading, retaining its place on the order of third reading and reported "with a substitute."

The bill of Senator Saxe and Assemblyman Stanley, providing for a State commission to have almost entire charge of the enforcement of the general motor vehicle law which the bill was to constitute, is believed to be dead. The opposition at the hearing of the State Association, the Automobile Club of America and other prominent bodies, comprising both automobilists and auto manufacturers, has been effective. It has not been advanced to a third reading, and probably will not be. Nothing has been done with it, so far as can be learned, since the hearing. Those provisions in it which conflict with the L'Hommedieu and Cox bills, the latter of which has just been signed, will likewise be void.

It is also conceded that the bill of Assemblyman O'Neil, to regulate the speed of automobiles, is dead, even though it was introduced "by unanimous consent." It has not been advanced to a second reading, and probably will not be. It is considered too harsh and little or no support has been given it. The present speed law seems to be satisfactory.

The bill of Assemblyman Weber, "creating a State motor vehicle accident commission and defining its duties, and providing for the recording of accidents by motor vehicles," is still in committee. The bill was introduced by request and seems to have little support.

The insurance and highway legislation will probably block further motor vehicle legislation, owing to the short time now left before the close of the present session and the amount of work still on hand.

Legislators Studying Handling and Control of Motor Vehicles.

Boston.—At the suggestion of the Massachusetts State Automobile Association, the Committee on Roads and Bridges of the Massachusetts Legislature, recently took a two days' trip through sections of the State most used by automobilists, for the purpose of making a practical study of the method of handling and control of motor vehicles. The committee were accompanied by several members of the association, also President Lewis R. Speare, of the Bay State Automobile Association, and legislative counsel, Francis Hurtubis, Jr. Five cars, owned by members of the association, were used for this trip.

At the request of different members of the committee the speed limit was exceeded at different times for the purpose of illustration. Cars going at 30 miles an hour were stopped within 15 feet, while cars at 20 miles were readily stopped in 10 feet. The party was entertained en route by various automobile clubs.

Plans for Enforcing New Jersey Law.

TRENTON, N. J.—It is the purpose of Assistant Secretary of State Smith, who, under the new Frelinghuysen automobile law, is commissioner of motor vehicles, to organize a system of operation that will be a model for other States to follow.

Places for registration and examination will be designated in several sections of the State. Offices at Camden and Jersey City will be opened within a few weeks, so that automobilists may be prepared for the law when it goes into effect July 1. They will be directly connected by telephone with the Secretary of State's office in this city.

The police boards of the various cities and towns in the State have been communicated with, and they will be asked to cooperate with the department in its efforts to enforce the law. Under the Frelinghuysen act only seven inspectors are provided for. They are to receive $3 a day when on duty, and an appropriation of only $750 was made for their compensation. They can work only thirty-five days in the 365, and expect compensation.

Commissioner Smith says that an effort will be made to eliminate the drunken chauffeur from the New Jersey highways. Whenever caught he will be punished to the limit of the law. The department will be fair in its dealings with reputable persons who apply for examination as to their ability to operate automobiles. They will not be asked to demonstrate that they are practical mechanical engineers, but they will have to show that they are familiar with the working of the machine or machines that they own, and expect to operate.

A careful estimate places the annual profit from registration fees that the State will receive the first year after the law goes into effect at $60,000, but the automobilist cannot reasonably complain at this, because the money is to be spent on improvement of the highways.

The Alcohol Bill in the Senate.

WASHINGTON, D. C.—The House of Representatives passed the free alcohol bill by a vote of 224 to 7 on April 16. Mr. Payne, of New York, explained the provisions of the measure, stating that it provides that denatured domestic alcohol may be withdrawn from bond without the payment of an internal revenue tax for use not only in the arts and industries, but for fuel, light and power. The bill provides for its denaturing, that is, making it poisonous so that it cannot be used as a beverage or for medicinal purposes.

It is intimated that the Senate Committee on Finance "will find it necessary to call witnesses," notwithstanding the extended hearings of the House Committee on Ways and Means, and the almost total lack of testimony or argument against the bill. "It is argued" by "some Senators" that "many of the tariff schedules were fixed in view of the high price of alcohol to American manufacturers: but if the duty is to be taken off this commodity, so that it will cost but 20 cents a gallon, there may be a readjustment of all these schedules to meet the changes."

This is simply a subterfuge, of course. The proposed bill has no reference to the tariff, but simply provides for the remission of the heavy internal revenue tax of $2 per gallon after the alcohol has been rendered unfit for drinking.

The Standard Oil Company is the corporation that will be principally affected by this bill if it becomes a law. Nelson W. Aldrich, of Rhode Island, is the chairman of the all powerful Senate Finance Committee. The country at large will doubtless scrutinize closely the action of this committee.

Which Applies—Baltimore Ordinance or Maryland Law?

BALTIMORE.—To decide which speed law is effective within the limits of this city—the city ordinance, prescribing 6 miles an hour as the speed limit, or the new State law allowing a speed of 16 miles an hour—Jesse L. Cassard, Jr., the Ford agent here, was selected by the A. C. of Maryland to subject himself to arrest, and thus bring the matter before the courts. It was thought he could safely do this, as he had never been convicted of speeding. The A. C. of Maryland believe that the State law applies in Baltimore, as well as in the other towns of the State, while the city magistrates insist that the city ordinance still holds good.

Mr. Cassard ran his machine one day last week at slightly more than 10 miles an hour through one of Baltimore's streets and was arrested.

Ohio Licenses Held up Until June 1.

CLEVELAND, Ohio.—The city clerk stopped issuing auto licenses on April 10, the last one being No. 2,526.

The Secretary of State sent word in answer to an inquiry that he would not be in readiness to issue State licenses until June 1. As a result cars bought between the above dates will run with numbers or licenses.

Persons making application for license will do well to get from the clerk's deputy a written statement showing that the new owner or transient driver has done all in his power to procure a license.

New York's Traffic Regulations.

Francis Hurtubis, Jr., counsel for the Massachusetts State A. A., says that the street traffic regulations in New York city impressed him as sensible and practicable.

"In Central Park and on most of the streets," he said, "vehicles traveling in one direction were compelled to remain on their own side of the street or road. Their drivers could not turn out wherever they pleased in order to get ahead of others, and whenever the traffic was blocked and carriages were obliged to stop, the raising of the hand by automobilists and the signalling with the whip by drivers of horse vehicles to the driver directly behind them, which was notice of the blockade, seemed to be a wise precaution and easily carried out. These were three things that particularly impressed me. A little later in the season the Massachusetts State A. A. will send out notices to all its members requesting them to observe the laws and regulations in force, and at that time these regulations will be called to their attention."

The Daimler Motoren Gesellschaft (Mercedes Company) have brought out a six cylinder racing car of 160x150 mm. cylinder dimensions, rated at 120 horse power. It has steel cylinders and high tension magneto ignition.

New Agencies.

Gothenborg, Sweden.—John Trogarah.

Emerado, N. Dak.—Archibald J. Scott, Northern cars.

Tracy, Minn.—August Westman's Automobile Agency.

Detroit.—Alexander J. McLeod, Rumsey electric vehicles.

Winston-Salem, N. C.—Hege Brothers, Northern cars.

Winnipeg, Man.—Northern Automobile Company, Northern cars.

Indianapolis, Ind.—The D. B. Sullivan Auto Company, the Lambert cars.

Detroit.—Wayne Auto and Supply Company, Logan delivery wagons and Babcock electrics.

Kansas City, Mo.—J. H. Whittman, Fifteenth and McGee streets, Pope-Toledo and Pope-Waverley cars.

Cleveland, Ohio.—The Reid & Cachat Company, 199 Crawford road, the Walker runabouts (Cuyahoga and Lake counties).

Cohoes, N. Y.—Clute Brothers, Inc., Mohawk street, the Pope-Hartford, Pope-Waverley, Pope-Toledo and Pope-Tribune Cars.

Grand Forks, N. Dak.—The Grand Forks Automobile and Garage Company, the Carter cars of the Motorcar Company (eastern North Dakota).

Milwaukee, Wis.—The Hickman, Kraemer & Croll Company, the Carter cars of the Motorcar Company, Detroit (Wisconsin and upper peninsula of Michigan).

Trade Personals.

Ed. Seymour, formerly with the Buick Motor Company, is the new assistant superintendent of the Oldsmobile plant at Lansing, Mich.

Le Roy Pelletier, formerly of the art department of *Motor Way*, has accepted a position with the Ford Motor Company, of Detroit, where he will have charge of the advertising work.

Simeon H. Baker has retired from the Baker-Cormerais Motor Car Company, Boston, agents for the Premier, and the firm name has been changed to the H. D. Cormerais Motor Car Company.

Charles E. Shaw, president and manager of the Palace Motor Car Company, of Buffalo, and Nathan Dougherty, the secretary, have resigned. Dr. John J. McCullough, the new secretary, is in charge of the company's affairs. The company is to be entirely reorganized and capitalized on a larger scale. They handle the Maxwell cars.

Rules of the A. C. A. Two-Gallon Efficiency Contest.*

I.

GENERAL.

It will be assumed that every contestant is acquainted with the rules of the contest. By entering therein he shall agree to abide by the rules. In the event of any dispute concerning the interpretation of the rules, the decision of the committee shall be final. Except in regard to the score formula, the committee reserves the right to alter or amend the rules up to the time of starting as it may deem expedient for the better management of the contest. The committee reserves the right to reject any car with or without publicly stating the reason, but in the latter case the entry fee will be refunded.

II.

CARS ELIGIBLE TO COMPETE.

The contest will be limited to self propelled pleasure vehicles of individual owners, or of manufacturers, taken from stock. Special or freak cars will be excluded. Except for the introduction of any devices regularly sold, no alteration of the mechanism, gears, carburetor, tank or any other part will be permitted, permissible manipulation being limited to such adjustments of ignition, mixture, etc., as are ordinarily made when on the road. Each car must be provided with a proper muffler which must be kept closed, and it must have a differential gear or its equivalent. Any car which in the judgment of the committee makes an excessive amount of noise or smoke will be excluded, but in this case the entrance fee will be refunded.

Rule No. 2 is amended to the extent of permitting change in the size, inclination or elevation of the gasoline tank to insure delivery of the entire 2 gallons.

III.

ENTRIES.

The entrance fee will be $10 per car, and the entries will close on May 2 at noon. No entry will be accepted unless all the information called for by the entry blank is given therein, and it is accompanied by the entrance fee. Entry blanks will be forwarded by the club secretary upon request.

IV.

STARTING.

The contest will start from a garage near the clubhouse. Beginning at 1 o'clock in the afternoon, after being weighed in at their own convenience, the cars will start immediately, pass the clubhouse and go over the measured course, a map of which, with the distances plainly marked, will be given to each driver. The course is straight up Fifth avenue to 110th street, to St. Nicholas avenue, to 155th street, to Central Bridge, to Jerome avenue, to Pelham Parkway, to the Shore Road, to New Rochelle, and on to Boston Post Road per route card. No attention will be paid to the time made, but any car not starting within fifteen minutes after the committee gives the word to it, or that does not finish within five hours, will be disqualified.

Before starting, each car, and especially the float chamber of its carburetor, must be emptied of all gasoline down to the point where its engine will stop. A sufficient number of independent experts will be on hand to examine the cars at this time, and in any case where it appears to the committee that any attempt has been made to avoid compliance with the rules, the car will be excluded from the competition. A sufficient number of cans, each containing exactly 2 gallons of gasoline, carefully measured and sealed, will be at hand, and will be distributed to the cars.

V.

LEGAL REQUIREMENTS.

Each car will be required to carry its State registration numbers and all equipment required by law, such as brakes, lamps and horn.

* To be held May 5.

VI.

OBSERVERS, MAPS AND NUMBERS.

The committee will select and assign an observer to each car, and the car will be given a contest number and map of the route, showing distances, and a memorandum of weight.

VII.

WEIGHING.

The weight of each car with its full complement of passengers will be taken as it starts in the contest, and will be recorded upon the report sheet for use in rating the car. The full complement of passengers will be as many as the car is constructed to seat comfortably.

VIII.

PASSENGERS.

The load carried by each car will consist of passengers only, including the operator and observer. No dead load other than ordinary equipment will be permitted. All passengers and equipment in the car at the time of weighing must remain during the entire run.

IX.

SCORE FORMULA.

The rating is based on cars having four or more cylinders. Cars having two cylinders will be rated as though they weighed, loaded, 75 per cent. of their actual weight. Cars having one cylinder will be rated as though they weighed, loaded, 70 per cent. of their actual weight.

The scores made in the contest will be arrived at as follows:

To the actual weight of the car with passengers as weighed at the moment of starting (or 75 per cent. or 70 per cent. of the same as mentioned above) a handicap of 800 pounds will be added. This sum will be multiplied by the distance in miles traveled to obtain the score.

The cars making the highest and the second and third highest scores will receive the first, second and third prizes respectively.

X.

DISTANCE TRAVELED.

Immediately upon a car coming to the end of its run, owing to the consumption of its 2 gallon supply, the observer will determine and note the exact position at which the car stopped and the distance traveled measured from the tires of the front wheels, and will see that the car remains stationary until the "advance" or "rear wagon" reaches the point and checks the position determined by the observer. If the car has traveled over 30 miles the observer will call up the clubhouse (telephone No. 2956 Plaza), and report the result, in order to facilitate the prompt deciding of the contest, and will in person immediately bring in the record, which he will swear to before a notary public at the clubhouse and deliver to the committee.

No means of propulsion for a car other than its own motor will be allowed.

At the conclusion of its run, and as soon as its position and distance have been determined, and it has received the relief supply of gasoline, each car will return at once to the clubhouse. As soon as the three cars apparently having the highest scores have been ascertained, they will be sent to the garage in charge of an official, and there be subjected to a further examination. The committee reserves the right to open and examine their gasoline tanks.

XI.

PROTESTS.

Any contestant desiring to enter a protest must submit the same in writing immediately upon the conclusion of the contest, together with a deposit of $25, which sum will be retained by the committee if the protest is not sustained. Any protest thus regularly made will be considered by the committee immediately and a decision will be rendered thereon at once.

XII.

DRIVERS.

No change of operators will be permitted after the start is made. The driver of each car must operate his car without assistance from others. The observer will occupy the front seat beside the driver.

XIII.

RELIEF CANS.

A car serving as an "advance wagon" will accompany the first starter and will keep up with any car that takes the lead. When the leading car stalls, the "advance wagon" will note its position and distance traveled, take up its contest number and deliver to it a 5 gallon or relief can of gasoline to enable it to return to the clubhouse. The "advance wagon" will then retrace its course, relieving in succession the stalled cars as it meets them. It will carry also a surveyor's assistant. A "rear wagon," similarly equipped and having a cyclometer, will accompany the last starter and will act in a similar capacity working from the rear of the course.

XIV.

PRIZES.

Prizes consisting of a $500 punch bowl for first, a $100 cup for second, and a medal for third are offered by the club, and are now on exhibition at the clubrooms, where they will remain until the awards are made. The distances traveled, weights and ratings as laid down above will be put together immediately by the committee, who will remain in session continuously from the time the contest begins until the conclusions are reached, and the winners will be announced and the prizes awarded and delivered before adjournment. A score board will be made up at the clubhouse showing the number, weight handicaps, total weight, distance traveled and the score of each car, from which the prizes will be awarded.

XV.

CERTIFICATES OF PERFORMANCE.

Upon request, certificates of performance will be given for each car that enters, goes over the course and complies with all the rules, and is therefore eligible for a prize.

The Road Club.

On the occasion of the recent Agricultural Hall Show in London a new organization of motorists, the Road Club, was founded, with the assistance of the A. C. G. B. and I. and the Motor Union. A pamphlet issued setting forth the object of the new club states that it was "established to meet the requirements of motorists, driving tourists, hunting and coaching people and others who wish to assist in a revival of the glories of the road and to pursue the delightful pastime of road touring under more favorable conditions than have hitherto prevailed.

Well appointed and comfortably furnished private clubrooms for the exclusive use of lady and gentlemen members and their friends (together with toilet rooms) are being taken where possible at the leading hotels in cities and towns which are considered to be of sufficient interest to members to be suitable and agreeable stopping places.

For the first 500 members of this club, who will join without entrance fee, the "very moderate subscription" is, for ordinary male members 4 guineas, but for ladies 3 guineas. Members of the Automobile Club and affiliated clubs, the Motor Union, members of hunts and coaching clubs, however, pay 3 guineas, while lady members of the Motor Union and Ladies' Automobile Club pay £2 12s. 6d. Prominent local residents in the various centres where the quarters of the Road Club are situated will be elected as honorary members.

MINOR MENTION

The American Lamp Company, Detroit, have occupied their new quarters at 255 Jefferson avenue.

The Winton Motor Carriage Company inform us that 800 of the Winton Model K cars have already been delivered to purchasers.

It is reported that the Golden State Motor Car Company, of Los Angeles, Cal., are to begin the manufacture of automobiles.

The police department of Winnipeg, Man., has purchased a Winton Model K for the use of the chief of the Northwestern Mounted Police.

The American Machinery and Manufacturing Company, 133 Beaubien street, Detroit, Mich., expect to begin making motor trucks September 1.

The Double Friction Coil Clutch Company, Chicago, Ill., have removed their general offices and works from 42 River street to 45-47 South Canal street.

The Olds Motor Works are conducting a 200 hour non-stop contest in Detroit with a four cylinder touring car from the agency of J. P. Schneider.

A New York company is reported being organized to manufacture on royalty the automobile tires controlled by the Seaton Auto Tire Company, of St. Louis.

The Prest-o-Lite Manufacturing Company, Indianapolis, Ind., have moved their plant from Pennsylvania and Twenty-eighth streets to 18-24 South East street.

The San Francisco branch of the Fisk Rubber Company is one of the stores known to have been totally destroyed by the fire which followed the recent earthquake.

The Truscott Boat Manufacturing Company, of St. Joseph, Mich., will begin the manufacture of motor supplies in May. Engines for motor cars will be a specialty.

Richard E. and H. P. Hannan, of Ogdensburg, N. Y., are about to open an agency, repair and supply establishment in that town, and desire to hear from interested firms.

The first shipment of Aerocars to New York city was received last week, and they are now on exhibition at the new salesrooms and garage at Broadway and Seventy-third street.

C. S. Mendenhall, 512 Race street, Cincinnati, Ohio, has just published a road map of Maryland and Delaware, accompanied by two detailed maps of the country around Washington and Baltimore.

Dr. J. W. Carhart, of Austin, Tex., has applied for a patent on a laminated paper tire for automobiles. The paper used is a heavy binder's board, sawed, by means of a band saw, into segments corresponding to the circle of the wheel. Four or more of these make the circuit of the wheel, being built up upon the rim of the wheel by adding one layer or segment to another with white lead or other paint between.

The Brown-Lipe Gear Company, Syracuse, N. Y., will build a five story factory for the manufacture of equalizing and steering gears for automobiles.

The national meet of the Federation of Motor Cyclists will be held at Rochester, N. Y., July 4 to 7. The national endurance contest will be run from New York to Rochester, 350 miles, July 2 and 3.

The Kobusch Automobile Company, of St. Louis, has been incorporated with a capital of $1,000,000 to take over the automobile business established by George J. Kobusch, president of the St. Louis Car Company.

The Brookline Medical Society, of Brookline, Mass., has appointed a committee to confer with the Board of Health in regard to abating the dust nuisance caused by automobiles in residential sections of that town.

Major F. A. Mahan, 51 Avenue Montaigne, Paris, has been appointed attorney for the A. C. A. in France. Members touring Europe may apply to him for legal advice and assistance, if the necessity arises, for which he will charge a reasonable fee.

The Matheson Motor Company, Wilkesbarre, Pa., have plans for the erection of a large plant for the manufacture of commercial automobiles. The employees of the company will be furnished with free libraries, clubrooms, baths and an athletic field with track.

Edward Johnson, of Jersey City, N. J., has been appointed chief inspector of motor vehicles for the State of New Jersey under the new law creating a department of automobiles, of which Assistant Secretary of State J. B. R. Smith is the head.

The Hedgeland solid axle, an American product, was recently subjected to a 1,000 mile trial fitted to a Cadillac four cylinder car, and also to special tests bearing on its anti-skidding qualities by the technical committee of the A. C. G. B. and I. in London. The results of the test are not yet to hand.

The recently incorporated Chatham Motor Car Company, Ltd., Chatham, Ont., have leased a factory, where they will manufacture runabouts and a light type of tonneau car. They will also deal in all kinds of motor vehicles. The provisional president is Dr. T. K. Holmes, and R. J. Gardiner is secretary and treasurer. The directors are R. L. Brackin, Chatham; Dr. T. K. Holmes, Chatham; Thomas Dillon, Detroit, and R. J. Gardiner, of Chatham.

The Excelsior Automobile Supply Company have opened their new Chicago store at 1436 Michigan avenue in Automobile Row. The Western Continental Caoutchouc Company have started business in the adjoining store, 1438 Michigan avenue, where they have a vulcanizing and tire repair plant. The interiors of these two stores are finished in weathered oak, Mission style, and the show cases are lighted by shaded electric lamps, in which the names of various automobile specialties are inserted in red letters.

Rutland, Vt., will have an automobile show in connection with its horse show June 5 and 6.

An automobile factory is being talked of at Lincoln, Neb. The Cushman Motor Company is interested in the proposition.

The Viqueot Company, New York, has gone out of business as the result of the failure of the Vehicle Equipment Company.

The Jackson Automobile Company, Jackson, Mich., have occupied additional buildings containing 10,000 square feet of floor space.

The Automobile Equipment Company have built an extension on their factory in Detroit. Chas. F. Root has been appointed superintendent.

The newly incorporated Rossel Company of America, sole agents in the United States and Canada for the Rossel cars made at Sochaux-Montbeliard, France, have opened an office in the Knickerbocker Building, Thirty-eighth street and Broadway, New York, with Wm. P. S. Earle, formerly with the New York branch of the White Sewing Machine Company, as manager. They will handle the four types of Rossel motors, 22-26 horse power, 28-35 horse power, 40-50 horse power and 50-65 horse power.

W. K. Vanderbilt, Jr., has written to Clerk Long, of the Nassau County Board of Supervisors at Mineola, N. Y., saying that it was more than likely that the course used last year for the Vanderbilt Cup Race will be used again this year. He expressed his pleasure at the receipt of the letter informing him that 1,500 residents of the county had signed a petition favoring the use of the Nassau course. The People's Protective Association will meet at Hempstead about May 1 in an effort to prevent the use of this course for the race.

At the annual meeting of the Winnipeg (Man.) A. C. the following officers were elected: Patron, Sir Daniel McMillan; honorary president, Mr. John Galt; president, Mr. J. G. C. Armytage; first vice president, Mr. F. H. Phippen; second vice president, Mr. R. MacLeod; secretary-treasurer, Mr. A. Emmett; executive committee, Messrs. Maw, Newman, J. K. McCullock, W. C. Power, H. Aylwyn, D. H. Bain and Dr. Baird; touring and racing committee, D. H. Bain (president), W. C. Power, J. K. McCullock, H. Aylwyn and R. MacLeod. Mr. F. H. Phippen was elected convener for the protection committee with power to choose his associates.

The Southern Automobile Company has been organized at Jacksonville, Fla., to manufacture automobiles. A factory has been secured, and business will begin at once. The officers are: President, John B. McDonald; vice president and treasurer,

Hubert G. Stone; secretary, Hugh E. Partridge.

The Kansas City Motor Car Company will locate at Kenosha, Wis., where they will build a factory for the manufacture of motor trucks. They have taken 300 acres of land.

The Corning (N. Y.) Automobile Club has been organized with Joseph C. Moore as president, J. H. Whitman secretary and Kenneth R. Otis as chairman of the entertainment committee.

The New York Automobile Trade Association have elected the following officers: President, Percy Owen, Aerocar Company; first vice president, Carl Page, White Sewing Machine Company; second vice president, C. F. Wyckoff, Decauville Company; secretary and treasurer, W. P. Kennedy.

The Bloomington (Ill.) A. C. has elected the following officers: President, S. P. Irwin; vice president, W. E. Johnston, of Arrowsmith; secretary, Henry Thobro; treasurer, Charles W. Diets; directors, W. K. Bracken, Walter H. Johnson, John A. Beck, O. R. Skinner and George M. Green; road captain, Guy Carlton; assistant, A. C. Carnahan.

The Hartford A. C. has elected the following officers: President, J. Howard Morse; vice president, F. C. Billings; secretary, G. B. Dustin; treasurer, R. B. Belden; chairman committees—membership, L. C. Gover; runs and tours, George Beach; racing, George E. Sykes; good roads, J. M. Birmingham; amusement, A. L. Hills; rights and privileges, R. M. Goodrich.

Another Sewer Explosion in Garage District.

The fifth in the series of explosions in the sewers in the garage district in New York city sent manholes soaring skyward Tuesday afternoon. Some reports say there were nine explosions quickly succeeding each other. A saloonkeeper at the southwest corner of Fifty-first street and Ninth avenue set off the sewers by going into his cellar and lighting a gas stove. Several people were injured and many buildings seriously damaged. The feeling is strong that gasoline flowing into the sewers from the garages is the cause of these explosions, which are becoming a menace to life and property in that part of the upper west side. Borough President Ahearn is conducting a searching investigation with the aid of chemists. The Board of Aldermen will probably pass an ordinance as the result of his report.

Garage Notes.

A. L. Taber has opened a garage and repair shop at Corona, Cal.

Victor A. Wiss, Morristown, N. J., is building a new garage on Pine street.

The Ellicott Automobile Station, Ellicott and Washington streets, Buffalo, N. Y., is being remodeled by the new proprietors, Wenzel & White. A specialty will be made of rebuilding transmissions of all kinds.

W. N. Woelk, Jr., has opened a livery garage and repair shop at Larned, Kan.

Mayor Severn, of Jamestown, N. Dak., is planning to build a garage in that town.

John F. Kitchen will conduct the Belmar garage, 521-525 Homewood avenue, Homewood, near Pittsburg, Pa.

Ralph Rogers & Co., Ottumwa, Ia., will open a garage at 316 North Main street, Burlington, Ia., May 15.

The Reid & Cachot Company, Cleveland, Ohio, have opened a garage and repair shop at 199 Crawford road.

Plans have been drawn for a garage to be built by Fred L. Herwig on North avenue near Prospect avenue, Milwaukee.

McGee & Greenlease have opened a livery garage at Fifteenth and Virginia street, Kansas City, Mo. They will rent Buick cars.

Garages have been opened at Reading, Mass., by H. K. Austin and Kinsley & Hawes, both of whom are agents for several lines.

The Ford agency in Cleveland is erecting a two story brick addition in rear of salesrooms, the total floor space to be 10,000 square feet.

Lucas & Christenson, formerly with the Olds Motor Works, have opened a garage and repair shop at 556 Euclid avenue, Cleveland, Ohio.

The Jay A. Hinman Telephone and Electric Company, Oshkosh, Wis., have opened a garage known as the Auto Inn at 226 Main street.

The Baltimore Motor Carriage Company, Baltimore, Md., have erected a garage on East North avenue, near Charles street. They handle the Winton cars.

W. E. Brown and Tarleton Kenworthy have organized the Tippecanoe Automobile Company at Lafayette, Ind., and will soon open a garage and repair shop at 928 Main street.

The new garage on Howard street, Albany, N. Y., of which C. Sutherland Ransom will be manager, is nearing completion. The stockholders include many automobilists of social prominence.

J. J. Hennings and I. L. Belyea have organized the Waterville Motor Company, Waterville, Me., and will soon open salesrooms and garage at 245 Main street. They will handle the Lambert and Reo cars.

The Pittsfield (Mass.) Auto Garage, to be conducted by the Douglas Andrews Company, opened last Saturday, with Frank P. Whyland, formerly superintendent of the Berkshire Automobile Company, as manager.

The Buffalo Garage Company, at Ferry and Chenango streets, Buffalo, N. Y., are looking for a site for a new garage in the Elmwood residential district. It is contemplated expending $22,000 on the new garage, about $8,000 to go into a building 100 feet by 225 feet. The structure is to be fireproof, of brown stone, two stories high.

New Incorporations.

Detroit Motor Casting Company, Detroit, Mich.—Capital, $25,000.

The Boulevard Garage Company, Cleveland, Ohio.—Capital, $10,000. Incorporators, H. J. Dunn et al.

Pioneer Automobile Company, Portland, Ore.—Capital, $1,000. Incorporators, Ed. L. Estes, Calvin Heilig, Edward Heilig and H. F. Estes.

Hesse Automobile Company, Brooklyn, N. Y.—Capital, $1,200. Incorporators, Emanuel Hesse, Herman Hesse and J. J. Hesse, all of Brooklyn.

Sears-Nattinger Company, Des Moines, Ia.—Capital, $10,000; to engage in the automobile business. Incorporators, W. W. Sears and O. R. Nattinger.

Fitchburg Auto Transit Company, Fitchburg, Mass.—Capital, $6,000 (paid in $5,000). Officers: President, N. Curtis Rubler; treasurer, E. A. Bruce.

South Bend Automobile and Garage Company, South Bend, Ind.—Capital, $5,000 (an auxiliary of the Studebaker Brothers Manufacturing Company). Incorporators, Harry D. Johnson, Nelson J. Riley, Geo. M. Studebaker, E. L. Kuhns and C. A. Carlisle.

Adams-Farwell Company, Chicago. — Capital, $2,500; dealing in automobiles. Incorporators, Eugene Adams, Herbert Adams, F. O. Farwell.

The Prince Wells Company, Louisville, Ky.—Capital, $5,000; to handle automobiles and accessories. Incorporators, Prince Wells, R. L. Wells and M. Erhele.

R. Bertelli & Co.—Capital, $75,000; to manufacture engines, machinery, automobiles, etc. Incorporators, R. R. Bertelli, E. Paladina, C. Piva, New York city.

Welch Motor Car Company, of New York.—Capital, $10,000; to deal in automobiles, etc. Incorporators, C. A. Hamilton, Burgoyne Hamilton, L. H. Perlman, New York city.

Camden Motor Company, Camden, N. J.—Capital, $1,000,000; to manufacture and deal in motors of all kinds. Incorporators, J. Jenks, R. Anderson and J. L. Rodgers, all of Camden.

Harvey Auto Shop, New York City.—Capital, $5,000; to deal in automobiles. Incorporators, C. H. O'Neill, W. K. Hadley, J. E. Murray, E. W. J. Taylor, of New York city; L. Powers, Ossining, N. Y.

The St. Clair Motor Company, Detroit, Mich.—Capital, $35,000; to manufacture engines, automobiles, power boats, etc. Incorporators, Harry D. Baird, Earl Roscoe Ryno and Ulrich A. Abrahams.

United States Motor Vehicle Company, Philadelphia, Pa.—To purchase patents granted in foreign countries for automobiles and other vehicles; capital stock, $100,000. Incorporated under Delaware laws.

Indiana Motor Club, White City, Ind.—Capital, $5,000; to promote the use of motor boats and automobiles as pleasure vehicles. Directors, Bruce Maxwell, E. A. Strong, Jr., R. H. Hasler, W. G. Wal and E. H. Katterhenry.

Maryland Motor Exhibition Company, Baltimore, Md.—Capital, $1,200; to hold automobile shows and automobile race meets. Incorporators, Howard W. Gill, A. S. Zell, E. L. Buchanon, B. R. Johnson and R. J. Atkinson.

Hastings Motor Car Supply Company.—Capital, $1,000; to manufacture supplies and appliances for automobiles, etc. Incorporators, Edward S. Perat, George J. Jackson and Cornelius Gallagher, all of No. 41 Park Row, New York.

Lubeck Automobile Company, Grand Rapids, Mich.—Capital, $15,000 ($5,000 paid in); to manufacture, buy, sell rent or otherwise deal in automobiles. Incorporators, J. Oakley Carson, Philip H. Travis and Benjamin P. Merrick, all of Grand Rapids.

Kobusch Automobile Company, St. Louis, Mo.—Capital stock, $1,000,000; to manufacture automobiles. Incorporators, George J. Kobusch (9,997 shares), Harry F. Vogel, George A. Mills and W. S. Miller, all of St. Louis (each one share).

The Rossel Company of America, New York City.—Capital, $100,000; to handle the Rossel French cars in the United States and Canada. Incorporators, Harry N. Fletcher, of Hoboken, N. J.; Francois Rossel, of Sochaux-Montbeliard, France; Count Manuel de Caserta, of Paris; William S. Ottman, Chas. M. Eaton and Eugene N. Robinson, of New York. Officers: President, Mr. Fletcher; vice president, M. Rossel; treasurer, Mr. Ottman; secretary, Count de Caserta.

Trade Literature Received.

Warner Instrument Company, Beloit, Wis.—Illustrated booklet, "The Autometer."

New York and New Jersey Lubricant Company.—Booklet, "The Survival of the Fittest Lubrication."

Pope Motor Car Company, Waverley Department, Indianapolis, Ind.—Booklet, "Profitable Electric Garages."

The Simms Manufacturing Company, Ltd., Magneto Department, Welbeck Works, Kimberley Road, Kilburn, London, England.—Circulars describing the Simms-Bosch magneto electric ignition.

...THE...

Horseless Age

VOLUME 17 MAY 2, 1906 NUMBER 18

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WINTON MODEL-K

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Mr. Henry L. Venn, of Chicago, pays this tribute to his Winton Model K:

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AGENTS:—C. A. Duerr & Co., New York; G. J. Dunham, Boston; The McDuffee Automobile Co., Chicago; G. W. Caplin, Minneapolis; Automobile & Supply Co., Lim., Toronto; Motor Shop, Philadelphia; Reyburn Motor Car Co., St. Louis; Standard Automobile Co., Pittsburg; Amos-Pierce Auto. Co., Syracuse; Schoeffel Co., Rochester; Royal Motor Car Agency, San Francisco.

Member A. L. A. M.

Pattern Making for Motor Car Work.

By E. F. Lake.

Pattern making is looked at as a necessary evil by the average manufacturer, and manufacturers of motor cars not having as yet arrived at that degree of organization which insures the best results—a well finished product at the lowest possible cost—mostly do without a pattern shop or department, and even many fairly large firms are sending their drawings out to get the patterns made, thus spending large sums. Some automobile manufacturers pay out from $5,000 to $10,000 a year for pattern work, expecting that next year they will have all the patterns made and the bill will be smaller, but when next year comes the patterns have been worn out and new ones have to be made, with the result that the bills are about the same.

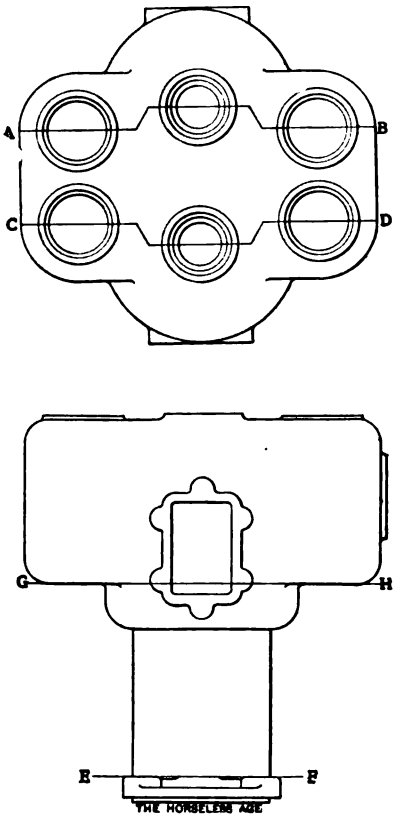
With the expenditure of about $800 for machinery, an up to date pattern shop could be fitted up and the patterns made at a great saving, not only in the actual pattern bill but also in the time of the engineer and others in looking after the work. Not that a saving would necessarily be effected in the first cost of each individual pattern, but the patterns might be built in a more substantial manner than they will be built by the ordinary job shop, which is forced to turn out the work as cheaply as possible, owing to the competition in that line of work, and in many cases to the ignorance of those for whom the work is done.

To illustrate this point, I may mention that I have seen within the last year a pattern for an aluminum engine case, made after the job shop style, which after sixty castings had been made from it, was sent back to the shop for repairs; and upon return to the foundry and after sixty-five more castings had been made, a total of 125, it was once more returned to the pattern shop and completely overhauled. A few weeks later another pattern was made in a pattern shop which the company had established for making their own patterns, from the same drawings, as enough castings could not be produced from the one pattern. This was sent to the foundry and after it had been used to make 135 castings was returned to the pattern shop for some alterations which the engineer wished to have made, and it showed very little wear, looking as though it would stand up for the rest of the season's work.

This company also had three patterns made in their own pattern shop, of a 30-35 horse power, four cycle, water cooled motor, twin cylinder, which patterns have been in use since last August and have not been returned for repairs yet, thus showing that patterns from which a great many castings are to be made cannot be made too good, and that it is much cheaper in the long run to have one pattern that will serve for 300 or 400 castings than to have three patterns that will only give 100 castings each, as one good pattern can be made much cheaper than three poor ones, to say nothing of the costly delays due to a pattern being held up for repairs, when every casting may mean the sale of another car.

Then, again, it is false economy to have an engineer to do the designing and not have a pattern shop to work out his ideas —one that he can go into without loss of time and see the work in course of construction, change anything that does not look good or that is not working out so as to fit other parts.

Of course, when the work becomes standardized, metal patterns can be made and used, and they are almost indestructible, but at this time, when so many alterations and improvements are being made, the wood pattern serves the purpose better than anything else. Cherry or baywood (commonly called mahogany) are the most suitable for patterns that are to be used for a large number of castings, as they are easy to cut and fashion into shape, present a hard surface and have a fine grain, which does not absorb the water and moisture readily, and then warp out of shape or break loose at the joints.



Figs. 1 and 2.

The pattern shop being classed as a non-productive investment, manufacturers look upon it as an expensive luxury, and it can be made such if the man in charge of the shop does not have a thorough knowledge of the business. He must have a knowledge not only of the actual construction of the pattern, as most any pattern can be built in a number of different ways, but also a knowledge of foundry methods. He should know what is the easiest and best way the molder can mold the pattern, which is also the cheapest way, not alone in the foundry but in the core room as well. He must know where the best metal is needed in the casting, and must make that part of the pattern come in the drag or nowell, if possible, as it is well known that loose sand facings, etc. being lighter than molten iron, will float to the top of the mold and cause bad spots in the casting, porous and sandy.

For instance, I have seen a pattern for a four cycle, water cooled cylinder, cast in pairs, parted by the patternmaker on the lines A B and C D, Fig. 1. This would mean that that part of the pattern below the line C D would be placed in the drag by the molder. The part between C D and A B would be in the cheek (this cylinder requiring a three part flask) and the part above A B would be in the cope, so that the walls of this part would catch and stop any loose sand facings or other foreign substance which may have gotten into the mold, with the result that the valve seats, compression chamber, etc., on one side of the cylinder and water jacket would show bad iron and possibly a leakage, so that the casting could not be used, while the other side would be as good as it was possible to get it. If the pattern had been made so as to part on the lines E F and G H, as shown in Fig. 2, that part of the pattern above G H would be molded in the drag or nowell, and all of the valve seats, both inlet and exhaust, the compression chamber, the water jacket and nearly one-half of the walls on which the piston has a bearing would be in the bottom of the mold, which would insure the best iron at these parts and result in the saving of a percentage of the castings which would have to be thrown away if molded as shown in Fig. 1. That part of the pattern between the lines E F and G H would be in the cheek and give good iron, although it is at the lowest part of the stroke and not very important. And that part of the pattern below the line E F would be in the cope and gather the loose sand facings, etc., if there were any in the mold. This being below the piston, even at the lowest part of its stroke, if it were porous or contained a few small holes it would not make any difference, as long as it was strong enough to hold the cylinder to the crank case, as there is no gas or water at this point to leak through.

Another part of the motor which gives a great deal of trouble in the casting is the piston. The wall of the piston being very thin, and very little metal remaining after the slots for the piston rings are cut, this, of necessity, must be good metal, or the piston will not stand the hammering which it gets from the explosions.

The writer not long ago, in a prom-

iment gas engine publication, read an article on molding pistons some two or three columns in length, and yet it did not mention what appeals to me as the best way, although it seemed to give every other way, such as using a split pattern and molding it on the side, which in many cases would give bad iron on the cope or top side and good iron on the drag or bottom side. Another way was to mold it on end and hang the core in the cope. This would give good iron where it was wanted, but unless very great care was taken in setting the core it would result in thinner metal on one side than on the other, and when the slot for the piston ring was turned the wall would be cut through and another casting would have to be thrown away, together with all the machine work that has been done on it. Another way was to cast two together, tying the patterns together with a core print and molding them on their side with a split pattern, but the result would be the same as casting one on its side, as described above.

The method used by the writer and many others is to mold the pattern on end, many putting on a large overhanging print, as shown in Fig. 3. This insures the best iron in the mold at the head of the piston, and the poor iron, if there is any, will be in the mold at the other end, where there is no pressure to resist and no gas or water to leak through.

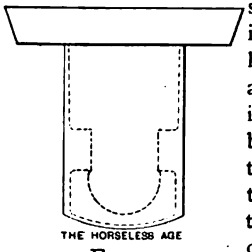


FIG. 3.

If the pattern and core box are both turned up in the lathe—and they would be by all good patternmakers—and made so the core will be an exact fit in the overhanging core print, it will give an even thickness of metal on both sides of the piston, and fewer castings will have to be condemned and put in the scrap pile than with any other way of molding.

The method here described is also the easiest, quickest, and, therefore, the cheapest way to mold a piston pattern, as the pattern can be placed on a board, the drag or nowell put on, the sand rammed up, the flask turned over, the pattern drawn out, the core placed in position, and a flat cope struck off with a straight edge, and the mold closed up ready to pour the iron in.

It may appear to the uninitiated as though I was going into the molder's end of the business, but this is knowledge which the patternmaker, and especially the foreman of the pattern shop, must have, as patterns are molded the way they are designed in the pattern shop, hence good designing means good castings and good machine shop work, and poor designing poor castings and poor machine shop work.

Tests on Two Cycle Engines.

By O. V. H.

TWO CYCLE ENGINES.

A writer in one of the leading automobile journals makes the statement that a two cycle engine in its best forms can do more than twice the work of a four cycle of the same bore, stroke and revolutions per minute, and is easier to cool. As far as cooling is concerned, there is no question in my mind that a two cycle engine is as easy to cool as a four cycle, if not easier, as the cold gas from the crank case rushing into the cylinder has a decided cooling effect which the four cycle does not get; but as to the relative power I have never yet found a two cycle engine that came anywhere near giving twice the power of a four cycle, and I have time after time put them on a brake test. Perhaps it has not been my good fortune to have had one of the best forms of two cycle engines, but I have tested some that were claimed to be as good as were made, and I never yet have found an automobile engine that would test up to its rated horse power. There may be some that will, but I have tested a number that fell considerably short, and they were working in perfect condition and much better than when they left the factory. It leaves a doubt in my mind about the length of time a factory test is given. If an engine is rated at 10 horse power it should pull that load all day long if necessary; but a test where an engine is speeded up, and a Prony brake applied for a few seconds, is no test at all, as the momentum of the flywheel will run the scales away down for such a short time. When I test an engine it must hold the scales at a certain place continuously, and not simply for a few seconds with flywheel momentum.

I had occasion to test some two cycle engines of a well known make, and not being satisfied with results I tried some experiments to see if I could make any increase in the power. I first faced the end of the piston off and put on a detachable deflector plate, as it seemed to me the plate was too near the intake port (it being 1 inch away), and that the incoming gas struck it too squarely, which obstructed its entrance to the cylinder. I moved the deflector plate 1¼ inches from the inlet port, and made another test, which showed a gain of nearly a horse power on a single cylinder 4½x4½ inch engine. I next put the deflector exactly in the middle of the piston and made another test, and found that I had gained over 2 horse power. Then, to make absolutely sure, several additional tests were made at various speeds, with results about the same, but the engine seemed to do better at about 900 r. p. m. than any other speed at which it was tried. The size of the ports was changed, but no change in power could be noticed, though I am inclined to think there would be less fuel used with a narrower port extending farther around the circumference on the cylinder, but as no fuel measurements were taken I cannot say positively.

The engine being of the three port variety, I thought it would be gratifying to know whether there was any difference in power between an engine that takes in gas during only a short portion of the piston stroke and one that had a chance to draw in charge during the full stroke of the piston. I used a leather seated poppet valve screwed into the crank case and connected to the carburetor, the poppet valve having a very light spring just sufficient to seat it. Another test was made and an increase of 2 horse power was shown, and the engine ran better in every way than it did when the three ports were used. The compression in the cylinder was 80 pounds, the crank case compression 9 pounds, and the single cylinder, 4½x4½, showed a fraction under 9 horse power. While not phenomenal, it is pretty fair power, and it was honest power. I could have taken momentum readings from the scales that would have shown nearly 16 horse power, and I am pretty well convinced that a great many ratings are so taken.

A two cycle engine is very simple; that is, it has few parts, and should be a good engine for an unskilled person to use. Much can be said in its favor, but I have yet to see one that can develop anywhere near twice the power that a four cycle can. Some makers give the cylinder head an oval or half round form, but judging from some experiments made with both styles the cylinder with the square head is the most economical, as the incoming gas striking the curved head seems more inclined to follow the exhaust out. With the square head it seems to strike the cylinder head so squarely that it failed to follow the exhaust. Of course a portion of the new charge goes out with the old. How could it be otherwise with the exhaust open while the inlet is also open? The dividing line is too fine to have the old gas expelled just as the piston closes the port and not let any of the new gas out. The conditions change with the load, for a two cycle engine will "hippy te hop" along running light, and when a load is put on it will get down to business and purr like a contented kitten. In the near future I expect to make some tests with a new style two cycle engine, and will give you an account of the results.

The varnish of a new car may be tested for dryness by pressing the thumb hard up against some unexposed portion of the body; pressure should be put on the varnish for several seconds, until the heat from the thumb is transferred to the paint. If the thumb comes away from the varnish without any feeling of stickiness, it may be taken to be perfectly dry, but any tendency to stickiness denotes that the varnish is not set, and should, if possible, be given several days more in which to dry. Any dust or dirt which comes in contact with imperfectly set varnish dulls, if it does not spot, the finish.—*Autocar.*

A Way to Economize in Gasoline Engine Testing.

By Benj. F. Bailey.

In a former article in The Horseless Age I advocated the use of alternating current dynamos, rather than the direct current variety, for use as absorption dynamometers in gas engine testing. Although the alternator is in general superior, certain conditions may exist which make the other preferable.

For instance, the thrifty manager sees numbers of engines working away driving dynamos or Prony brakes, and every watt of the energy produced being absolutely wasted. The question naturally arises in his mind, Cannot part, at least, of this energy be saved and used for power or light? If the conditions are favorable, it most certainly can, and at little or no extra expense.

Suppose a large plant supplied with electric power from an outside company, and using considerable amounts of such power for lighting or machine tool driving. If the supply is a direct current one, it is possible to furnish a large portion of this power with the power that would otherwise go to waste, either in the brakes (if they are used) or in the rheostats or lamp banks, if an electrical method of testing is employed.

Each testing stand would, of course, require a dynamo or motor, either direct connected or belted to the engine to be tested. The former would be preferable from the standpoint of accuracy, since it does away with the belt loss, which is a rather uncertain and variable quantity, but the latter would permit the use of cheaper dynamos and would have great advantages as regards flexibility of speed. On the whole, I should be inclined to advise the belted method.

APPARATUS REQUIRED.

The following would be the complete apparatus required for each testing stand:

1. A direct current shunt wound motor for the same nominal voltage as the supply circuit. This should be of about two-thirds the horse power capacity that the engine to be tested is capable of developing continuously. This is in case long runs are to be made. For short runs, a good motor will readily absorb all the power from an engine of twice its normal capacity. The motor will be used either as a motor or as a generator, according to circumstances.

2. A motor speed controller, i. e., a starting box, but having heavy enough resistance so that it can be left constantly in circuit if necessary.

3. A shunt field rheostat. This may with convenience be combined with the controller in such a manner that movement of the control handle decreases gradually the resistance in circuit. After this is all cut out, further movement of the handle increases the resistance in the field circuit. Such combined speed controllers can be bought from a number of makers. This controller should have no voltage release, but preferably not an overload release.

4. A reverse current circuit breaker, so arranged as to open with excessive current when the machine is acting as a motor, but not to open with a current in the reverse direction when the machine is acting as a dynamo. In the latter case there is no danger of an overload, as the engine cannot exert more than a certain power, and for the circuit breaker to open and remove the load would cause the engine to race and probably damage itself.

5. An ammeter and a voltmeter of suitable range. The voltmeter should be connected across the brushes and the ammeter should be inserted in the lead running to the armature only, so as to measure the armature current of the machine and not the external current. The ammeter should be provided with a reversing switch, which should perform its function without opening the circuit. The operator can then measure currents passing in either direction. This feature is advisable, but not absolutely necessary.

Each of these sets should be wired up to the power mains in the same manner as though they were to be used as motors only, except for the slight changes necessary for the insertion of the measuring instruments. The controller, instruments, etc., might with advantage be mounted on an inexpensive switchboard.

6. An electric speed indicator would be a useful and convenient addition. If used the indicator, which is merely a voltmeter, should also be on the switchboard.

If this equipment be deemed too elaborate a fair test of the system can be made with any ordinary motor provided with the customary starting box, the only accessories required being an ammeter and a voltmeter.

OPERATION OF THE APPARATUS.

The operation of the above described outfit is extremely simple. The main switch is closed, and by operating the starting box, or controller, the motor is started and with it the engine to be tested. When the starting operation is completed the ignition circuit of the engine can be closed, and the latter will begin to develop power. As soon as this takes place the generator will automatically and without any attention whatever cease acting as a motor and begin to supply power as a dynamo to the mains. During this change from motor action to dynamo action the set will speed up about 5 per cent. The output is indicated by the voltmeter and ammeter, and changes of output can be made by adjustment of the spark and throttle in the usual way. Any number of such sets can be operated at the same time and without interfering with the use of lights or motors on other parts of the system.

ACTION OF A DYNAMO.

In order to understand fully the action of such a system, it is necessary to consider briefly the action of a dynamo or motor. In the first place, there is no essential difference between a dynamo and a motor. Any dynamo-electric machine will act as either one or the other. When the armature of such a machine is rotated, it makes no difference whether by mechanical power as a dynamo, or by current passed through it as a motor, there is generated in the armature winding an electromotive force. This electromotive force in a dynamo is the cause of the current flow. In a motor it is always generated in such a direction as to oppose the flow of current through the machine. The real electromotive force acting on the machine is the difference of the two. Ohm's law then assumes the form $I = \frac{E-E'}{R}$ in which I is the current in the armature, R is the resistance of the same, E is the electromotive force of the mains supplying the current, and E' is the back electromotive force of the motor. In all modern systems of supply E, the electromotive force on the mains, is kept approximately constant, say at 220 volts. This is accomplished by the action of the governing devices and by hand regulation at the central station, and the customer has, of course, nothing to do with it. In a typical 15 horse power motor we should have about the following values: $E = 220$ volts, $R = 0.1$ ohm, and E', or the back electromotive force, would range in value from about 219 volts at no load to 214 volts at full load. We should then have at full load the relation $I = \frac{220-214}{0.1} = 60$ amperes.

EFFECT OF THE ENGINE.

Suppose now the motor to be running as above, driving the engine as a load, and taking 60 amperes from the mains. The ignition circuit of the engine is now closed, and it begins to develop power. The effect of this is, of course, to relieve the motor of the drag upon it, and allow it to rotate faster. The result is to increase the back electromotive force of the motor. A small increase of speed, in the case considered, $\frac{6}{220}$, or about 2.7 per cent. only, is necessary to cause this back electromotive force to equal the applied voltage. In this case $I = \frac{220-220}{0.1} = 0$, or no current flows either to or from the machine. Under these circumstances the engine is developing just enough power to maintain itself and the motor in motion. If now the throttle be opened more and the spark advanced the engine develops more power and tends to run the motor faster. The result of this is that the back electromotive force becomes greater than the applied. An increase in speed of, say, 2.7 per cent. will cause a voltage of 226 to be generated, and we have $I = \frac{220-226}{0.1} = -60$ amperes. The negative sign indicates that the current is flowing in the reverse direction, or the machine is acting as a generator and returning power to the system. The amount of this power is

60 × 220 = 13,200 watts. Since 1 horse power is equal to 746 watts, this is 17.7 horse power, or, allowing for losses, the engine is developing about 21 horse power.

SPEED CONTROL.

Another question immediately arises: How shall we provide for testing the engine at various speeds? This is most simply done by varying the strength of the shunt field current by means of a rheostat. Imagine the engine running as before and developing a certain amount of power. Suppose we weaken the field of the motor (now acting as a dynamo). This, of course, lessens the counter electromotive force developed, suppose in the case before considered, from 226 to 220 volts. The current immediately drops to zero, and the engine, now relieved of its load, speeds up. This increases again the current developed, and a point is quickly reached where the load on the dynamo equals the power developed by the engine, and it continues to run at the new speed.

This is an extremely simple and efficient method of speed control, where the range of speed demanded is not too great. For large variations of speed, however, say from 250 to 1,000 r. p. m., the motors required are large and expensive, costing about twice as much as ordinary single speed machines. Special machines, having two armature windings and two commutators, may be used, and these, for this particular use, should be somewhat cheaper, since at low speeds they would not be required to develop so much power as at full speed.

In general, any of the commercial variable speed systems, as applied to machine tool driving, might be employed. In general, they comprise the system of plain shunt control above described, the use of double commutator motors and the three or four wire multi-voltage systems, giving speed ranges of as much as 10 to 1. It may happen that one of these multi-voltage systems is already installed in the factory. If so, its use is to be advised. If not, the expense would usually be too great, and the use of three or four sizes of pulleys on the motor (intermediate speeds being secured by shunt field regulation) offers a cheap and very good substitute.

IN CONNECTION WITH PRIVATE PLANT.

The question occurs, Can this system be used by a factory owning its own electric power plant? It is perfectly practicable to do this, provided the power required by the whole factory is greater than that supplied by the gas engine testing sets. This condition is necessary, since if the testing sets were to furnish more power than were needed to supply the factory the excess would act to run the main generators as motors, the engine governors shutting off the supply of steam (or gasoline, if gasoline engines be used) altogether. Under these circumstances there would be no governor acting anywhere on the system, and the whole plant would be likely to speed up to a dangerous point. This condition could, of course, be prevented by a lavish use of lights, motors, electric heaters, or even in extreme cases by an artificial load of water rheostats.

In the case of a factory supplied with power from outside, if the power used were less than that generated by the testing sets, the excess would simply be returned to the mains. This would cause the meter to register backward, and an enterprising manager, by doing sufficient testing, might even have the electric lighting company owing him money at the end of the month.

COMMERCIAL ADVANTAGES.

This condition is hardly likely to occur, but, seriously, the saving effected would be very considerable. Thus with the engine and dynamo previously considered, the engine developing 22 horse power and the dynamo delivering 13.2 kilowatts to the system, this would mean in a month of twenty-five working days of ten hours each 3,300 kilowatt hours. This, even at the low power rate of $0.05 per kilowatt hour, would be $165 per month. Of course one testing stand would not average this much, but two or three might easily do so. The complete electrical equipment for such a testing set could be bought and installed for from $300 to $350, and making liberal allowances for slack times, etc., ought to pay for itself in one year.

This may seem "too good to be true" for these days. It is easy, however, to see the possibility of such a profit, if we consider that we are really operating an electric power plant in which the only expense is the first cost of the motors, controllers, etc. The engines, floor space, fuel, oil, attendance, etc., would all be required, no matter what system of testing were used. The enormous cost of conductors, installation, clerical work, meters, advertising, etc., which swallow up the profits of the ordinary plant so rapidly, do not enter at all. Moreover, the public plant cannot sell all the current it wishes, nor at the time it would prefer, but must generate from minute to minute, according to the demand. We are not restricted in this way, but may "pump back" as suits our convenience. Hence it happens that what would be under ordinary circumstances an 8 per cent. profit may readily grow to 100 per cent. on our little testing dynamo.

This, of course, could not be secured in every plant. It only requires, however, that the factory be buying power in considerable quantities, and that the power so used exceed in the course of the month that returned by the testing sets. If these simple conditions be fulfilled the above results can certainly be secured.

"WORKING IN" ENGINES.

For "working in" engines, one large dynamo capable of absorbing the power of, say, ten engines would be preferable. This would be belted to a countershaft, to which also the engine to be worked would be belted. Some of these might be developing power, others run idly by the excess power of the ones working, or if that were not enough, by the automatic motor action of the dynamo. If the countershaft were provided with friction clutches, individual engines could be stopped or started without interfering with the action of the remainder.

TECHNICAL ADVANTAGES.

Outside of its attractive financial possibilities, the system offers very great technical advantages. One is that the speed having once been adjusted to any particular value, it will stay there. Thus as an extreme case the total failure of the gasoline or spark means only a slowing down of about 5 per cent. This fact means also that the attendant, after a little practice, can tell very closely the speed of the engine by a mere glance at the position of the controller handle. The different speeds corresponding to each position and to the pulley used might even be marked directly on the controller.

The slightest change in spark or mixture shows instantly on the ammeter, but without appreciable change of speed. Think of the convenience of being able to test almost instantly the equality of action of the four cylinders of an engine, by closing the spark circuit on one at a time, and without any fear of the engine stopping.

Another great convenience of such an outfit is the ease with which engines can be tested for friction loss and compression. The friction loss can be obtained by taking out the spark plugs of the engine and driving it by means of the motor. A simple reading of the instruments would then show whether or not the engine turned as freely as its brethren. The effect of changes of design upon the friction can also readily be noted.

To test the compression is equally easy. The starting box for this purpose should have a greater resistance than those regularly furnished, so that the starting torque can be made very small if necessary. With the spark plugs in and everything tight, proceed to start the motor, gradually increasing the current until the engine is just pulled over compression, and note the current required to accomplish this. The operation can then be repeated for the other cylinders and the results compared.

CHECKING MOTOR EFFICIENCY.

The arrangement described offers also an easy method of checking the efficiency of the motor at any time. Only two measurements would have to be made. First the motor would be run with belt off, and the power required noted from the instruments. Next the armature would be blocked so it could not turn, or the same result secured by opening the field circuits. A current would then be passed through the armature by putting the controller handle in the first position, and the current reading and the voltage noted. The armature resistance would then be obtained from Ohm's law.

$$R = \frac{E}{I}$$

To read this voltage accurately would require a second low reading scale on the voltmeter.

With these data the input to the dynamo
the output of the machine as a motor
in readily be obtained. The no load loss
cludes several factors. It is usually called
e "stray power," and is constant, inde-
ndent of the load. The armature resist-
ice loss is I^2R. No account need be taken
f the field loss, since the ammeter was pur-
osely so placed as to take no account of it.
'e then have the relation in the case of a
enerator,

nput = output + stray power + I^2R + belt loss.

f the dynamo is acting as a motor, we ave

)utput = input — stray power — I^2R — belt loss.

'he output as a dynamo or the input as a iotor is the product of the readings of the mmeter and the voltmeter.

FOR ALTERNATING CURRENT SUPPLY.

If the plant is supplied with alternating urrent the conditions for "pumping back" re not so favorable. Two methods of pro-edure are open to us. One is the installa-ion of a rotary converter to change the lternating current to direct current. If his alternative is adopted it will cost but lightly more to have the rotary so con-ected as to furnish two voltages on a three wire system. This, as was previously ex-plained, would be very favorable from the standpoint of convenient speed regulation, ut would, of course, involve the extra ex-pense and complication of the rotary.

The other alternative is the use of alter-nating current motors. These should pref-erably be two or three phase, but might even be single phase. An alternating cur-rent motor if driven slightly above its nor-mal speed returns power to the line, pre-cisely as does a direct current motor. The principal objection to this plan is that an alternating current motor is a very inflex-ible piece of apparatus, as regards speed regulation. In practice, all speed changes would have to be made by changing pulleys on the motor. Aside from this defect, which is, however, a rather serious one, the system would work well. The motors are, in fact, superior to the direct current mo-tors, have fewer delicate parts, and are less liable to get out of order.

This system is certainly worthy of a trial in any factory where electric power is used. Under normal conditions the power gen-erated should pay for the cost of the test-ing set in the course of a year, and the greater accuracy and thoroughness of test made possible are certainly worth a great deal.

Consul Wilber reports that a motor road between Bangkok, Siam, and Penang, Straits Settlements, is under consideration. The distance will be 700 miles, the object being quicker postal communications with Europe and more rapid passenger traffic, and will also result in a closer relation be-tween the native states and Siam.

Water Pumps and Circulation.

By Harry Allen.

At present nearly all water cooled cars are fitted with a pump of some kind to cir-culate the water, although a few makers employ the thermosiphon principle of cir-culation. Some use a gear pump, consist-ing of two gears meshing with each other and revolving in opposite directions in a close fitting case, so that the teeth carry the water around with them on the outer sides. The objection to this type of pump is that small particles of grit are liable to get into it and cut the gears, thus reducing the ef-ficiency of the pump. Others pin their faith to a paddle wheel pump with curved blades, often called a centrifugal pump. It is claimed for this type of pump that the curved blades exert a wedging effect upon the water and throw it out with great force. The writer is of opinion, however, that straight blades are generally the most use-ful, and produce the greatest force. I have seen comparative tests made, and the last named type of pump proved to be the best of those tested.

Some makers use a pump with cast iron body, which is objectionable on account of its tendency to rust, and should not be used, notwithstanding its cheapness. A bronze case and a brass paddle wheel make an excellent combination. Aluminum pump cases and paddle wheels are now coming to be largely used, and make a nice, light pump, but the case requires to be bushed. In many instances a gasket is inserted be-tween the pump body and the head, and while this may be all right in some re-spects, it can be done without by using a sufficient number of screws around the case. A gasket is usually a troublesome thing, and its breakage is particularly ag-gravating when it occurs away from home.

Pumps are sometimes fastened directly to the crank case, and this is undoubtedly the proper place for them, especially con-sidering that when in that location they are usually driven by a spur gear from the cam shaft, which is preferable to a drive by chain from the crank shaft, as provided by some makers. To secure the best re-sults, the pump should be located at the lowest point of the circulating system, as in that case the pump will be fed by gravity, and will need to force the water only from the discharge opening. Every pump should be provided with a pipe plug or petcock at the bottom, by which to drain it; these de-vices are very useful, especially in cold weather, when neglect to drain the system at the completion of a run may easily re-sult in a cracked cylinder and consequent costly repairs.

In designing a car it is well to locate the pump where it is easily accessible, and where the stuffing box particularly can be easily removed and replaced. Some mak-ers, unmindful of this requirement, place their pump so close to the exhaust pipe that one is almost certain to burn his fingers while working around it. When the pump is fastened to the crank case a very neat connection can be secured by using a cast pipe with flanged heads and rubber gaskets between the pump outlet and the cylinder jackets. For the return from the water jacket to the radiator, on top of the engine, a nicely polished cast pipe looks much bet-ter than the usual hose connection.

Some makers run their pumps at very high speed, which is detrimental to their efficiency. In the writer's opinion, 1,200 r. p. m. is a very good speed to run a pump at. The driving gears for pumps, the same as all other gear wheels on an engine, should be enclosed, as it is very dangerous to work around an engine with open gears.

Every car should preferably be provided with a water tank. Too many makers rely on the cooler alone, but its water capacity is hardly sufficient, and in most instances it would be advisable to add a little weight and have increased water capacity.

One may often see water pumps provided with either oil or grease cups, or else hav-ing one feed from a mechanical oiler led to the bearings of the pump shaft. The writer, however, believes it entirely unnec-essary to provide special lubricating means for pumps, as the water itself forms a good lubricant, and it is only necessary to cut a small groove on the inside of a bearing to allow the water to get around the shaft. The bearings should, of course, have a packing gland, and the nut should be threaded in such a direction that it tends to screw in and tighten as the shaft re-volves. With a centrifugal pump, a good way to fasten the paddle wheel to the shaft is to turn the shaft down to a shoul-der, drive the paddle over the reduced portion and put a taper pin through the hub and shaft, between blades. To get the paddle off it is only necessary to drive the taper pin out. For securing the head to the body of the pump fillister head screws are often used, but the writer considers small cap screws better adapted to the pur-pose, as the head can then be more easily made water tight, owing to the fact that a greater pressure can be put on the screws with a wrench than with a screwdriver.

Regarding the direction of circulation, some claim that the water should enter the jackets from the top, as this is where the greatest cooling effect is required, but by far the greater number of makers lead the cold water into the jacket at the lowest point, which has the advantage that the cir-culation is aided by the thermal action.

It is becoming the practice to put a screen in the filling cap, one that is easily removed, which presents the advantage that it catches all dirt and grit that may be con-tained in the water, and prevents it from getting into the circulating system. It is advisable for all users of cars to occa-sionally take off the water connection at the top and bottom of the jacket and force hydrant water through the jacket to wash out any sediment that may have accumu-lated upon the walls.

Up to Date Shop Methods in Automobile Construction.

By W. B. Harsel.

(Concluded.)

Reverting once more to shop equipment, I wish to call attention to a machine which I consider a money saver in any automobile shop. There are many parts that require dressing either on a planer or milling machine, as, for instance, brackets, pumps made in halves and many other small parts, that can be machined with this tool in one-half to one-quarter the time, and accurate to within .004 of an inch, which would be sufficient for the purpose. The tool referred to is a grinding machine and consists of a disc covered with emery cloth or similar material, as may be best suited to the particular class of work. This machine also comprises a swinging table and a lever feed. The part



Showing Method of Using Rotary Fixture on Grinding Machine.

to be finished is held in a fixture and the table is swung across the disc, which grinds off the stock faster than it could be done in any other way. The general appearance of the tool may be seen from the illustration.

The writer would point out that it is impossible to give too much attention to the tools and fixtures in the factory, and it is better to put in an extra machine than to overwork those already in use. In passing through shops I have often noticed a pile of work lying around on the benches, and the workman waiting until some one else was through with his machine, so that he could use it. Of course, new machine tools and appliances are brought out almost every day, and it would be impossible to purchase all, but it is possible to have a factory equipped with modern tools and to work according to a system whereby a uniform product can be quickly and cheaply turned out.

We will now take up the frame of the car. Another class of machinery from that referred to above is required for manufacturing the frame and body. The necessary equipment includes a power press, bending and forming machinery, specially constructed drilling tools and a considerable equipment of drop forge machinery. Pressed steel frames are usually made on hydraulic presses, in separate sections which are riveted together. Section steel frames are often made practically in a single piece. In either case the frames are formed either hot or cold, with a press specially adapted for the purpose. All such parts as tie rods, lamp brackets, cross girts, spring straps, change gear frame and motor frame are made to gauge, so as to get them as nearly as possible alike, and are then either riveted or bolted in place, to form an integral part of the frame.

The vehicle bodies are usually made by body builders outside of the factory, to specifications furnished by the automobile manufacturer. The bodies usually are set on the frame and bolted in place. As a rule, many parts of the car are purchased outside of the factory, including springs, wheels, anti-friction bearings, chains, steering wheels, steering knuckles, spark coils, magnetos, lamp brackets, horns, etc. Some manufacturers purchase their wheels complete with a first or priming coat of paint, while others buy spokes and rims separately and do the assembling of the wheels themselves.

We will now proceed to the assembling of the body on the frame, as it is usually carried out at the factory. The first operation is to place, say, twenty or more frames on suitable supports in the assembling room. Next the front and rear springs are secured in place with the clips provided for the purpose, and then the front and rear axle are attached and the front and rear wheels are mounted upon them. The change speed gear is then set up and adjusted and all the necessary bolts and nuts are put on. The steering wheel is then put in place, and the column connected to the steering knuckles. The dashboard is secured to place, brakes and pedals are put on, and the next operation, as a rule, is to mount the motor on the frame and establish the connections with its accessories. Every part that can be secured in place and connected before the body is put on should be attended to, and the frame and all parts upon it that require to be painted should now be painted. It is preferable to do the painting after the assembling, for the reason that there is then less danger of scratching the paint.

The course here laid out for the assembling of the car is, of course, not followed in all factories, as each manufacturer has his own system, and much depends upon where the motor is located and what type of change speed gear is used. After the frame is painted, the body is put on, the bonnet is put in place, the gasoline tank is connected, batteries are connected up, the flooring is put in place, and all the remaining connections are made, such as that of the brakes, for instance. The car is then given its road test for speed on the level, hill climbing ability, reversing, etc. It should be run for at least four hours under all sorts of conditions, to allow of making the proper adjustment, to limber up the bearings and to bring to light any imperfections in the parts or in the assembling.

Of course, as in the assembling, different methods are followed in the testing of the car by different makers. Some use a separate testing body, and give the chassis what is known as a rough test, and finally test the car with the proper body attached. One manufacturer I have in mind secures the engine on a stand and runs it by a belt over the flywheel for at least two hours while flooded with oil, then takes the belt off, cleans the engine and connects it to its accessories, and runs it for two hours under its own power. Then it is sent to the assembling room and is secured to its frame, and the engine and frame assembled are taken to another department and run up to a stand, connected up with a chain to a blower and the engine is run under its own power for another two hours, during which time adjustments are made. The car is then taken off the stand and fitted with a detachable seat or body, after which it is driven out on a 1 mile track.

over which it is driven for two hours forward and backward, up hill and down, at high speed and slow. It is then brought back to the shop, has the regular body and attachments fitted, is driven around the town over all sorts of roads, and if satisfactory in every way is cleaned up and put in shape for shipment. This is certainly a very complete test, and the car is a cheap one at that.

In the factory referred to there is a general inspector, whose duty it is to see that all parts are in their proper places, and that every adjustment is made; to receive complaints if any parts do not fit together correctly, to see that all parts are made alike, and to reject any parts that do not meet the requirements. This same man is also in charge of the experimental department, keeps track of cars turned out, and, in case a special device is applied, sees to it that it is in proper shape. Such a system is practically imperative, preventing carelessness of the mechanics, who are aware that every piece of work they do will be subject to the closest scrutiny. Numerous accidents are the result of carelessness in assembling, and, in the writer's opinion, in a large factory there should be at least two men attending to the duties above referred to, who should be held strictly responsible for all such carelessness, and have authority to have all parts adjusted or changed which, in their opinion, require it. There are many instances of parts failing because no one cared to speak about it, fearing that if they did mention it no one would give their report proper attention. The writer's candid opinion is that every man in the shop should be allowed to make suggestions for improvements, as very frequently a man who works on a part day after day happens to think of ways in which the thing could be done either quicker or better. When a certain fixture was started with a view to reducing cost and duplication, it was well thought out and built, and was conceded to be just the thing for the purpose. When it came to the hands of the operator the first remark he made was: "Yes, that is just what is needed, but why did you make it this way? You should have made it that way, and I could have handled it easier and better." The man who is to use a tool or fixture should always be consulted in such matters, as he may be presumed to know at least the best way of handling it in connection with his machine.

The piece work system is responsible for much inferior work in factories, as it is only natural that every man tries to earn the most and not to do the best kind of work. If an employer would take a fair average of the number of pieces a man can make well in a day and pay the men certain wages, with the understanding that that number of pieces must be made per day, it would simplify matters and conduce to better workmanship. It is true that with piece work the operator loses his pay for imperfect parts, but there is nothing gained by this, as the part is useless and the time wasted is always a subject of contention in a shop. I have known cases where workmen on piece work made more per week than the foreman, with the result that the foreman was sore all the time, and transferred the man and gave some one else the job who could not make half as many in a given time. In that case the operator is usually given the choice of going back to his machine at a reduced figure per piece, and usually starts a row either by quitting or by not doing his best.

Every large factory has connected with it a stock room and store room, where all the parts and materials are stored, and from where they are withdrawn on orders. Among the stores kept in this department are many tons of round steel and iron, as well as square and hexagon shapes; also many thousands of different sizes of bolts and nuts, lamp brackets, frames, oil cans, wrenches, tires and general equipment. A particular modern stock room that I have in mind is constructed entirely of steel; that is to say, all bins, racks, closets, drawers, shelves, barrels, trucks, etc., are made of steel. Every part of the machine manufactured that is stored in the room has a number and a name. The room is at least 40x90 feet, and provides storage facilities for all the small parts, and there is only enough free space to just move around in. In one part of the room I once saw at least a thousand tires, including the shoes; springs piled up as high as the ceiling and taking up a floor space of at least 10x30 feet; bolts and studs by the ton, and also large quantities of brass goods. I simply mention the items to show the magnitude of the stores in some of the large factories.

The store room is entirely independent of the tool room, where all the special fixtures, viz., reamers, taps, wrenches, drills, boring bars, waste, oil, emery cloth and other tools and appliances, are kept. These tools are handed out to workmen as required against brass checks. It is obvious that a large amount of capital is invested in this part of the works, and that good management is necessary to keep expenses down.

In addition to the departments referred to above, a complete automobile factory comprises departments for nickel plating, buffing and brass finishing, forging and casting aluminum and iron; also a painting and varnishing department and a shipping department. The power house, with its steam engines, electric generators, etc., is a department by itself in which a large amount of capital is invested. In the most modern factories it is the usual practice to operate each department by an individual electric motor, so that any department can be stopped without interfering with the rest.



SECTION OF A MODERN FACTORY STORE ROOM.

Automobiles in Portugal.

The British consul at Oporto, Portugal, points out to his Government that there is an increasing demand for motor cars, as can be seen from the fact that 60 were imported during 1905, as against 34 in 1904 and 26 in 1903. Of these 60, 49 came from France, 5 from Belgium, 3 from the United Kingdom, 2 from Germany and 1 from Italy. The total value, as declared in the custom house, was 127,855 milreis (about $136,000). It appears that no American cars have yet been imported.

Buying a Motor Car.

By "Investigator."

Having cut my eye teeth on a curved dash runabout in 1902-3, and had satisfactory experience with another runabout in 1904-5, in December, 1905, I began to select a new car. My limit in price was $2,500, and I soon found I had a wide field from which to make a selection. As the result of my previous experience, I resolved, first, not to buy a car unless it had been on the market and competed successfully for at at least a year, and had undergone no radical changes in this year's model; and, second, to have quickly detachable rims on the wheels. I have broken both these resolutions, for reasons which will appear later.

I wanted a light car, for the reason that 80 per cent. of its use would be with two persons; because a light car with proper tires should give less tire trouble than a heavy car, and also because my disposition rebels at carrying about 2,500 pounds when I can get rid of 600 or 800 pounds of it with little consequent disadvantage. I also wanted a car geared for good hill climbing ability and moderate speed, rather than one geared for high speed. Why is so little said about gear ratios in the columns of The Horseless Age? Among the cars I have investigated I have found cars geared 2½ to 1, and others between this figure and 4½ to 1, and yet in a great majority of cases the agent does not know the gear ratio when asked what it is. All agents claim both high speed and ability on hills for their cars, and fail to realize that a car geared 3 to 1 cannot, other things being equal, have the same ability on hills on high gear as a car geared 4 to 1 has, and it is not fair to judge a car by its hill climbing without taking into consideration its gear ratio. Also, it is not fair to expect the same speed from a 4 to 1 car as one would get from a 3 to 1.

The first car I tried was one which had a good record for 1905. It was a two cylinder car which exhibited some very good points in its design and construction. The first half of the demonstration was quite successful. During the rest of the ride I sat in the rear seat, which contained three passengers. Here I found the spring action so unsatisfactory that subsequent experiences disqualified the car for this reason. This car was catalogued at 1,600 pounds, but it weighed a little over 1,800 with its regular equipment. I have weighed every car which was presented for demonstration, and have found that all of them weigh 200 or 300 pounds more than the weight given by agents or catalogues.

The next candidate was one handled by a very clever agent. The price was above my limit, but the very able presentation of the superior qualities of the car made me consider it seriously. It weighed 2,100 pounds with top (a 1905 model), and failed entirely on the test hill; it was geared 3 to 1, which explained its failure to perform to my satisfaction, but the agent attributed its failure to bad adjustment of the carburetor. The material and workmanship of this car, both in mechanism and body, were of the best quality. It was finally rejected because I did not want a 3 to 1 car, its price was too high, and its transmission and wheel bearings were plain bronze, which introduced considerable friction.

At this stage of the game I obtained a catalogue which is a masterpiece; it described "the only car built on correct principles and having the important parts made by automatic machinery." A clever agent could have sold me this car on the first demonstration, but a trip to the factory in which it is made changed my mind. It was a rather dark and dirty machine shop without a single automatic machine in it that I could find. The car had plain bearings in the transmission, and the angle between the transmission shaft and the propeller shaft was too great.

Then came the New York Show. I learned something there. I saw a 75 horse power chassis of foreign make; it was jacked up and I observed the very small amount of friction in the mechanism. It had anti-friction bearings all through. If they are good enough for this car, I certainly do not want a light car with plain bearings.

I also saw there the chassis of a well known air cooled car which I had considered somewhat in the freak class, but the details and construction of this car showed that its designer was a man of original ideas and not a copyist. I expressed my admiration for the designer of the car, but would not take a demonstration, as I considered water cooling the only thing worth considering.

The next candidate had a beautifully curved and highly finished body, which did not please me at all; it also had a fancy name, which almost condemned it; the scales finished it for me—2,610 pounds.

The next was a good looking car of good make. It weighed 2,650 pounds for 24 horse power. The agent did not know the gear ratio, but judging from the ability to take the test hill on high gear it must be about 5 to 1. It was the noisiest car of the lot, which is to be expected with a high speed engine.

The next was an up to date car of the usual type, with an ancient name. It was too big, weighing 2,400 pounds, and had a 3 to 1 gear ratio. It was very fast and easy riding when the road was smooth, but striking an ordinary depression running across the road it made the occupant of the rear seat think he was about to be transferred to the front one.

I was now persuaded to take a demonstration in the air cooled car I had seen at the show. It weighed on two days a little over and a little under 1,600 pounds, respectively, though it was catalogued at 1,400. It was rated at 12 horse power. It was geared 4½ to 1 on high. It took the test hill on the high gear, as it should do, and was slow enough and fast enough on the level, but its easy riding qualities were a surprise to me. It had full elliptical springs, with no radius rods or distance rods. It is this mounting which makes riding so easy; but will it stand the racket? I stood on the sidewalk and sent the car up and down the road to listen to it. It was not a quiet car, yet it was not noisy enough to be objectionable. It was smoking too much, as are many other cars on demonstration, as the drivers feed too much oil in order to be sure to get enough. Does air cooling cool? I think it does. On this demonstration the car got stalled in snow; it ground the snow with its wheels for about fifteen minutes with three of us pushing, but we made very little distance. Then it had to go backward for 500 feet in the snow and through it all it stayed cool. After riding two hours over long and high hills I raised the hood at the top of a hill and could put my hand on the rear cylinder, as well as on any other. They ran the car backward and forward for me on the floor of the garage until I was satisfied that its cooling system was ample. I have talked with several men who have used these cars, and they all say they do not heat under any conditions they have met. My chief objection to this car is that it seems to smoke and smell more than it should, but I hope this is not a necessary condition. I have ordered one of these cars, which I would not consider three months ago, and I have broken both of my fundamental resolutions. It meets my requirements better than any other car I have tried. It is the lightest car I have tried, it is the easiest riding car, it does its work very well. Nickel steel is used liberally in its construction, and it was designed by a man of good mechanical ideas. Also, it is well inside my money limit.

My experience teaches me, however, that my requirements are not those of the majority of motorists, as the usual type of car is designed for much higher speed than I want or than I think safe or wise.

The Automobile Co-operative Association, with headquarters at 1 Albemarle street, London, was recently formed, under the presidency of John Walker. The association is a body trading direct with its members, and sharing with them the profits of the retailer. By purchasing a £1 share in the undertaking, and paying an annual subscription of a guinea, reduced to 5s. for the first 500 applicants, motorists become members and entitled to bonuses on all purchases made through the society, by reason of favorable contracts which the latter claims to have made with leading motor firms. At the end of each financial year there is a division of the surplus profits to the shareholders according to the amount of stock registered in their names. The association proposes to provide repair shops, maintain cars and insure them on the co-operative plan.

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The Automobile in the San Francisco Disaster.

The practical advantages of the automobile as a means of rapid conveyance have never been more forcefully demonstrated to the general public than in the recent San Francisco calamity. Not a few of the people first heard from in the East after the disaster stated that they owed their escape to their automobiles; and, according to more recent information, nearly all the cars in the city were confiscated by the police and army authorities and used by them as ambulances, for conveying messages, transporting food supplies, etc. It is remarkable that, in spite of the great amount of débris, especially puncturing articles, in the streets, all newspaper accounts are unanimous in pronouncing the work done by the machines as very effective.

That motor cars should be extremely useful in a great calamity of this kind can be readily understood. Their high speed renders them greatly superior to a horse wagon for ambulance purposes, etc., and another point in their favor is that, with a change of driver, they can be used night and day. With the automobiles the injured could be quickly transported to the hospitals, new fires rapidly reported, and many other kinds of urgent business attended to far more effectively than in any other way. The services rendered by the automobile in the great calamity are perhaps best expressed in the words of a local agent, who states that without automobiles the suffering in the stricken city would have been ten times what it was.

It is not too much to expect a far-reaching moral effect from the fine showing made by motor cars in this great public calamity. Those who were personally benefited by the machines will hardly ever again be ill-disposed toward the new method of locomotion, and even those who only heard or read of the grand work accomplished with the cars for the benefit of the sufferers can hardly fail to recognize the automobile's great potency as a public benefactor.

Automobile Schools.

Some rather bitter protests against the methods prevailing in automobile schools have been voiced in recent letters from students. Since the demand for competent motor car drivers has become so great that a man with even a little knowledge of automobile mechanics can command much higher wages than in any other similar mechanical employment, "schools" have sprung up over night like mushrooms. They claim to instruct men in all that is necessary to become competent chauffeurs in three months' time, or less, and charge relatively high rates of tuition.

Many of the graduates find themselves totally incompetent to render the kind of service for which they are supposed to be prepared. Others find that a prejudice against them has already arisen among employers, which may be compared to the prejudice many business men feel against young men whose only equipment for business is a diploma from a business college. Ordinarily, such young men have to learn business after they get in it. In the same way many men hiring chauffeurs prefer men who have had even a little practical experience to the graduates of automobile schools. Doubtless such prejudices have some foundation. Employers complain that the graduates do not come to them with any practical knowledge.

There seems no good reason why young men cannot be taught how to operate automobiles in schools, if the classes are conducted in a serious spirit, and proper discipline is maintained. It seems quite likely that the school which exercises some care in admitting young men to its classes, requiring a certain mental and moral standard, will make a reputation for itself. A much better class of young men would be

attracted in the long run, even though many undesirable students would be lost at first. Naturally, a large number of men totally unfit for such work, either on account of their habits or general deficiency in gray matter, are attracted to it, because it is lucrative. Employers certainly would be glad to know of a school where they could find motor car drivers to be depended on to know what they are supposed to know.

Too many schools appear to be merely loafing places. We recently passed such a school on one of the principal thoroughfares of Philadelphia. A number of young men were standing in front of the building and with no visible employment. We were much surprised to learn that they spent most of their time there.

It is probable that the higher technical schools, like the Massachusetts Institute of Technology and the scientific schools at Yale, Princeton, Cornell and Pennsylvania, will from now on devote increasing attention to the mechanics of the automobile for the benefit of those who wish to inform themselves fully.

The New Jersey Automobile King.

The new automobile law of New Jersey has been definitely adopted, and it would seem that if any serious objections to the law existed they should have been urged against the bill before it passed. However, all the objectionable features were not and could not be discovered at the time of protesting against the passage of the bill, and even now it is impossible to foresee questions that may arise in future concerning defects in the law. Ordinarily it takes time to discover defects in legislation, and requires, as a rule, a violation of the law brought in a proper way to the attention of the courts in order to have the defects passed upon authoritatively.

How many have given the New Jersey automobile act a close study without being impressed with the magnitude of the powers conferred upon the Commissioner of Motor Vehicles? Never did any law vest so much absolute power in an individual. Was there ever such a monarch of the highways? Under the enactment the Motor Vehicle Commissioner is given absolute discretion in granting and refusing licenses to automobile operators. The law is even so broad that he can prohibit all automobiling in the State. One of the provisions referred to is as follows:

"The Commissioner of Motor Vehicles shall be authorized, and full power and authority are hereby given to him, to license, at his discretion and upon payment of the lawful fee, any proper person of the age of sixteen years or over, to be a motor vehicle driver * * * and the said Commissioner of Motor Vehicles may, in his discretion, refuse to grant a license to drive motor vehicles to any person who shall, in the estimation of such commissioner, be an improper person to be granted such a license."

It will be seen from the above quotation that the Commissioner of Motor Vehicles is made the judge of those qualifications which shall constitute a proper person to operate an automobile on the public avenues of travel. Undoubtedly, the term "proper person" refers primarily to the ability of a person to properly handle an automobile, but there are other considerations which do not involve a knowledge of the mechanical construction of the motor vehicle, but which pertain more to the personal qualifications of an operator; such, for example, as his age (which, by the way, is expressly limited to that of sixteen years or over), discretion, sobriety, etc. Obviously the term "proper person" is one of such elasticity that the Commissioner of Motor Vehicles has a very broad discretion in granting licenses. It would seem that this should not be so, and that there should be an appeal from the commissioner's decision expressly provided for in the enactment.

Again, we find the Motor Vehicle Commissioner's powers defined as follows:

"It shall be lawful for the said Commissioner of Motor Vehicles to refuse registration to any vehicle that, in his estimation, is not a proper vehicle to be used upon public roads and highways of this State."

By the above provision one man's estimation, opinion, or, possibly, whim, is made the test of an automobilist's right to use the highways.

The absolute discretion of the Commissioner of Motor Vehicles permeates the whole of the New Jersey act. He is all powerful over automobiling; he may prohibit motoring; he may refuse to license at his discretion; in fact, he is a king of automobiling in his domain. Is such a law constitutional? Has not the State of New Jersey, by attempting to severely restrict motoring, undermined the whole structure of its automobile regulations so that it is bound to fall if the enactment is contested on the ground of unconstitutionality? If the New Jersey law should be declared unconstitutional no place more free from restriction could be found by the motorist than that State.

Standard Methods of Testing.

As an industry develops and competition in it becomes keen, there is always a temptation to exaggerate the relative value of its products, or their capacity for doing work, if work machines or motors are involved. There are generally a number of possible methods of testing the capacity of the machines, and the natural tendency is to adopt that method which gives the greatest results, irrespective of whether it corresponds to the conditions of practical use. There appears at present to be a very prevalent tendency to overrate the power of automobile motors of the gasoline type, but there is no reason for believing that this pernicious practice is peculiar to this particular industry; on the contrary, from the fact that in a number of older industries it has been found necessary or desirable to lay down standard rules for testing, it may be inferred that it also obtained in these industries at some time in the past. For testing electric machinery, for instance, the rule has been laid down that when operated at its full rated capacity for a certain number of hours no part of the machine shall show an increase of temperature of more than a certain number of degrees above the surrounding atmosphere. The subject of standard methods for gas engine testing has been under consideration for a number of years by the American Society of Mechanical Engineers, and a number of reports have been issued on it.

Now that some of the large engineering schools are taking up the subject of automobile engine tests, and a number of special testing laboratories, including that of the A. C. A., are in contemplation, it might be well to agree on some definite method of tests, so that the results obtained by different experimenters may be comparable. For instance, it is well known that so called instantaneous brake tests are very misleading, and a minimum time should be fixed during which the load should be kept constant. Any testing device which does not admit of maintaining a constant load on the motor for that length of time should be considered unsuitable for the purpose. Another point to be considered is whether motors should be tested with or without muffler. It has, of course, been shown that even a good muffler may increase the power of the motor, instead of reducing it, but

this is not the rule, and most drivers are in the habit of opening the muffler when requiring an extra amount of power, thus indicating that in their belief the muffler consumes an appreciable amount of power. In practice motors can only be used with mufflers connected, and it therefore seems only reasonable to test them with mufflers.

Another point that would have to be settled is whether or not the engine when tested for power should drive all the auxiliaries, such as pump, fan, magneto and lubricator.

When a standard method of making power tests is thus decided on, not only will the results convey a definite meaning, but the results obtained by different persons from different motors can be directly compared with each other.

Prospects of the Gas Turbine.

Ever since the steam turbine has attained success in the motive power field, the idea of utilizing the energy of exploding gas charges on the turbine principle has been widely entertained by those familiar with gas engines. The gas turbine, as an ideal conception, has appealed to many, for the reason that it would, if realized, convert thermal energy directly into mechanical energy of rotation, without the intervention of reciprocating parts, and would be much simpler mechanically than gas engines of the cylinder and piston type—desiderata which might have an important bearing upon the future of the automobile art.

Up to the present time no practical embodiment has been given to the gas turbine principle; but the impression seems to be widely current that at some future time it may be put into usable form, despite the great obstacles standing in the way of its development.

In a paper recently presented before the English Junior Institution of Engineers, Dugald Clerk, the famous gas engineer, presents most cogently the difficulties which seem to render extremely dubious the practical solution of the gas turbine problem along any of the lines which have yet been proposed.

The method of gas turbine operation which is treated of as the only practical one is that of furnishing to the turbine blades gas issuing at constant pressure through a jet, from an exploding chamber in which the charge is compressed by external means—the gas operations being thus on the so called Brayton cycle.

It is pointed out by Mr. Clerk that any attempt to serve the turbine blades with gas at the temperatures common in piston gas engines—1,600° or 1,700° C.—would cause their rapid destruction, as these temperatures are above that of the melting point of platinum, and above the softening points of many of our most refractory nonmetallic materials. According to the figures given, about 500° C. is as high a temperature as turbine blades made of any available material could permanently withstand. This fact necessitates a gas supply to the turbine at very greatly reduced temperature, and the expanding jet between the exploding chamber and the turbine must perform this function—converting the heat of the issuing gas into kinetic energy of motion of the fluid, which energy it is sought to realize at the turbine blades. It is regarded by the author quoted as very doubtful whether a jet capable of a sufficiently economical transformation of heat into gas velocity can be attained. It is also pointed out that, as the turbine principle is adopted in order to obviate the use of reciprocating parts, a piston compressor cannot be consistently employed to feed the compressed charge to the exploding chamber, and it is doubted whether a rotary or turbine form of compressor, of satisfactorily high efficiency, can be produced. The probable inefficiency of conversion of the energy of gas motion into blade rotation is also adverted to.

Even assuming the efficiencies of the compressor, jet and blades to be as high as could possibly be expected and far higher than could at present be realized, and assuming the heat losses relatively no greater than those experienced in ordinary gas engines, it is shown that an indicated efficiency of but about 16.5 per cent. could be expected of a turbine of this type, while a piston engine of fair size would show an indicated efficiency about double this figure.

The comparatively low temperature at which gas must be supplied to the blades, the inefficiency of the conversion in the nozzle, the losses in compression and very serious presumptive mechanical difficulties in the turbine, even at the temperature assumed, are regarded by Mr. Clerk as almost insuperable difficulties in the way of rendering the turbine practicable, although it is admitted that a certain lack of efficiency would be tolerated in view of the abolition of reciprocating motion. It is, however, very judiciously stated in the paper that the rather discouraging conclusions drawn are based upon present knowledge regarding the subject, and that future discoveries and an improved line of attack may render possible a more favorable consideration of what is admittedly a most fascinating problem.

Our Communications Department.

The communications received by any journal relative to the topics treated of in its pages are an unerring indication of the interest of its readers. Such communications are coveted by every publisher—so much so that some write letters to themselves. This necessity has never arisen in THE HORSELESS AGE office, and it has been not the least gratifying incident connected with the publication of this journal that our readers have always manifested so genuine and intelligent an interest in the articles appearing in it.

For years we have published every week from two to six pages of communications, in which all subjects of interest to the manufacturer and the user of automobiles have been discussed by thoughtful correspondents. There is no department of this journal in which we take a greater pride, or which we consider of greater value to our subscribers. We propose to continue publishing a journal that will appeal to people who have a substantial and rational interest in the automobile, and consequently we have no fear of ever failing to receive valuable communications from our readers.

Important Decision Regarding Responsibility of Automobilists.

An important decision in an automobile damage suit has just been handed down by the Reichsgericht of Leipsig, the highest court in the German Empire. The horse of complainant had taken fright at the automobile of defendant and thrown its attached vehicle, occupied by complainant, into the ditch. The lower court had recognized the claim for damages as just, but the two highest courts reversed the decision, after it had been proven that the automobile at the time of the accident was developing only the very reasonable speed of 7½ miles per hour. To the contention that the horse had shied as the result of the noise made by the automobile, the Court retorted that if the use of automobiles was not to be completely prevented, certain necessary accompaniments of their operation, particularly at moderate speed, would have to be allowed. Such an accompaniment was, among others, noise. Defendant was not responsible for the circumstance that behind him there was accidentally another automobile, which probably had something to do with the shying of the horse.

Difficulties of the Popular Priced Car Problem.

By Albert L. Clough.

The low powered, low cost car, constructed of good material and embodying the best of workmanship—such a vehicle as shall prove appropriate for moderate speed, family and business use—is being looked forward to by a vast number of expectant, would-be motorists. These prospective users form a class in comparison with which the present automobile using public is but "a drop in the bucket." Thus far, however, the realization of the hopes of this body of people has not appeared imminent, and the outlook for its attainment in the near future, under present conditions, does not appear especially bright. This is deeply to be regretted. Not everyone interested in automobiles realizes the difficulties in the way of the production of a car of this class, which shall possess the required good qualities and still sell at a price that will render it distinctly popular.

COST NOT PROPORTIONATE TO SIZE.

In almost all branches of engineering small constructions cost far more proportionally than large ones. Per unit of size or of performance the small building or the small mechanism is generally more costly than the large one. Consider the homely example of a simple building with walls, floor and roof. If the floor space be increased as the square and its usefulness thus augmented in the same proportion, while the cost of labor and materials in roof and floor will, of course, be increased in a square ratio, the cost of lumber and labor in the walls is increased only in the ratio of the first power and not as the square. The total cost per square foot of floor space is thus less in the larger than in the smaller construction.

Similar conditions obtain in regard to the constructional cost of gasoline engines and, indeed, the cost of production of the motor car as a whole, when its dimensions are increased. Up to a certain point, at least, the constructional cost per horse power or per unit of load carrying capability decreases with the power developed. A gasoline engine cylinder (assuming a constant stroke and speed) possesses a capacity for producing power which is in proportion to the square of its bore. The output of a cylinder of 3 inch bore may be represented as 9 units, while that of one of 5 inch bore is approximately represented by the figure 25. The larger cylinder may thus be expected to develop 2 7-9, or nearly three times that of the smaller.

ELEMENTS OF MANUFACTURING COST.

The cost of construction of an engine may be divided into three elements, namely: The cost of materials (which is a less important factor than the others, on account of the use of cast iron for cylinders and pistons); the cost of the machine work, and the cost of assembling, "running in" and testing.

As to the cost of materials entering into two engines having the above difference in bore and, say, of the four cylinder type, it may be said that the weight and cost will increase in no such proportion as the horse power. For instance, the circumference of the cylinder walls of the larger engine is less than twice that of the smaller, and, even allowing for the necessary increase in cylinder wall thickness, the cylinder weight need not be increased in proportion to the output. The same thing may be said of the pistons, crank case and some other parts. The secondary gears and shaft, together with the rest of the valve operating mechanism and the gearing for auxiliaries, will be only moderately heavier in the large motor. As a matter of fact, an increase of approximately 40 per cent. in engine weight will result in an engine of double the power, raising its output from 25 to 50 horse power, for example. It is thus apparent that the cost of materials is much more favorable to the production of the large than of the small engine.

COST OF MACHINE WORK.

The expense of finishing mechanical parts from the rough will be about in proportion to the superficial areas of the finished surfaces, were it not that setting up the parts in machine tools, testing of dimensions and so forth enter in as a constant factor nearly irrespective of the sizes dealt with. Machinery parts thus usually involve an outlay in labor considerably less than proportionate to the areas to be finished. The finished areas of the important parts increase much more slowly than do the outputs of the engines into which they enter. In the cylinder, for instance, an increase of approximately 60 per cent. in the surface to be finished will represent the difference between a 25 and a 50 horse power motor. The machine work necessary upon the large motor will cost very substantially less per unit of output than that required upon the small one. Since a small motor has just as many parts as a large one of the same type, the cost of assembling will be practically as great in the case of the former as in that of the latter, and the same is true of the running in and testing out operations.

NOTHING SAVED ON IGNITION EQUIPMENT.

Similar relations between cost of production and size obtain in regard to the rest of the chassis. Parts which require to be built heavier in the larger vehicle do not require in their manufacture a proportionately increased amount of labor. The costs of assembling, testing out and advertising a small car are practically the same as the corresponding items in the production of a large vehicle of the same general design. There are certain parts of the equipment which are identical in a large and a small car of the same type; for instance, the entire ignition equipment. The fuel feed and cooling systems of large and small cars of the same type cost about the same. As the body of the low priced family car must be capable of accommodating four or five persons, no great saving can be effected in its construction, except by making it serviceable rather than luxurious. From what has been said, it must be plain that it is a difficult proposition to build a small powered car for moderate speed service which in general type is a copy upon a small scale of the large touring cars, and to sell it profitably at a price which shall render it popular among the class which requires such a vehicle. The price would have to be cut to a point leaving a very small manufacturer's profit, as compared with the margin which could be realized upon the same type of vehicle of larger power and superior capabilities. A four cylinder runabout, which has recently been advertised at a very popular figure and which is equipped with a small, four cylinder engine and otherwise is a diminutive copy of the four cylinder touring car which this manufacturer builds, must be constructed upon a very small margin of profit as compared with other larger cars which this concern turns out. Apparently it is only when a small car of this class is produced in enormous numbers that it can be made to prove an attractive business proposition.

MATERIAL AND WORKMANSHIP.

The moderate priced car for family or business purposes must embody as good material and as good workmanship as the car de luxe, but it need not be expensively finished or luxuriously appointed. Its user has just as good a claim upon the manufacturer for good stock and that measure of reliability and security which good workmanship insures as has the user of the big touring car of high power. Moreover, in the present state of widespread knowledge as to the requirements of a serviceable car, he will not suffer his car to be slighted in either of these directions.

SIMPLIFICATION NECESSARY.

It would seem that the only direction in which the realization of the low priced pleasure and service car can profitably be sought is in that of simplification of the car mechanism, reducing the equipment to its absolute essentials and discarding all superfluities. In this way, and in this way only, it would seem, can the cost of material and machine work and the expense of assembling—the chief elements of productive cost—be reduced to a point at which cars of the class here referred to can be made at an attractive profit and still sold at a popular price. We should not expect to see such a car advertised like brands of soap or new breakfast foods in the monthly magazines or other non-technical organs. This sort of advertising is a sore burden on the automobile buyer, who in the last analysis must pay the bill, and it is a large one. Such a car might be sold direct to the user and the middleman's commission saved.

TWO CYLINDER CARS.

The most obvious simplification which can be adopted in the construction of such a car is in the reduction of the number of motor cylinders. Freedom from vibration is one of the things which are secured by

the adoption of a four cylinder engine and one which is paid for at a good round figure. No one was ever harmed or very seriously annoyed, I believe, by the vibration of a good two cylinder engine, and, as the four cylinder is not needed upon this class of car to secure enough power, the former should prove the type of motor most appropriate. Then, again, there is a type of motor which is not being "laughed out of court" this year as it has been in the past, which, in its two cylinder form, almost equals the four cylinder, four cycle motor in its freedom from vibration and in its torque constancy. I refer to the two cycle engine. A motor of this type does away at once with all labor on valves, valve lifters, cam shaft, cams and secondary shaft gears, and can be produced at a cost far less than even a two cylinder four cycle engine. The difficulties of air cooling a two cycle engine are by no means insuperable and will doubtless be successfully overcome. This will enable the radiator, pump and piping to be eliminated.

RUNNING GEAR PARTS.

In a car of this class a good wood frame will be found to be in every way satisfactory and much cheaper than one of pressed steel. Perhaps the change speed gear and transmission arrangements of this sort of car will be found the most serious part of the problem. Frictional methods of speed variation are "looking up" this season, and a good friction device with direct drive on the high gear would merit most serious consideration on account of the relatively small amount of labor involved in its construction, as compared with that called for in a sliding gear or planetary combination.

The differential may be eliminated by the use of a form of axle employing an automatic clutching and releasing device in the rear wheel hubs. A reduction in the cost of labor could here be effected. A chain drive to this special, live rear axle would answer every purpose satisfactorily, and effect a saving in labor over that involved in a shaft drive. A front axle of special cast bronze would probably be found cheapest and best for such a car. The steering gear, springs and brakes need not and should not be slighted in an attempt to cheapen the construction. One good brake on each rear hub, actuated by separate linkages from the operating device, would, with the braking power of the engine, prove sufficient. It is not my intention specially to advocate the particular construction just described, but to let it serve as an illustration of the process of elimination and simplification with the attendant reduction of labor, cost and material, which it is believed will have to be resorted to in order to successfully produce a popular priced car.

Any reader desiring a separate print of the vehicle speed chart on this page can obtain one by sending in a request accompanied by a 2 cent stamp.

Vehicle Speed Chart.

We publish herewith a chart or diagram which permits of instantly determining the vehicle speed in miles per hour when the engine speed in revolutions per minute, the ratio of reduction from the engine to the road wheels, and the wheel diameter are known. This figure has to be determined very frequently in the draughting room, and its calculation consumes considerable time and involves more or less chance for errors, unless the draughtsman or designer is very accurate in calculations. The use of the chart obviates both the loss of time and the possibility of errors, and we believe it will be found very convenient in the draughting room. The use of the chart may be illustrated by an example. Suppose it is required to find the speed a car will run at when the engine turns at 900 r. p. m., the gear reduction is 3 and the road wheels are 30 inches in diameter. The ordinary method of calculation is as follows: The wheel circumference is

$30 \times 3.1416 = 94.248$ inches or $\frac{94.248}{12} = 7.854$ feet.

The speed of revolution of the road wheels is $\frac{900}{3} = 300$ r. p. m.

The distance covered by the road wheels in one minute is therefore

$300 \times 7.854 = 2{,}356.2$ feet,

and in one hour

$60 \times 2{,}356.2 = 141{,}372$ feet,

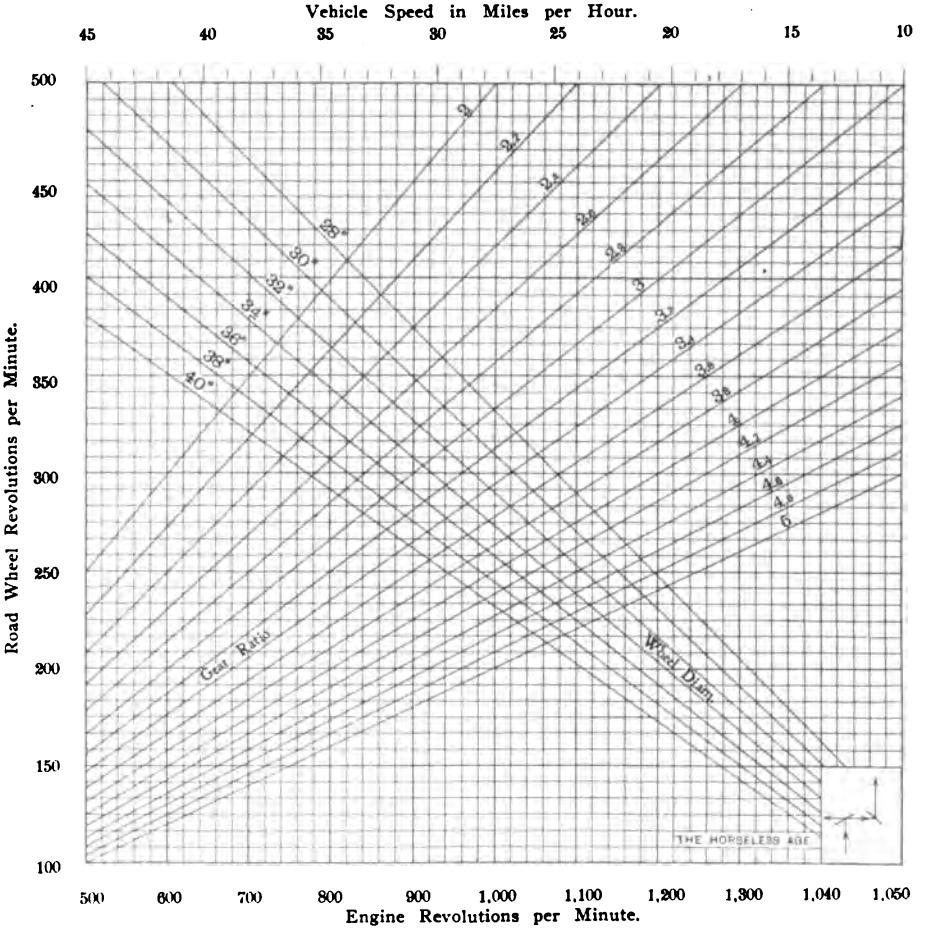
which is equal to

$\frac{141{,}372}{5{,}280} = 26\frac{3}{4}$ miles (approx.).

By means of the chart this result may be arrived at by locating the point on the lower horizontal scale denoting the engine revolutions, then passing vertically upward until intersecting the inclined line representing the gear ratio, then horizontally to the right (or the left, as the case may be), until intersecting the inclined line representing the wheel diameter, then vertically upward to the upper horizontal scale, where the miles per hour at which the vehicle will run under these conditions may be read off. The method of use is indicated by the sketch in the lower right hand corner of the chart.

Gasoline Storage Outfit in Garage Fire.

S. F. Bowser & Co., Fort Wayne, Ind., have sent us some photographs of the ruins of the Schoeffel garage in Rochester, N. Y., which was burned down on March 23. One of the pictures shows the Bowser long distance gasoline pump and three compartment oil cabinet, with which the garage was equipped, and which passed through the fire without suffering any more serious damage than the burning of the wood casing of the oil cabinet, remaining in perfect working order. The manufacturers regard this as a very effectual proof of the evaporation and leak proof qualities of their outfit.



GEAR RATIO AND VEHICLE SPEED CHART.

WINTER EXPERIENCES.

In the Service of a City Doctor.

By Dr. Edward F. Gifford.

The initiated, old and experienced are always amazed or amused at the eagerness with which the novice will seek to convey positive advice to the would-be purchaser. This seems to be particularly true in the automobile game, in which we are all mere beginners. But after several seasons' use of the water cooled car, my winter's success with an air cooled engine has been so satisfactory that I am tempted to narrate my experiences and add a few conclusions, expecting each reader to reject all of which he does not approve.

In a recent issue of The Horseless Age a fellow who rightly signs himself "Kicker" (I am one of them) complains of the "extreme inconsistency" of the manufacturers who build steam cars and air cooled gasoline cars, because they do not conform to the ideas necessary for standardization in automobile construction. Now I had arrived at about the same conclusions concerning the steam car and agree with him in all the mean things he has to say of its shortcomings, because it is the only type of car I have never driven and I know nothing about it from actual experience. But I do know the air cooled car is a success, and the great number of manufacturers and users who are adopting that type are sure to put an awful hole in attempts to standardize construction, if to do so necessitates the universal adoption of water cooling, which, by the way, is happily not the case. I cannot reconcile myself to the employment of several gallons of water, a pump, piping and that delicate and troublesome radiator when they are entirely unnecessary complications in engines up to 25 or 30 horse power. I have not forgotten the eight hours of labor required of two tinners and myself in an attempt to repair a radiator which collided with a large dog just as I was starting on a several days' tour. And to increase my discomfiture, the dog escaped uninjured. The simpler construction, fewer parts, lighter weight, lesser cost and cold weather ability of the air cooler are features which are likely to perpetuate it. While it is possible to drive a water cooled car in winter, it is not practicable for a busy physician to depend on such an unknown quantity as the chemical anti-freeze solutions and the changeable temperature of our northern climate. A very slight miscalculation means a ruined radiator, if not also cracked cylinders. A few of my friends proved it again this winter to their sorrow. Some will say they were careless, which is no doubt true, but the exigencies of a doctor's work are such that even his own family must be neglected at times, not to mention an inanimate object such as his autobile.

OF MANY MINDS.

In the past hundred or more years doctors have been of many minds as to what constituted an ideal horse drawn vehicle, and there may be found even to-day specimens of the craft riding on or in everything from the horse and saddle and "one horse chaise" to the coach and pair, and perhaps each satisfied that he has solved the problem in the manner best suited to his particular needs. Some of them are also very much dissatisfied. So with the comparatively new motor car it is not to be reasonably expected that any one make or type will please all. A perusal of the last special Doctors' Number of The Horseless Age will show that nearly all agree that the gas engine is the proper motive power; most recommend that it be placed in front under the hood and that it should be air cooled. Some advocate a two cylinder engine and two speed planetary transmission, but I can hardly believe that these latter have ever driven a four cylinder engine. With the multiple cylinders the torque is so much steadier on hill work and the car drives so much sweeter in working through crowded traffic or when slowed down for any purpose, the engine starts so much more readily, the car accelerates so much more quickly and there is so much less vibration—all of these and other considerations make it unwise to think of less than four cylinders in the ideal doctor's rig. The above, of course, applies to the now prevalent four cycle type of engine. Basing my opinion on my six years' experience with a somewhat clumsy two cycle marine engine, I fully expect to see the refined three port, two cycle type finally adopted as the accepted standard in automobile construction, especially if they succeed in building a satisfactorily air cooled two cycle motor.

SUCCESS OF AIR COOLING.

Right here I want to state most emphatically that no one need doubt the success of the air cooling features of several of the leading cars of that faith now offered for sale. Nor need the intending purchaser believe that their oil consumption entitles them to be classed as "oil cooled." Fifteen gallons of lubricating oil has sufficed to keep my car in daily use from about June 1 to March 1, probably about 7,000 miles, and this quantity includes all that has been used about the car for gear case and general lubrication as well as the engine.

After my car was delivered I had a top, storm front and torpedo back made by a local carriage maker, at a cost of $35. Such an equipment may now be purchased complete from the builders of several similar cars. I first used curtains, closing the space between the storm front and side curtains, making it entirely enclosed, but found them wholly unnecessary and discarded them. Even without them rain and snow never beat in, and the heat coming through the clutch opening in the footboard, from the engine, is such that I have even discarded the lap robe, finding it is not needed on the coldest days. Indeed, the protection from cold afforded by this top and storm front was a great and happy surprise to me. My car has been stabled in a cold barn without any artificial heat, and while that fact has caused me no inconvenience I feel that it is abusing machinery, because it suffers for want of lubrication before the oil is warmed up enough to flow, and the car will "sweat" when the weather turns suddenly warm, which is, of course, injurious to the finish of both wood and metal.

LUBRICATION EXPERIMENT.

I have not found an oil which would satisfactorily stand both the heat and cold, though in a warm stable this would involve no difficulties whatever. I tried various oils and resorted to several expedients, such as the addition of kerosene to preserve its fluidity, but finally decided the oil which was most satisfactory in summer was also best for winter use. One experiment worth mentioning was the use of sperm oil. After assurance by a chemist that it would not carbonize a friend procured some genuine sperm. I found that it did jelly in extremely cold weather, however. As it was ordinarily very thin, I added about three parts of Mobiloil No 4 to one of sperm to give it body. It did lubricate very nicely, did not carbonize, and we wondered why no one had employed it before, but soon found out. Alas! there was no doubt about its genuineness. For the next week or two I dreaded the sight of a street urchin, for I expected each one to be the first to cry "Fresh fish!" instead of the old and almost forgotten "Get a hoss." For a few days the odor of that car would put a fish market out of business.

I was pleased to find there was very little difficulty in starting the engine in the cold barn, only occasionally on the very coldest days was it necessary to pour a little gasoline in the priming cup on the intake pipe, when the car was first started in the morning. Usually after "tickling" the carburetor, three or four turns at most would start the motor.

EFFECT ON TIRES.

Another question that is often asked is concerning the effect of frozen snow and ice on the tires. My tires are, in so far as I can see, just as good as they were last fall, and that is nearly as good as new. In the 7,000 miles of use I have had just three punctures, caused by a wire nail in each instance. The seeming sharp ice is never sharp enough to cut the tires. The secret of tire economy is in the light weight car with the large tire. For the doctor's use there is no sense in a weight of over 1,500 pounds, and the engine should be of at least 16 horse power. With such a weight and tires as now built I can see no need in the expense and frailty of the high wheels so many writers advocate. Certainly the high wheels are not needed on good roads, and I think with a continuance of the present agitation we will have the macadam roads pretty well started in this

country before we see buggy wheels generally used on an automobile. In fact nothing short of the perfected flying machine, which we have not yet realized, will ever make an ideal rig for the navigation of our unimproved country roads in winter, and, personally, I prefer not to wait for the day of that arrival. Neither do I look to the solid rubber tire for help. I have never been able to understand why so many seem to think the solid rubber tire indestructible. In days happily passed I have experienced infinitely more trouble with solid tires on my buggy than I ever have with pneumatics on my motor cars. The life of the best solid rubber tire I ever used is not much, if any, greater, mile for mile, than a pneumatic, and they certainly are not as comfortable. Having very little fabric in their make up, they show a decided tendency to crack and tear away from their fastenings to the rim, they are liable to deep and destructive cuts, are subject to very much greater loss of substance by actual wear on the tread than are pneumatics, and their defects are not nearly so easily repaired as are those of the latter.

CLINCHER AND MECHANICAL TIRES.

I am even so old fashioned that I much prefer the standard clincher tire, with four or five lugs or stay bolts to hold it firmly in place, rather than any of the so called quick detachable substitutes. The clincher never creeps, never comes off until you want it to, and with proper tools and a little of the *know how*, I have usually been able to remove them about as quickly as any of the "improved" type. My experience has been that after they have been on the wheel a few months the quick detachable fangles do not come off as readily as on the demonstrating wheels at the shows. In a word, their good points are often offset by new weaknesses.

TIRE CHAINS.

In the fall I provided myself with a set of tire chains, and with the first snow I put them on. They are very effectual in preventing slipping and skidding, give good traction in slippery places, and are in fact a decided success for the purpose for which they are made. They do not seem to injure the tire in the least, but after using them for about a month I found that the pavement was wearing the chain away very rapidly, so removed them, thinking to save them for a season when deeper snow would make them more necessary. I found with the light car, however, there was so much less tendency to slip and to skid than with my former heavier cars that the chains were rarely necessary. Only once during the whole winter did I feel the need of them, and that was in turning on a rough and frozen road I got in a deep rut crosswise, which the wheels would not mount. With the engine working on the low gear, the wheels still slipping, a very little help with one hand was sufficient to extricate the car.

These experiences, it must be understood, are in city work where most of the streets are paved. Our hard worked and well deserving country brethren must hustle and hasten the day of macadamized roads before they may hope to enjoy the real comforts and benefits of winter use of the automobile to the exclusion of the horse in this climate. A few determined ones may force a car through the bad roads, but I fear it is usually a case of working their passage. This has, of course, been a very mild winter, here as elsewhere, but there have been a few days of severest cold and deepest snow—enough to thoroughly test the car under all conditions of weather.

CHAIN VERSUS SHAFT DRIVE.

One more point about which there has been some discussion is the merits of the shaft drive. A favorite argument is that if anything happens to your shaft drive your car is completely disabled. About the most sudden and certainly complete disablement which I have ever known to happen to a car is to have a broken chain wrap around the rear sprocket and jam between the differential and trusses. And it is not such an uncommon accident as many drivers might wish, either. I have known this accident to block the rear wheels so suddenly as to skid the car into the ditch, destroy tires, spring rear axles and break sprockets, as well as ruin the chain itself. And there never was any doubt about the completeness of the disablement in any of these cases. In former years I have had a chain so fouled with slush-ice and mud as to be ruined in a few days' driving, and nearly or quite put the car out of commission. If you protect the chain in a tight boot it is then open to the same objections of inaccessibility for repairs as is the shaft drive. I believe most of the arguments against the shaft drive are advanced by those who have never used it, and while I can conceive that, like everything else, it might in rare instances cause trouble, in my experience it has given none, and I have never seen an instance in which it has caused the least inconvenience. In some of the earlier types the cheaply constructed universal joints used to wear enough to cause some play, but they never approached the nerve racking creak and craunch of a worn and "stretched" chain. I believe we must consider the chain as only a poor and cheap substitute for the shaft drive.

AN IDEAL.

The specifications, then, for the "ideal doctor's car" would be about as follows: A detachable tonneau car weighing not over 1,500 pounds, a 16 horse power air cooled engine, four cylinders arranged tandem under the hood where they are accessible, three speed transmission, shaft drive, at least 30x3½ clincher tires. Such a car may be purchased for $1,600-$1,700, with complete equipment, and to the weary and heavy laden Sawbones it will be found even a greater blessing in winter than in summer.

If you must experiment with a cheap car in order to be convinced of the utility of the automobile, or thinking thereby to get something good enough and save a few dollars, then do so knowing that the money you pay for the cheap car is the price you are paying for your education. Even the cheap car is so much superior to the horse that you will be a convert, but with only half the joys of the new life. I promise you that cheap machinery is even a poorer investment than cheap or worn out horseflesh. If you are willing to heed the advice of some of us who have paid, you will save a lot of money by paying the price of a good car equipped with a multiple cylinder engine. Such a car should wear as long as a horse and the item of depreciation will then not figure so prominently in your expense account.

An Original Contest.

The Chauffeurs' League, an organization of automobile owners in France, has suggested a novel form of contest, called the "milk bottle contest," which, if no other organization should be found willing to take it up, it will carry through itself. It is stated that occupants of the rear seats of an automobile often complain that they are uncomfortably jolted at high speed, in consequence of the successive oscillations of the springs. There are on the market a large number of special suspensions, shock dampers, etc., but so far the relative merits of these have never been the subject of a public competition. This deficiency the Chauffeurs' League proposes to meet by its milk bottle contest. The rules of this contest are somewhat as follows:

Two bottle carriers containing eight bottles each will be placed in the axis of the side doors of the competing vehicle and secured to the footboard. The bottles will be of the regular commercial type and at the start of the contest will contain each a predetermined quantity of water. A member of the committee of the League of Chauffeurs will accompany each competing vehicle. The winner of the contest will be the contestant who returns with the greatest quantity of water, and has finished the prescribed course within the time limit. The course to be covered is through the city of Paris and back over a cobblestone pavement. The winner will receive a medal of the League of Chauffeurs having a milk bottle engraved on it, and also a certificate stating the name of the vehicle, the make and size of tires, features of the spring suspension and any special arrangements having a bearing on the comfortable riding qualities of the car.

According to the recently issued annual report of the German A. C., that body has now 1,137 members (690 last year), 880 of these being ordinary members, and twenty-eight lady members. The annual dues were increased from 20 to 50 marks. According to the report, the German industry will be strongly represented in both the Herkomer Tour and the "European Circuit."

The Automobile in Peru.

By Prof. A. Grieve.

In Peru the automobile is to-day regarded by the public in about the same light as it was regarded in the United States ten years ago. There is a lack of confidence in the reliability of the machine, and people who are really interested in pleasure cars and commercial vehicles are under the impression that they are most complicated machines and require to be kept at repair shops a great part of the time. So, when these same people purchase an automobile and have the good fortune (not at all rare to-day) of securing a well built machine, they are astonished at its reliability and great usefulness.

From the above it may be inferred that the automobile business in Peru is struggling against great difficulties. Aside from the ultra-conservatism of the public, a great obstacle to the introduction of automobiles is found in the absolute lack of good roads, The country is divided into three zones, which may be described as follows: The Montana, the interior part of great rivers, tropical climate and exuberant vegetation, which is almost unexplored; the Sierra, that portion of the country situated between the several branches of the Andine Cordillera, where the roads are quite scarce and those which do exist are not suitable for automobile travel, for the reason that there are deep precipices on both sides of the narrow passage and the motorist's life would be endangered by the slightest side slip; the Costa is the long stretch of territory between the eastern branch of the Andes and the Pacific shore. There are a few good roads between some cities and the harbors on the Pacific, but only a few, and even the cities are poorly paved. The valleys form a very small percentage of the total area of the country, as most of the ground is sandy and waterless. Of course, every experienced automobilist knows that great propelling power is necessary to drive on loose, sandy soil, and that the fine silicious dust has a very detrimental effect on all the bearings and other wearing parts of a motor car. These conditions render automobile touring between the cities along the coast almost prohibitive.

For the above reasons the actual field for automobile use in Peru is very limited. The cars may be used in the cities and suburbs and between the cities and certain haciendas (estates). The country, however, is alive to the great importance of good roads, and the road question is a subject of general discussion in official and business circles. It is generally hoped that the building of good roads will soon be taken up in an energetic manner, this being one of the urgent needs of the country.

"Which are the best automobiles, American or European?" is a question frequently asked of every expert by parties desiring to purchase a car. It is very difficult to give a concrete answer, but it is well to bear in mind that the American builders have had to contend with some of the same conditions which prevail in Peru, including the very bad state of the average roads, while it is well known that the European highways are for the most part of great excellence. For this reason it is natural to suppose that American cars are more suitable for our roads than European. There are exceptions to all rules, however, and the writer only recently saw a number of four cylinder cars of a well known American maker which were fitted with front axles so weakly designed that after a few weeks the front wheels spread considerably at the bottom.

Peru, as is well known, is an oil producing country, the better known of the oil fields being on the northern coast (Department of Piura). There are two large petroleum syndicates, but the production has increased less rapidly than the demand, with the result that the price of gasoline of domestic production has increased continuously. In 1904 the price of gasoline was 40 centavos (20 cents) per gallon, today it is nearly twice that. For this reason the cost of the fuel is a fairly important item in the operation of an automobile, and the writer believes that the importation of cheap American gasoline would be a profitable undertaking.

Peru is also a large alcohol producer; the average price of this fuel is remarkably low, and the adaptation of an internal combustion motor to the use of alcohol fuel is of great interest to the country. Alcohol as a motor fuel for automobiles, as is well known, presents great advantages and also grave defects. A rich reward is awaiting the manufacturer who succeeds in solving the problem of the alcohol automobile, a machine that will be easy to start and that will have as good carburation as a gasoline motor.

The tire problem is even more serious in Peru than elsewhere, owing to the bad character of the roads and the predilection of drivers for going at full speed even on rough stretches of road and on curves. The necessity for comparatively frequent tire repairs on the road and the lack of skill in removing tires on the part of the driver all point to the abandonment of the ordinary type of clincher tires. I have seen motorist spend a complete holiday in removing a worn clincher tire and replacing it with a new one. With the detachable type of tire it is a job of fifteen minutes' duration on the outside, even in the case of a layman.

Ignition by dry cells is also a frequent source of trouble. Dry cells are not manufactured in this country, and so must be imported, which results in a loss of capacity and a very high price. There are no facilities for recharging storage batteries in Peru, as all the lighting and power circuits carry alternating currents. The convenience of magneto ignition is therefore apparent. The writer personally favors high tension ignition by means of a low tension magneto, a separate transformer coil and a high tension distributer, as most suitable to local conditions.

Multi-cylinder engines, particularly the four cylinder type, promise to be universally adopted in the near future, and this will be good for motorists living in countries like Peru, as the greater flexibility of the multi-cylinder engine enables even a poor driver to make a fairly good showing. It is well known that a single cylinder car requires much greater skill in driving, and this, in conjunction with the fact that a single cylinder motor is the more generally employed in cheap cars, which are more apt to go into inexpert hands, has been one of



President of Peru and Mayor of Lima Attending Army Manoeuvres in an Automobile.

the greatest drawbacks to automobile progress. The appearance of the first low priced four cylinder machines of American construction has for this reason aroused a good deal of interest among the few automobile enthusiasts in Peru.

Lima, the capital of the country, undoubtedly offers the greatest field for the adoption of the automobile. Some of the doctors, business men and wealthy people are already using the new vehicle, and it is not an infrequent sight to see several automobiles passing each other swiftly in the streets. Paseo Colon, the principal park, is a beautiful place, which forms the rendezvous of high society in the evenings, and here may frequently be seen a number of autos wedged in between a large number of carriages of all kinds and types. The accompanying photos were taken in this park.

The American automobile industry is enjoying a phenomenal growth, which is only approached by the growth of the domestic automobile market. Farsighted manufacturers will, however, not lose sight of foreign markets for their products, and South American countries appear to offer the best chance for an extension of the home market. It is only natural to suppose that manufacturers desiring to push their products in foreign countries will be very liberal with local dealers. In Peru there is little chance of securing good agents by requiring them to buy a number of expensive cars on net cash terms, the conditions being so different from those prevailing in the United States.

Legal Liability for Frightening Horses.

By Xenophon P. Huddy, LL.B.

Have you the right to frighten a horse? Are you liable if a horse is frightened by your machine and damage is caused to another? What should you do to avoid legal liability when a horse is frightened? These questions are constantly before the motorist when driving on the public streets and highways. It is seldom that a long distance run can be made without meeting a restive horse, and without being confronted with the task of solving correctly one or more of the above questions, under the penalty of being subjected to the payment of heavy damages for injuries caused by the propensities of an animal. Does it not seem a little unfair that the automobilist should be obliged to assume responsibility for the pranks of a senseless creature, neither owned, trained nor controlled by him?

The number of civil suits for damages against automobilists due to the alleged frightening of horses far exceeds any other cause of litigation arising out of the operation of motor vehicles on the public ways. The autoist is constantly menaced with the liability of a suit, because of the propensities of the horse, and the automobile driver is commencing to ask what shall be done upon meeting an animal-drawn carriage. Certainly no operator of an automobile wishes to frighten a horse into injuring persons or property, and it should be and is a moral duty at least to relieve parties with a terror stricken animal from their predicament, if possible. Naturally the automobilist cannot, however, always determine upon the correct course of action to pursue in reference to the various horses which he is apt to meet. And for this reason it would seem that there should be some rule for the guidance of the motorist to be followed by him in such emergencies. Has the law given any such rule?

Whether an automobilist frightening a horse into committing an injury to property or person is liable depends upon whether there exists negligence on the part of the automobile operator, and a lack of contributory negligence on the part of the party injured. Let us consider the question of negligence.

The rule is well settled that in order to hold a person liable for an injury on the ground of negligence it must appear that the party inflicting the damage owed some duty to the person injured in reference to his safety. If there existed no such duty there can be no liability. How does this rule apply to the autoist when meeting a restive horse? Of course, where there is a statute prescribing the duty to stop, etc., which is the case in several of the States, the motorist is obliged to obey the enactment, but what is the duty of the autoist where no statutory provision exists, and what is the extent of his obligation?

We have simply the situation of a frightened animal causing damage, and an automobile, a lawful thing, causing the fright; there is no contact or collision. The real cause of the fright exists in the animal. The propensities of the horse constitute a condition which the motorist meets on the road as an incident to using the highway. Is the motorist bound in law to recognize this condition? As a problem of fundamental jurisprudence, it would seem logical not to hold a person liable for damages caused by mere fright where the terror is unreasonable and is due to the propensities of the object frightened, especially where the thing causing the fright is lawful. However, whether logically right or wrong, the courts have held that automobilists are responsible where ordinary care is not exercised to prevent an injury in such cases, and it has also been decided that it is the duty of the motorist to stop, even if there is no statute requiring such a course of action. The Supreme Court of Illinois has held that the automobile should stop, even if no signal to do so is given by a party with a restive horse, and the statute provides for the giving of a signal under such circumstances. The courts of Kentucky have laid down the rule that where a party operating an automobile knows, or should know by the exercise of ordinary care, that the machine in his possession and under his control has so far excited a horse as to render the animal dangerous and unmanageable, it is the party's duty to stop the automobile and take such other steps for safety as ordinary prudence might suggest.

That the situation of the motorist when meeting a horse which becomes frightened at the appearance of the automobile is one of difficulty is conceded by all. He may do everything in his power to prevent injury, but to no avail. Surely, the motorist should not be held responsible for the inherent traits of the horse, and the only duty which can be imposed upon the automobile operator is to exercise reasonable care and prudence under the conditions. This is the general rule that is being announced by the courts.

It is of interest to note what is said in this connection by the Appellate Division of the Supreme Court of New York. Mr. Justice Williams in Murphy vs. Wait, 102 App. Div. 121, said: "Since the automobile has come into use upon our streets and highways, these accidents have been common, and actions to recover damages resulting therefrom have been frequent. These machines may be used on the public highways, but horses will also continue to be used, for a time, at least. Both may be legally used as motive power in public travel. Some horses are frightened when they meet these machines, and it is the duty of persons running the machines to exercise reasonable care to avoid accidents when horses become frightened. It is not pleasant to be obliged to slow down these rapid running machines to accommodate persons driving or riding slow country horses that do not readily become accustomed to the innovation. It is more agreeable to send the machine along and let the horse get on as best he may; but it is well to understand if this course is adopted and accidents and injury result, that the automobile owner may be called upon to respond in damages for such injuries."

The subject of contributory negligence seems not to have been broadly considered heretofore in determining responsibility for accidents due to automobiles frightening horses. The chances are that a party owning a horse knows the propensities of the animal and is cognizant of its disposition in the presence of an automobile. Moreover, no one could now be heard to say that he did not reasonably expect to meet an automobile while driving with a horse. In fact, every person who starts out on the road with an animal-drawn carriage must be presumed to contemplate meeting motor vehicles. What is the legal situation presented?

The situation is that, if a party possesses a horse which is known by him to be afraid of automobiles, he takes his safety into his own hands and is upon his own responsibility if he drives the animal on the highways. It comes very near constituting contributory negligence to drive such a horse at all where automobiles may reasonably be expected to be met. The horse driver, as well as the automobilist, has his responsibilities when on the road.

MAINTENANCE AND REPAIRS

[Suitable contributions to this department, accompanied by sketches, are solicited and will be well paid for.]

A Few Practical Hints.

By R. M. Shewmacher.

Every owner should learn the functions of every part of the car, even if he has a paid chauffeur, for he may see the time when he will have to drive the car himself in order to get home. He will then also know whether his chauffeur is doing his duty.

In going over the most essential points to keep in mind, first of all learn to use the oil can, and use it often. Pay strictest attention to those parts that are hard to get at to repair or adjust for wear. It is better to use too much oil than too little, though the best plan is to use a little at a time and apply it often. If the bearings get plenty of oil there will be little need of adjustment for a long time.

ADJUSTING BEARINGS.

Then learn to adjust the bearings, as well as other parts, so as to be able to do so when it becomes necessary. Train the ear to be ever watchful of anything unusual in the performance of the machinery. It won't take long to locate the trouble and such trouble should be attended to without delay. To adjust any bearing it should be tightened up as much as possible without causing it to bind in the least. The engine bearings can be adjusted best with the spark plugs out and the cranks on dead centre; then the flywheel can be moved back and forth very easily with one hand.

Never run the motor to see how fast it can run, and don't let it race while changing speeds. Broken and loose wires, flooded carburetors, broken oil pipes, defective oiling, loose bearings, broken piston rings, broken connecting rods, and hot engines are the usual consequence of letting the engine race. Keep the motor running at a slow or medium speed as much as possible. This, with plenty of oiling, will do more to keep the car in proper working order than anything else one can do.

STARTING THE CAR.

Never engage the clutch suddenly. The strain on the working parts by so doing is the cause of so many serious breakdowns when far from home. When starting from rest advance the spark a little, then let the clutch in gradually and open the throttle according to the demand of power from the motor. If the motor has no governor the throttle should be partly closed while changing speeds, but never suddenly open the throttle wide or advance the spark very much, as it is very easy to break a crank shaft by so doing.

Learn to control the speed of the car with the spark and throttle as much as possible and only use the clutch when necessary to stop or nearly stop. It is hard to explain just how to use the spark and throttle so that the beginner will understand, but the writer found that the best plan was to say, "Use the spark for speed and the throttle for power." Beginners seemed to understand this simple explanation and the use of the spark and throttle soon ceased to be such a mystery.

PREVENTING SKIDS.

When stopping never set the brakes tight enough to slide the wheels. The car will stop quicker if the wheels are allowed to revolve, and the danger of skidding is very slight. But should the car begin to skid release the brakes and clutch, so as to allow the wheels to roll freely; close the throttle, so as to check the speed of the flywheel, and keep the front wheels going straight ahead or rather in the direction you are traveling. If the driver is quick enough he can gain control of the car nearly every time. If the flywheel is allowed to run fast the car will spin like a top, owing to the gyroscopic action.

DRIVING RULES.

In taking corners slow down with the throttle until half way around or until having a good view of the road ahead, then open the throttle gradually. The driver can save tires a great deal by careful driving. One should never try to dodge every pebble or rut in the road, take corners at top speed or stop in the shortest possible distance.

Every time the steering wheel is turned there is a severe side strain on the tires, and this causes more trouble than anything else. Actual punctures from nails, etc., are seldom the cause of tire failure. Do not pump the tires too hard. Get a pump with a pressure gauge on it and follow the directions of the tire maker.

LOCATING FAULTS BY SOUND.

To locate trouble by sound must be learned by experience, for the different sounds are very hard to describe. However, if the motor stops firing suddenly, the trouble most likely will be found in either the sparking system or the valve mechanism. See if the switch is turned off, then trace the primary wiring from the battery to the switch, to the commutator, to the ground, then back to the battery for loose or broken wires. See that none of the battery binding posts are broken off. Examine the vibrator on the coil to see that it is clean. Sometimes a small drop of water will get on the vibrator points when least expected and you can't see it. If the coal buzzes at the proper time there is no need of looking over the primary wiring at all. See that the secondary or high tension wires are attached to the coil and plugs; also see that the plugs are not broken or too dirty, and that the points are one-thirty-second of an inch apart.

VALVE GEAR TROUBLES.

If the spark is all right then examine the cam shaft and valve gear. The cam shaft gear may be stripped or broken, so that it won't revolve, or the cam shaft may be broken. Also look at the commutator and see that it is properly timed. If the engine has no compression then you will find the trouble in the valves. If the inlet valve is broken the engine will draw a charge and then fire back in the carburetor. If the exhaust valve is broken air will be taken in and expelled through the exhaust pipe.

If the motor fires spasmodically it may be due to a broken or sooty plug, vibrator out of adjustment, vibrator points loose, worn off or burned, wire broken inside the insulation (usually the one leading to the commutator), loose battery wire or no gasoline.

DISARRANGEMENTS IN VALVES.

If the motor gets in the habit of missing a little every day when nothing seems wrong, it is well to look for a clogged muffler (which causes back pressure), weak valve springs, insufficient clearance between valve stem and tappet rod, leaky valves, leaky inlet pipe, vibrator points worn off, spark coil broken down in the insulation, insufficient time of contact in the commutator or badly worn valve gear.

The clearance between the valve stem and tappet rod should be not less than one-thirty-second of an inch. Leaky valves can easily be found by trying the compression with the inlet and exhaust pipes detached. If the inlet pipe leaks the motor will start hard and will require carburetor priming, and when the throttle is opened the engine will choke and emit black smoke from the muffler.

COIL TROUBLES.

If the vibrator points are worn off, considerable sparking at the vibrator will be noticed. When everything else is right in the sparking system the coil should give a spark at least one-half inch long in the air. Sometimes a broken down coil can be restored to good working order by putting it in a dry, warm place for few days, so as to melt the wax inside and fill up the break in the insulation. Too much battery will break down a coil. The time of contact in the commutator should be not less than one-twelfth of a revolution of the flywheel, and a little more is better.

If the valve gear is worn the engine will be lacking in speed and power and will heat up too much.

Lack of oil in the cylinders is indicated by a loss of power and a rasping sound in the cylinder. In such a case look for trouble in the lubricator.

CLUTCH WRINKLES.

If the clutch grips too quickly oil it. If it is leather lined use castor oil. When a cone clutch becomes worn it should be taken out and scraped, so that the outer or larger part will engage first, and as it slips it will work in tight gradually.

If the engine pounds with a dull thud look for a loose bearing or loose flywheel. If the spark should be advanced too far while climbing a hill a sharp metallic knock will be noticed. This same sound will be heard when there are carbon deposits in the cylinders. The engine will run all right

under light load, but will knock as soon as a heavy load is put on. Retarding the spark will not check it, but by partly closing the throttle it will stop. After a certain engine speed is attained the car will travel as good as ever without any knock. Increasing the gasoline in the mixture will also stop the knock, but that is not advisable. An excessive feed of lubricating oil will also stop the knock temporarily, as the oil moistens the carbon and keeps it cool.

BROKEN PUMPS.

The causes of overheating in motors may be summed up as follows: Poor oil, insufficient oil, bad mixture, weak spark, obstructed muffler, broken pump, flat or obstructed water pipe, low water, and valves out of time. The pump may be broken and still circulate the water. Very frequently after a little freeze up the key or pin in the pump vane is found sheared off and the ends will drag the vane just enough to circulate the water a little, but not enough to keep the engine cool. The radiator will get hot because slow circulating water does not cool as fast as fast circulating water.

COOLING SOLUTION.

If aluminum is used anywhere in the cooling system calcium chloride should not be used as an anti-freeze solution, as it attacks the aluminum, and the whole system would soon be filled up with a kind of scale which clogs up the pipes. Return tube radiators cannot always be entirely drained, and in case of a sudden cold spell coming on, when no anti-freeze solution is at hand, drain off all the water possible and then put in some wood alcohol. Pour in at the top until some runs out at the bottom.

Carry a Copy in Your Pocket.

"Evidence and Proof of Speed," by Xenophon P. Huddy, of the New York bar, is the title of a valuable booklet recently published by THE HORSELESS AGE. It gives in the form of a brief the rules of law pertaining to the proof of speed of automobiles as laid down by the courts of final appeal in the several States, together with references to the leading cases in point.

A motorist unfortunate enough to be haled before a police magistrate or justice of the peace for unwittingly fracturing a speed law will find such a digest of the greatest value in presenting his case to the court if he doesn't happen to be represented by counsel.

The court itself would usually be glad to have at hand an authoritative statement of the rules that should govern its action in admitting and weighing evidence. The motorist who is able to furnish this would in all probability help his case.

Lawyers also will find this little book of great assistance, as it may often be instrumental in saving their clients from unnecessary annoyance and humiliation.

It is bound in a durable linen paper cover and is a convenient size to carry in one's pocket. Copies will be mailed to any address on receipt of 10 cents each.

Book Reviews.

Motor Vehicles and Motors. By W. Worby Beaumont. Second Volume (bringing the subject up to date and covering the period since the publication of the first volume). Published by Archibald Constable & Co., London, and J. B. Lippincott Co., Philadelphia.

The first volume of Mr. Beaumont's technical treatise on the automobile appeared in 1900 and was reviewed in our columns at the time. It was a rather ambitious work for the time, but its author undoubtedly correctly foresaw the immense future of the automobile industry and planned a sort of standard text book on automobile construction. As a considerable portion of the first volume consists of technical descriptions of cars and parts, and these have now long been superseded by improved and refined designs (though still embodying the same principles), it became necessary to consider a second edition to take account of the advances made since the first edition appeared, and the second volume, here under review, is devoted to descriptions of modern cars and technical discussions of subjects which have engaged the attention of automobile designers more particularly in recent years. The two volumes of Mr. Beaumont's book embody each an immense amount of original work, which distinguishes them favorably from most other automobile book publications. In this second volume, for instance, there are more than 500 illustrations, mostly line cuts with scale of dimensions and made from original drawings. The author informs us in the preface that the preparation of the drawings extended over a period of three years. It may be of interest to mention that a considerable number of the line cuts are printed on large folding plates and the illustrations throughout are on a very liberal scale.

A number of chapters are devoted to detailed descriptions of American gasoline cars, including the Cadillac, Oldsmobile, Pierce, Winton and Duryea. Among the special subjects dealt with may be mentioned the following: Radiators and Water Cooling Requirements; Power, Speed and Tractive Effort; Crank Shafts and Axles; Vibration and Turning Effort; Engine Dimensions, Piston Displacement and Mean Pressure; Overturning and Skidding; Carburetors and Carburation.

The book covers all three motive powers and deals at length with heavy commercial vehicles. It is printed on heavy paper and is well bound, contains 659 pages of text, an alphabetical index, a list of illustrations and a list of tables. The price is 42 shillings.

The Law of Heavy and Light Mechanical Traction on Highways in the United Kingdom. By C. A. Montague Barlow and W. Joynson Hicks. Published by Isaac Pitman & Sons (London and) 31 Union Square West, New York. Price, $2.25.

The book contains the Locomotives Acts and Amendments passed in the United Kingdom since 1861, including the Motor Car Act of 1903, now in force, and the Local Government Board's Regulations, with notes; also a summary of the English and Scotch reported cases on extraordinary traffic. The work would undoubtedly be a valuable addition to the library of a lawyer specializing in cases coming under the laws of the road.

Motor-Car Mechanism and Management; Part I, The Petrol Car. By W. Poynter Adams. Published by Charles Griffin & Co., Ltd., London (J. B. Lippincott Co., Philadelphia). Price, $2.

This book is of an elementary character and intended for the instruction of amateur and professional drivers. It is the first volume of a set of three, one of which is devoted to each of the motive powers. The volume is divided into two sections, the first dealing with the mechanism of the gasoline car and its underlying principles, and the second relating to the management of such cars. The work is one of the best elementary treatises on the subject which we have seen. The illustrations are clear and distinct, though perhaps fewer in number than would be desirable. The author is an electrical engineer, and the electrical portion of the car appears to be dealt with most extensively, which is an advantage, for the reason that it is this portion which presents the greatest difficulties to the average driver. The book concludes with a glossary of automobile technical terms and their definitions.

The British Motor Union.

The annual report of the Motor Union, which was presented at the general meeting on March 28, shows that this organization has greatly increased in strength during the past year. It now includes no fewer than sixty-five separate bodies, as well as over 2,000 motorists who have joined the union direct. Of the total of 11,000 members, the Automobile Club of Great Britain and Ireland and its affiliated clubs account for nearly 5,000, the balance being made up by those provincial clubs and organizations which are affiliated to the union and by the individual members. Much useful work was done during the past year, particularly in connection with the opposing of unnecessary speed limit applications, and in the preparation of evidence to lay before the Royal Commission. In these two matters the union co-operated with the Automobile Club, and a sum of $2,500 was contributed to the fund administered by the joint committee of the two bodies. On the year's working there is a balance of $8,305, while, in addition, the Legal and Legislative Defense Fund shows a surplus of nearly $2,500.

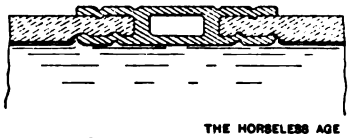
NEW VEHICLES AND PARTS.

Marmon Eight Cylinder Car.

The Nordyke & Marmon Co. are designing an eight cylinder car, all but a few of the minor details having been determined, and will have it out late in August. The cylinders will be 4⅝ bore and 4½ inch stroke, set at an angle of 90 degrees. The engine will be 60-70 horse power. The car is designed especially for a seven passenger touring car. While it will contain a number of new features, the main characteristic of the Marmon, the double three point suspension, will be retained.

The Cinch Tire Repair Kit.

A new tire repair outfit with the above name has been placed on the market recently by the Auto Goods Company, of Providence, R. I. The outfit permits of repairing punctures in inner tubes without

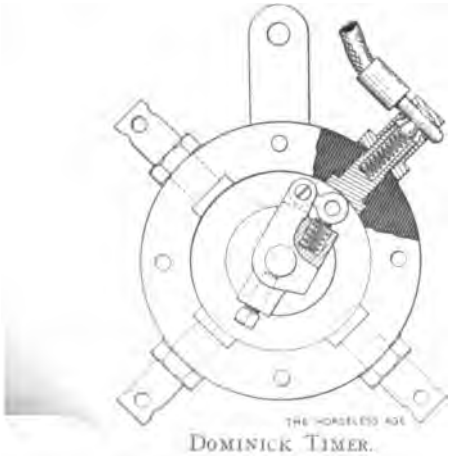


CINCH TIRE SEAL.

cement and a vulcanizer. The repair is effected by what is known as a seal, consisting of a rubber coated double head rivet. The first operation in making a repair with this outfit is to cut a smooth round hole by means of a special tool provided for the purpose. Then a wire opening tool is inserted and the hole is stretched sufficiently to admit the seal. After the seal is in place it is brought to the edge of the tube and compressed by means of a pair of pliers. A cross section of the repaired tube is shown herewith. Among the advantages claimed for this method of air tube repairing is the saving in time effected, as there is no need of cleaning surfaces, waiting for cement to dry, etc.

The Dominick Timer.

A new design of ignition timer, a drawing of which is shown herewith, has recently been placed on the market by William Dominick & Co., 243 Michigan avenue, Chicago. The device consists of a hard fibre annular shell, into which are set four tool steel contact blocks. The revolving part, secured to the shaft, consists of a bracket having a tool steel block similar to a chain block pivoted to it, the free end of this block being pressed outward against the inner surface of the fibre shell by a coiled spring located in a socket in the bracket. The revolving block is so arranged that the direction of rotation of the device is immaterial. Another novel feature in the design is the contact terminal. As seen from the drawing, the outer end of the contact blocks is bored out to receive a coiled spring and ball, and has a cap screwed over it, with lateral holes, through which a pin soldered to the end of the wire cable may be inserted. The pin has a number of depressions, into which the steel ball is adapted to engage, and it is claimed that when the terminal is once put in place it is held there rigidly and securely.



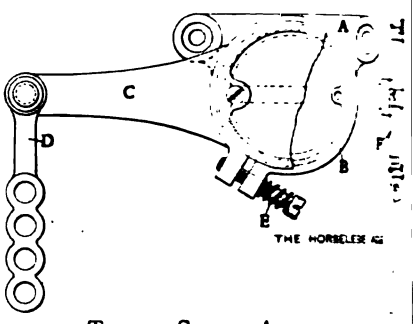
DOMINICK TIMER.

New Tire Repair Patches.

The Huntington Automobile Company, Huntington, N. Y., market a new tire repair patch which requires no cement. The patch is made of red colored soft rubber (like inner tubes of some makes), beveled at the edge and provided with a top shaped central stem or shank on one side, the point of which is of hard rubber and vulcanized to the remaining portion, which is made integral with the patch. In order to repair a punctured tube the stem of the patch is pushed through the puncture, and it is claimed that the pressure of the inner tube and outer casing against the patch renders it airtight.

The Toquet Shock Absorber.

We show herewith two views of a new shock absorber which is to be marketed by Louis B. Toquet, of South Norwalk, Conn. It is of the one-way type, retarding the action of the spring only during the rebound, and is based on the principle of the single acting band brake. A brass drum A cast with two lugs is bolted to the side frame of the car, and over the drum is slipped a split brass ring B with an integral extending arm C, which is connected by a link D with the spring rest on the axle. Between the drum A and the encircling band B is a layer of leather which increases the friction. The split in the ring B is just to one side of the arm C, and the two ends of the ring are forced together by means of a steel spring E over a machine screw which passes through the lug at one end of the ring and is screwed and riveted into the lug at the other end. It is evident that when the arm C turns right handedly about the drum A the friction between drum A and ring B tends to compress the spring E, and thereby to reduce the pressure of ring B against drum A, while when the arm C turns left handedly about the drum A the friction between the drum and band aids the spring

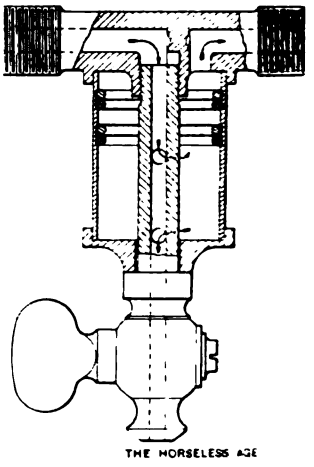


TOQUET SHOCK ABSORBER.

E in compressing the ring B. The ... handed motion of arm C corresponds ... the recoil of the vehicle spring. The drum is provided with a head plate ... which holds the leather in place between the drum and spring.

The Breese Gasoline Strainer.

A new gasoline strainer has recently been placed upon the market by the Breese Motor Manufacturing Company, of ... Main street, Newark, N. J. Referring to the sectional view of the device herewith, the gasoline enters the top fitting at the left, passes down the central standpipe



BREESE GASOLINE STRAINER.

and through the upper hole in same the chamber of the strainer. Within the upper portion of this chamber there are four layers of fine mesh wire gauze, which are held in place between split rings of spring wire, which are lodged in grooves in the wall of the chamber. The gasoline filters through the gauze and passes from the device through the top fitting at the right. Any water that may be contained in the gasoline, as well as particles of dirt, will settle to the bottom of the chamber and pass through the lower hole into the stand pipe into the drain cock at the bottom of the strainer, by means of which it may be periodically drained off.

A proposal is on foot for the establishment of an Australian Automobile Corps in two divisions—one of motor car engineers, the other of motor cyclists—the latter to be used in connection with artillery and the other for dispatch work. The minister is stated to be seriously considering the

New York Sewer Explosions: Cause and Suggested Remedy.

By E. S. Foljambe.

The recent sewer explosions in the garage district of New York have caused considerable damage, and speculation is rife as to their cause. In a report of the Bureau of Combustibles of the New York City Fire Department, submitted to Fire Commissioner John H. O'Brien, which was published in our issue of April 18, it was stated that very little, if any, gasoline is used in garages for cleaning either machinery or floors, and that garage owners are very careful to get the legitimate use of all the gasoline they buy. It was further stated that, considering that the union of the refuse oils, kerosene, water, etc., in the sewers destroys the life and character of gasoline, the condition would not bring about an accumulation of gasoline vapor, and that the explosions were probably due to other inflammable gases which are known to exist at times in the sewers.

Dr. Walter Bensel, Superintendent of Sanitary Inspection of the Board of Health, by the process of exclusion, decided that the explosions were due to illuminating gas, but the Inspection Department of the Bureau of Sewers were skeptical regarding this report. So-called experts suggested that the explosions could not be due to gasoline, as the color of the flame from the sewers was not blue, but this shows absolutely nothing; for, as any one knows who is familiar with explosive mixtures of gasoline and air, the flame may be of any color from a deep, rich red through the blues to a sickly yellow, according to the richness of the mixture, and that the blue flame is obtained only when an absolutely correct mixture exists, which would be most unlikely in this case. The statement made in the report that gasoline in the sewers would lose its character is also incorrect; for if gasoline is present in sufficient quantities and in motion, part of it volatilizes, even when mixed with water and oil. Others suggested that it could not be due to gasoline from the garages, as the explosions would then have taken place close to these garages and not farther down in the sewer. This does not follow, as the sewer is in many respects like a river with its tributaries, and it is quite possible that sufficient gasoline to form an explosive mixture with the large volume of air in a 4 or 5 foot sewer would not be accumulated until the refuse from many garages came together. Furthermore, pressure could not be the cause of firing this vapor, as sufficient pressure to do this would be more than sufficient to blow off the manhole covers; direct contact with fire, such as lighted cigarette or cigar stubs, would be necessary.

As to the cause of these explosions, there is no doubt in the mind of the writer that it is gasoline; not the little which might accidentally leak into the drains, but the large quantities of gasoline which are used daily for cleaning purposes in all up to date garages and repair shops. This is considered a legitimate use of gasoline and garages are willing to pay for it. In most cases the gasoline used is taken directly from the stock supplied for automobiles, and is not of inferior quality, as suggested by some investigators. No provision whatever has been made for the disposal of the resulting mixture of dirt, powdered steel, bronze, aluminum, oil and gasoline, and it is, therefore, most natural that in this crowded district, where convenient vacant lots do not offer themselves as safe dumping grounds for this refuse, as is the case in outside districts and in smaller cities, much of it finds its way into the sewers.

That gasoline in considerable quantities is poured wholesale into the sewers is shown by the fact that quart samples dipped at random at different times from the trunk sewer in question on the night of April 28 each show a layer of oil and gasoline at the top of about 1 inch in depth. These samples were taken by Dr. E. J. Lederle, former city Health Commissioner, and were obtained at night when the sewer was comparatively empty, so that it is probable that during the day much larger quantities would be present. The following is an extract from the Garage Regulations of the City of New York by the Bureau of Combustibles of the Fire Department:

Sec. 26.

HANDLING AND USE OF VOLATILE INFLAMMABLE LIQUIDS.

No volatile inflammable liquid shall be—

1. Used in a garage for cleaning or for any other purpose whatsoever other than filling the tanks of automobiles;

2. Allowed to run upon the floor or to fall or pass into the draining system of garages;

3. Put into or removed from the tank of an automobile while any light or fire on the same is burning;

4. Carried or kept in open vessels.

Sec. 28.

WASTE CANS.

Self-closing metal cans set firmly on 4 inch legs shall be kept on all floors for the purpose of holding all inflammable waste material.

This last regulation evidently refers to oily waste, etc., and does not include gasoline. These regulations prohibiting the use of gasoline for cleaning are evidently not enforced, and, in fact, never ought to have been made, as they would, if carried out, seriously interfere with the expeditious methods of cleaning automobile machinery, which are in common use in practically all garages and repair shops; but if the use of gasoline for this purpose is allowed, definite and systematic arrangements should be made for the disposal of the waste. This could be done by requiring each garage and repair shop owner to supply a suitable, safe receptacle, according to specifications, into which the refuse gasoline and oil from cleaning could be poured from drain or cleaning pans. These could then be collected regularly and carried to points where a safe disposition could be made of the gasoline. Taking care of this waste product is certainly as important as removing paper and oily waste.

It seems to the writer unfair that the use of so important a cleaning agent should be prohibited simply because suitable regulations for disposing of the refuse have not as yet been made, and it is to be hoped that such regulations will be determined upon as will effectually prevent further trouble, and at the same time work hardship to none.

Difficulties of the Automobile Situation in China.

W. W. Rockhill, the United States Minister to China, writes us regarding the automobile situation in Peking—or rather the lack of it, for he says it has no past or present. He points out that the terrible condition of the roads in northern China has prevented the introduction of Occidental vehicles. Up to two years ago there were no horse carriages in the city of Peking, all kinds of traffic having been carried on for centuries by means of heavily built springless carts, or jinrickishas.

The only automobiles in Peking are several purchased more than a year ago by the Imperial Court, and kept within the enclosure of the Summer Palace, where there is no adequate space to use them.

Macadamized roads are now being built for the first time in Peking, and if the new system is extended to the surrounding country Minister Rockhill believes that the demand for automobiles will arise, as is now the case with bicycles, which are beginning to appear on the streets of Peking in small numbers.

James Linn Rodgers, United States Consul General at Shanghai, China, doesn't hold the optimistic views regarding the introduction of the automobile into China set forth in a report by H. R. Burrell, special agent of the Department of Labor and Commerce, published in The Horseless Age of December 13, 1905. He writes us as follows:

"I do not incline to the view of there being much of a market for automobiles in any Chinese city. The roads are of limited extent, and only exist in foreign settlements, not penetrating inland on account of Chinese opposition to such improvements.

"Thus in Shanghai, for instance (and Shanghai has more foreign built roads within the International Settlement and the French concession than any other city in China), the radius of travel is about 4 miles.

"Again, automobiling is so dangerous owing to the great number of Chinese thronging the streets and refusing to give a clear thoroughfare, that but few people care to take the risk of driving a car. Accidents are common, and, though usually settled on a money basis, leave unpleasant impressions on the public mind."

COMMUNICATIONS

Sulphur in Gasoline.

Editor HORSELESS AGE:

A number of the men connected with our factory have reported finding a small quantity of sediment in the gasoline pipes leading from the tank to the carburetors on our machines. Our Mr. Nutt secured a small quantity of this substance a few days since from the gasoline delivery pipe and gave it to the writer. The motor had been missing for some time, and he was unable to locate the trouble until after the gasoline pipe was removed and cleaned. The writer made a chemical examination of the metal. It consists of black, lustrous scales closely resembling flake graphite, except that it is rather more densely black in color. When heated on a platinum foil sulphur dioxide was evolved, and treatment with nitric acid produced a green solution and liberated free sulphur.

A quantity of the solution was evaporated nearly to dryness in a platinum dish and a small quantity of hydrochloric acid; a small quantity of the solution was placed in a platinum capsule and a piece of zinc added; metallic copper was deposited on the platinum. The results of the analysis clearly showed that these scales consisted of laminated sulphite of copper, and are doubtlessly formed by the action of some sulphur compounds in the gasoline on the copper of the gasoline tank.

It will thus be seen that even though a copper tank and copper pipes are used, sediment may still be formed and cause trouble in the delivery of the gasoline to the carburetor. Since the scales are evidently formed after the gasoline is placed in the tank, no amount of straining or filtering will be of any avail. A method of preventing this annoyance, which has been more or less frequent, would be to screen the gasoline just before it leaves the tank and use an aluminum pipe for conveying it to the carburetor. ELWOOD HAYNES.

Acid Cure Solution.

Editor HORSELESS AGE:

In your issue of April 4 I notice a request under "Tire Repair" articles of one H. R. S., asking information regarding the acid cure solution. I am pleased to give you my experience with such a solution.

I had a blow-out on the front tire, which left a good sized hole in the inner tube, and which I repaired on the road with the cement furnished by the tire company. After a run of 10 miles the patch came off. I then repaired it at home with the utmost care, and it stayed on for 20 miles. I then sent for the acid cure solution and followed its directions. The patch is on today and I have run over 300 miles since the repair was made. "It holds."

I have also used the solution for repairing outer casings and covering cuts in such cases, and the patches hold if put on according to directions. I got quite a cut in one of the rear tires quite to the canvas and placed a patch over it with the acid cure, then used a shoe which fitted the tire exactly, laced it tight and blew up the tire to 60 pounds pressure. The patch was vulcanized to the tire and the repair is permanent. I have since purchased two sets of the $1 size and carry it with me all the time.

GEO. J. BOLKS.

Objectionable Practices Required by Law.

Editor HORSELESS AGE:

Your remarks re objectionable auto practices are correct, and constant hammering along this line will eventually wake up people to seek the truth, but in the meantime what is the poor auto driver to do? In Pennsylvania, for example, the law requires that we blow a horn within 100 feet of every street crossing, and if a man tries to observe the law he cannot avoid making a nuisance of himself by the amount of noise he makes. Just imagine a few autos going through town late at night and obeying the law literally. It seems to me the only way to get the objectionable law repealed is to follow it, and the more persistently auto users in this State use their horns the quicker this nuisance will be suppressed. The same is true of lamps. The auto user is forced to show lamps front and rear. If an accident occurs he gets the blame. He cannot see a horse coming in the dark unless he has a searchlight, so he must perforce carry a searchlight. This enables him to see what the horse and driver are doing while he has yet time to stop before doing damage. The fact that it dazzles the horse driver so that he is likely to drive into the ditch and that both horse and driver lose knowledge of where they are, and as likely as not get on the wrong side of the road, with the result that a collision follows, as happened only last week in Jersey, resulting in the death of the auto driver, cuts no ice with the legislator. He makes the law to "soak it" to the automobilist. It is awfully nice to have laws that hit the other fellow. Some day, when the people who do not drive autos get a little sense, they will see the folly of class legislation, and lamp laws will be made to apply to all vehicles alike; then the horse driver will show lights front and rear, so that the auto driver can see him without a searchlight, and the searchlight will either be suppressed or turned off as soon as the auto gets within dazzling distance of the horse driver. This will be safe for both and as it should be.

The muffler cut-out, like the bail on a lantern, is a confession of weakness and should be avoided by manufacturers for the good of their product, if nothing else.

CHAS. E. DURYEA.

Automobiles in the San Francisco Earthquake.

Editor HORSELESS AGE:

In these troublous times I take the pleasure of informing your journal that many a person was saved in the San Francisco disaster through the use of automobiles. The Government has seized over 3,000 machines and pressed them into service, supplying each with 5 gallons of gasoline at a time. All these machines were used as ambulances and quick service dispatch, to save the patients at the hospitals and to convey messages and alarms of fire. The people have nothing but words of praise for the automobile, and I doubt if any prejudice will ever again exist.

Our own machine was in operation ten minutes after that terrible earthquake, and has been running continuously night and day. The horses have already given out and the only things running on wheels are baby carriages and autos.

The tires of machines are standing a terrible test, for the streets are full of glass and nails and red hot bricks, tangled and twisted wires, and in some places it is hard to tell if one is riding on a street or inside the sidewalk line. The only habitable big building still standing is the ferry building—and that standing upon filled in land. Looking from the upper floor, one can see only ruins. There are a few large fireproof buildings standing, but they are gutted and will have to be dynamited.

Hoping that your subscribers will realize the value of machines without first being forced to do so through so great a calamity, I remain,

PETER TUM SUDEN.

The Selection of an Automobile.

Editor HORSELESS AGE:

The many interesting letters appearing in THE HORSELESS AGE, dealing with expense of maintenance, ability to use machines throughout the winter, etc., suggest that possibly some advice may be given, which, if needed, may prove profitable to those about to purchase machines for the coming season.

I belong to a bowling team and during the course of the early winter one particular man frequently buttonholed me between "throws," as it were, as to what I thought was the best runabout in our market. He knew that I had had five machines, all of them runabouts, and that they always apparently were in perfect working order. I advised him to buy a well known neatly designed runabout, which had given me the best satisfaction of any machine that I had owned. At different times I suggested to him that if he bought this particular machine he would have little or no trouble, and that the cost of maintenance would be comparatively low, because it did not need the everlasting tinkering that all the others have needed.

I presume he thought I was overzealous

in my recommendation, because he went to the Chicago Show and became infatuated with a double cylinder horizontally opposed engine under the seat, with ostensibly twice the horse power of my single cylinder runabout. He asked me what I thought of it, and I told him that it was an experimental machine, because it had been on the market only one season; that in my judgment the day had gone by for buying a horizontally opposed engine under the seat, and that it was bad enough to think of adjusting one cylinder in this position, but it was altogether unthinkable to adjust two cylinders in this position. However, a gentleman who had never run an automobile, but who is a first class business man, advised him to buy this machine, and it did have such a beautiful finish on the outside, and the firm selling it gave away so many coupons in the form of lamps, that the temptation became too strong and he bought this particular machine.

After buying the machine he told me it was really funny when one thought the matter over, that one could start out with a firm determination to buy a machine with two cylinders in front under a hood where they could be gotten at for adjustment, and a shaft drive, and finally wind up by buying a machine with a hood in front and two horizontally opposed cylinders under the seat, with a chain drive. I suggested to him that when a man decided to buy an automobile he was a good deal like a man in love, and when he got stuck on a particular machine it was a waste of time trying to dissuade him from his choice.

Now I frequently meet this young gentleman, who is a prominent attorney, riding on a boulevard. I had ascribed the slowness of his machine to a certain timidity on his part on account of inexperience in operation, and I still believe the machine is capable of better speed than he seems to be able to get out of it. He is, however, evidently somewhat ruffled in his admiration for the machine and his judgment in selecting it. One day recently while I was on my way to lunch, having been detained at the office, I was going somewhat near the limit of the machine. About a block ahead of me I soon discovered my bowling friend, and he turned to see who was coming behind him. He had a pleasant smile on his face, a kind of a stage smile, and as I passed him, there not being time for him to adequately express his sentiments in words, he electrified me with a bit of pantomime. As I shot by him he raised his extended hand toward me, the little finger of which reached out in my direction, while the thumb sought the end of his nose. Now I leave it to your readers to interpret his meaning. We are the best of friends, but I do believe that he is a little bit disappointed.

To the readers of THE HORSELESS AGE let me offer the suggestion, if they are thinking of buying a runabout and want peace of mind, let them buy a single cylinder standard runabout, and in selecting the machine buy only from a company which by a number of years' steady demonstration have proven the worth of their product. If you will select a machine which a large number of your fellow townsmen have found practical you will not go far wrong. Beware, however, of new types, new concerns, new givers of premiums, and don't get fooled on this question of horse power. In the ordinary everyday business it is not necessary to climb the Washington monument or the Capitol steps at Washington.

A PIONEER.

Cause of Backfiring.

Editor HORSELESS AGE:

Will you please explain in your magazine what causes a four cycle engine to "backfire" into the carburetor? If the valves are perfectly ground and the spark and valves are correctly timed, how can a "weak mixture" cause the engine to shoot back through the intake? Where does the explosion take place?

I have a four cylinder, four cycle, air cooled engine with auxiliary exhaust, which invariably "backfires" into the carburetor when the spark is much retarded or the throttle nearly closed, or both, and I have been trying to figure out why it does so. If the explosion takes place within the cylinder and as the result of the spark, I cannot see how the intake valve could possibly let any of the charge by, even though the spark was excessively retarded. The "backfiring" will begin with the first few explosions, which fact suggested that it cannot be particles of carbon in the cylinder causing premature explosions. It has been suggested to me that one cylinder might miss and discharge into the exhaust and this charge be lighted in the exhaust pipe by the next cylinder that exploded, but I can hold down any one of the vibrators and cause one cylinder to exhaust constantly into the muffler with no apparent increase in the backfiring. I would like to know what causes this trouble. G. W. INGHAM.

[The ignition of the gas in the inlet pipe and carburetor is undoubtedly effected by heat from the previous explosions. It is well known that a cylinder heats more when the spark is retarded. Probably some projecting point in the cylinder is raised to such a temperature that when the inlet valve is opened on the suction stroke it immediately ignites the incoming mixture. —ED.]

Valve Timing.

Editor HORSELESS AGE:

I am thinking of opening a discussion on valve timing in THE HORSELESS AGE. I bought lately a double opposed 5 inch bore engine from the —— Company, which was timed as follows: Exhaust opened on dead centre and closed before next dead centre; inlet opened on dead centre and closed before next dead centre. No alteration of the timing gears made any improvement in the running of the engine. The manufacturers were notified; they made no comment, but asked that the top plate and cam shafts be returned at my expense. As the express on these parts there and back would have cost at least $5 and the work would have caused a month or more delay, I got new cams made at a local shop and sent the bill to the manufacturers, though I don't for a moment suppose they will pay it. If they do, I have nothing more to say, but if not, I would like to see them on the defence, if they have any, in your columns. With the new cams, the exhaust opens 1 inch before the end of the working stroke and closes one-eighth inch after the next dead centre. The inlet opens as the exhaust closes and keeps open till one-eighth inch after the dead centre. When I hear from the company I will write again, but the point is that many engines may be as badly timed and that may account for the varying results obtained with the same size engine.

W. DEARDEN.

Chance for Motor Line.

Editor HORSELESS AGE:

A Nottingham lace mill at Gouverneur, N. Y., employs several hundred hands, largely women and girls, who live in Gouverneur and four or five nearby villages. The problem has arisen how to secure the help from these other villages in face of the 2 cents per mile rate on the New York Central Railroad system. Attempts have been made to secure a special train morning and evening at a 1 cent per mile rate, but the railroad management will do nothing

Here is an opening for a couple of gasoline motor cars of light construction adapted to run on the railroad tracks. I believe if such cars were offered to the railroad management the special transportation desired by the lace mill employees would be obtained. The conditions here must exist in many other places also. An opportunity is evidently waiting for the manufacturer who will give his attention to this problem.

J. S. CORBIN.

The "Kicker" Discussion.

Editor HORSELESS AGE:

I have read with interest the discussion that has been started in the columns of THE HORSELESS AGE between the users of steam and gasoline cars. It seems to me that "Kicker" and C. J. Pembroke, who are defending the gasoline car, have got the better of the discussion all around. H. W. Beach speaks of trials and contests that the steam car has won, and refers to the tour through the Maine woods by this same car. I read the account of this tour and have had the pleasure of also reading all accounts of tours, endurance tests and hill climbing feats, and this point has stood out very plain —that all of these victories have been won by only one steam car. Why is it that you do not hear of some other steam cars taking a hand in the work? Every day we read of some gasoline car running 1,000 miles without stopping the motor. This certainly shows that there are a good

many gasoline cars that are prize winners, while, on the other hand, this one steam car seems to be the entire output of the steam kingdom. I know of another steam car that showed a great deal of speed at Ormond last January, but this car, so far as I know, has not got the record that the one Mr. Beach speaks of has. No one can doubt that this sole hero of the steam power is a very smooth running and quiet car. But, in the first place, the price of this car is far beyond the average pocketbook, and in the second place the average person is not capable of caring for it. These gentlemen who have stood up for the steam car most likely are very good mechanics and enjoy taking care of a complicated piece of machinery, but when it comes to the average person, I think he would have his hands full. Take, for example, the issue of THE HORSELESS AGE for April 18, and look over the advertisements of different makes. We find some twenty-five gasoline care mentioned, and only one steam car, this same hero all by himself. About a year ago one of the most prominent steam car makers dropped the steam car, and turned his attention toward the gasoline car. This company until that time were turning out both steam and gasoline cars, and their dropping the steam car and adopting the gasoline shows very plainly that they had a chance to know which was the best proposition, and after finding out turned their undivided attention to the gasoline car. Last fall another most prominent steam car maker dropped the steam car entirely, and this year we see him out with a four cylinder gasoline car. If the steam car is the best proposition for country use why is is, then, that so few makers are turning them out, and that at the opening of an auto show you see many new makes of gasoline cars?

W. L. MCELDOWNEY.

Automobiles in Finland.

Editor HORSELESS AGE:

A new era is beginning in Finland, as the Czar of Russia, who is Grand Duke of Finland, has finally given up his policy of oppression, and the Constitution is again in force. Commerce and industry, which have been practically dead for several years, are beginning to show signs of returning life. America can have a large share of Finland's business, if the right effort is made to secure it. Finland formerly purchased most of its imports from Germany, England and France, but the superiority of American products is realized here, and merchants are turning their attention to them more and more every year.

Automobiles are yet very little used in Finland, the first French and German machines having made their appearance last summer. Last fall agents for several American manufacturers placed four or five machines on exhibition, and this spring the outlook is for quite a demand for American automobiles, especially for 2 and 3 ton trucks and cheap runabouts.

At the present time the German machines are a little cheaper. The American cars would undoubtedly be in much greater demand if shipments could be made in a shorter time. It requires only from ten to fourteen days to travel from New York to Helsingfors, but for freight it takes two months, much time being wasted in England. If American products are to have a fair show in Finland and Russia some adjustment must be made in the freight service between these countries.

There are no automobile manufacturers in Finland at the present time, and only one in Russia. Erkke & Markoff, Helsingfors, manufacture gasoline motors and motor boats, and their products are sold largely in Finland and Russia. I hear that this firm is considering taking the agency for American automobiles. E. M.

The Dyer Patents.

Editor HORSELESS AGE:

The editorial contained in your issue of April 4, 1906, and headed "Some Recent Patent Deals," so far as it refers to my automobile patents does me an injustice which I have no doubt you will, with your usual sense of fairness, correct on becoming acquainted with the facts.

It will appear from the editorial referred to you consider that, as a lawyer practicing patent law, I have taken advantage of what you have pleased to term the "weaknesses" of that law, and secured patents without having benefited the public or complied with the spirit of the statutes which were intended to reward practical inventors. The facts with respect to the making of my various automobile inventions, stated briefly, will show your criticism as applied to me to be unjust.

These inventions were all made about eleven or twelve years ago, long before the automobile business reached its present state of perfection. At that time I was a resident of Washington, D. C., and, appreciating the great field for automobiles, provided various objections to their then crude methods of manufacture could be overcome, I discontinued the practice of my profession entirely, went to a Western city and spent almost an entire year there designing and building automobiles in connection with certain interested manufacturers of machinery. During this period I made the inventions forming the subject-matter of the various patents under which I have recently granted licenses to the Association Patents Company. The parties who were associated with me in the West did not appreciate the merits of my invention and decided not to enter the automobile field. These inventions, as is often the case with inventions of the greatest merit, were so far in advance of the art that they failed to be appreciated at the time, and no manufacturers appeared desirous of adopting them. It is only in recent years and with the gradual growth of the automobile business that manufacturers have appreciated the merits of, and seen fit to adopt, the devices. It is well known that manufacturing enterprises are not started by persons of intelligence in this day and age without having an investigation made as to the patent situation in the particular field of manufacture which is intended to be exploited. Therefore it is reasonable to suppose that most of the automobile concerns who adopted my inventions were well acquainted with the fact that patents were in existence covering the special features; but, instead of securing permission from me to manufacture my invention, the various manufacturers have seen fit to pirate my ideas with the hope that they would be permitted to do so without hindrance, while those same makers have entered the field only after commercially successful vehicles were in the market, which in most cases *they* have copied. Although I have for the past three years been in correspondence with various manufacturers endeavoring to arrange for the manufacture of automobiles under my patents instead of in infringement of them, it was only after an extended investigation by counsel for the Association Patents Company, which includes all of the most prominent automobile manufacturers, that I was able to secure recognition of my rights. This recognition was granted to me after a full and careful search of the prior art, which confirmed the belief of the counsel making the investigation in the validity and absolute newness of my inventions. It would appear from the article contained in your issue of April 4, 1906, written by Frederick W. Barker, that he also considers the inventions of the two of these patents which he has investigated to be new and the subject of valid patents.

Under the circumstances, therefore, it would seem to me that instead of being open to criticism for not commercially introducing my inventions after several years' efforts to do so, I am unfortunate in having been so far in advance of the automobile art that my patents have already run upwards of five years without my having received any remuneration for my early work. Although the consideration paid to me by the Association Patents Company was a most substantial one, I do not consider that it is anywhere near the compensation I am entitled to for the direct time involved in the making of the inventions, aside from the time lost from the practice of my profession, and I hope to receive several times the amount of this consideration through actions which I have brought and shall bring against manufacturers who are unlawfully using my inventions without permission.

I trust that, under the circumstances, you will see fit to publish this letter, giving it the same prominence as the editorial referred to. LEONARD H. DYER.

An Indian Automobilist.

Editor HORSELESS AGE:

I was amused while in South Dakota recently riding across the prairies and pin

es west of the Missouri prospecting for , to see scooting across the prairie far id an object which on closer inspec- proved to be a big red automobile, ging along over the veldt with as much egard for the rough track as though ad been the smoothest asphalt. It ed like a $3,000 machine. We were it 50 miles from a railroad in about wild a part of the country as is now in the United States. The guide told that the driver and owner of the ma- e was "Doc" Lewis, a half breed In- , who owned four sections (about 2,500 s) of land, and had acquired consider- wealth. L. W. HOUSEL.

A Precursor of Selden.

tor HORSELESS AGE:

"good American" wishing to foster erican integrity and add one more bit of dence to that existing to show the de- dly questionable nature of the "Selden ent," calls attention to the issues of the nch automobile weekly, *Omnia*, of March and April 7, 1906, pages 136 and 190, wing that (not to speak of Lenoir, who, 1862, went from the interior of Paris to ncennes in a carriage moved by an "ex- sion motor") a certain Delamare-De- tteville in 1882-1883 (of Cailly and ntaine-le-Bourg, in the district of Seine- férieure, France) had preceded Benz and imler in the construction and the use on the public highway of rapid vehicles pelled solely by "explosion motors." His ent in France (February, 1884) was No. 1,267. A. FRANZ AMMOY.

nquiry About New Jersey Law.

litor HORSELESS AGE:

Can you tell me what the clause in the w Jersey law, taking effect July 1, means, en it says that "chain tires are not per- tted, save in snow and ice." Does it not an the chain for use in mud, or any nilar chain? My reason for asking is it I have leather covered non-skid tires my rear wheels, which have the tread vered with flat steel discs, about one- ghth inch long, and I don't know if the act eans all non-skid tires or not. If it does, en it should specify and not say a chain e. All persons I have consulted say it es not refer to the leather covered tire, it to chains applied to the tire.

WALTER LATHROP.

[Section 6 of Part II of the New Jer- y law reads as follows: "No motor vehi- e tire shall be fitted with a chain when ed upon gravel, macadam or other made ads, except upon natural dirt, asphalt, obble, Belgian block or vitrified brick pave- ent," etc. Steel studded tires are not entioned by the act, and their use is erefore not prohibited.—ED.]

Autos in the Azores.

Consul Pickerell, of St. Michaels, Azores slands, writes to the *Daily Consular and Trade Reports* under date of March 26 that circulars had been issued to the investing public inviting subscriptions to an automobile company whose capital stock in reis is equivalent to about $13,500. The interest evinced in the enterprise leads the consul to believe that the entire amount will be speedily subscribed. He says:

Should the hopes of the managers be realized, and I believe they will be, the company intend at once to send their manager either to Europe or America to purchase the necessary machines. They are very anxious to get started, and hope to have everything running not later than June 10 in order to take advantage of the summer trade. It is the present intention of the leaders in this new movement to commence operations with four machines, two of 12 to 15 horse power and two of 6 to 8 horse power, capable of carrying five passengers each, which they estimate will be sufficient to serve their purpose, as the grades are in the main easy. Should this initial experiment prove a success, they will order more machines in a short time.

Owing to the fact that this company was organized in a few hours, it has been impossible to get exact details. Interested parties informed me that the type of machine mentioned above can be purchased in Germany or France for about $1,500. I have induced the present manager to seriously consider the placing of the order in America, or at least make that country a visit with a view of buying should he find what he wants. In order that no excuse may be offered, I would be pleased to receive bids for four gasoline automobiles, of from 12 to 15 horse power, each capable of carrying five passengers. Furnishings to be good, plain and durable. Tires to be solid rubber. Cars to be well made, strong and durable, strength being preferred to beauty of furnishings. Price is a very important feature, as well as deliveries, which must not be later than May 15. Prices can be made f. o. b. New York, terms cash against documents.

Should the manufacturers prefer they may send their bids direct to the manager, Augusto da Silva Moreira, Ponta Delgada, Saint Michaels, Azores, or they may cable him, F. Augmoreira, Ponta Delgada. Owing to the fact that our cars have never been seen here the idea prevails that they are light, easily put out of order, and in general poor seconds to machines of Continental manufacture. In view of this, and the fact that the company will be, from the character of the men composing it and their ability to secure concessions, a success, I believe it would pay our manufacturers to give this proposition serious consideration and lower their prices and profits in order to secure the future business, which will not be small. I would also suggest that a photo accompany the bids.

March Exports and Imports.

The value of the exports of automobiles and parts from the United States for March, 1906, amounted to $283,561, as against $235,826 for the same month last year, thus showing an increase of $57,735. The value of the exports for the nine months ending March 31, 1906, amounted to $2,064,874, as against $1,638,601 for the corresponding period last year, and $1,305,777 for the corresponding period the year before. The distribution of exports among the different countries was as follows:

	March, 1906.	Nine Months Ending March 31, 1906.
United Kingdom	$70,414	$541,431
France	16,035	139,226
Germany	10,413	45,742
Italy	40,418	171,628
Other Europe	12,207	102,459
British North America	69,094	353,717
Mexico	34,611	201,121
West Indies and Bermuda.	9,996	220,424
South America	3,991	52,032
British East Indies	369	28,733
British Australasia	10,774	129,620
Other Asia and Oceania	9,857	40,767
Africa	5,219	26,094
Other countries	163	11,880
Total	$293,561	$2,064,874

Eighty automobiles valued at $263,928, and automobile parts valued at $43,797 were imported during March, 1906. For the nine months ending March 31, 1906, 744 automobiles, valued at $2,694,093, were imported, and automobile parts valued at $279,367.

Commendable Action by the Colorado A. C.

The Colorado A. C., of Denver, has instructed its executive committee to request every member of the club, in case he is involved in or witnesses any automobile accident, to obtain testimony concerning it from witnesses, and under no circumstances to hurry away in order to avoid responsibility.

The club has provided members with post cards for notifying the secretary of violations of the tramway rules prohibiting two cars from passing each other at intersecting streets, or passing any street intersection at a high rate of speed, without sounding the bell.

James H. Pershing has been retained as club attorney to advise members regarding the laws of the road or in case of accident.

As in the San Francisco earthquake, the automobile has proved itself extremely useful in connection with the eruption of Mt. Vesuvius. After the service of the street car line connecting several villages at the foot of the mountain had been interrupted, owing to the tracks being covered with a layer of ashes a foot high, the King and Queen and a number of high Government officials visited these villages in an auto, comforting the panic stricken inhabitants.

OUR FOREIGN EXCHANGES

Rating Motors by Cylinder Dimensions.

(Abstract of paper by Dugald Clerk read before the A. C. G. B. and I. on March 22, 1906.)

I hope that in the case of the gasoline motor no rigid rules may be formulated tending to impede progress, and prevent engine designers varying proportions and dimensions of their engines in any way which they may think best adapted to secure improved results.

Personally, I fear it is impossible to devise a rating rule which will enable one to accurately estimate the power of any engine from cylinder dimensions only. To obtain any such accurate rule would require uniformity of mean pressures, cylinder proportions, piston speeds and engine revolutions, which would tend, in my view, to impede progress.

Before a rule can be framed at all it is necessary to get accurate information as to the mean pressures produced, the piston speeds used, the total cylinder volumes used and even the number of revolutions. If we could have standard mean pressures, standard cylinder proportions and piston speeds, then no doubt accuracy would be possible.

In order to consider the matter I have had certain tests made—some by my partner, Mr. Adam, some by myself—by the Wolseley Company and by the Daimler Company. From these various tests I have prepared Table I, which gives results from ten gasoline engines and one three cylinder gas engine. For the sake of completeness I have included in these particulars the results stated by Dr. Watson in his recent paper. His engine, however, may be taken as experimental, as the piston speed is much lower than that usually adopted by makers for the market.

I have arranged mean pressure under two columns. In the one case the mean pressure given is the exact equivalent of the brake horse power, without any allowance for friction; that is, it is that proportion of the mean pressure upon the piston which is really delivered from the engine in brake horse power. The second mean pressure column gives the mean pressure upon the piston, assuming the mechanical efficiency of each engine to be .8. The last column gives the piston speed. The power and cylinder dimension columns are self explanatory. It will be observed that the cylinder dimensions in the gasoline engines vary from 3½ inches diameter by 4 inches stroke as the minimum, to 7⅛ inches diameter by 6 inches stroke; and that the mean pressure equivalent to brake horse power varies from sixty-one as the minimum to eighty-one as the maximum. The highest mean pressure actually exerted on the piston is 101.5 pounds per square inch, and the lowest 76.4. With pressures varying so much as this, it is obvious that no rule could be given depending on cylinder dimensions only, which would estimate, even with approximate accuracy, the power to be given by two engines. Two engines of exactly the same cylinder dimensions, with this variation in mean pressure, would vary as much as 25 per cent. in rated power. Judging, however, from these numbers, a gasoline engine of first class construction should give a brake equivalent of about 70 pounds per square inch mean pressure upon the piston.

Looking now at piston speeds, the engines from 6 horse power to 15 horse power, excepting Dr. Watson's experimental engine, vary from 750 feet to 800 feet piston speed per minute. It might then be considered with some justice that the piston speed of a good engine, varying from 6 horse power to 15 horse power, could be taken at 800 feet per minute. The piston speed of the more powerful engines appears to vary more; from 28 horse power Humber to 60 horse power Mercedes it varies from 862.5 feet to 1,350 feet. A piston speed, however, of 1,000 feet per minute appears to be very near the mark of all engines, except racers.

GASOLINE MOTOR TESTS.

Engine.	Cylinders. No.	Diameter.	Stroke.	B. H. P.	Revs. Per Min.	Mean Pressure Equal to B. H. P.	Mean Pressure on Piston M. E. .8
6 h. p. Wolseley....	1 of	4.5 in.	5 in.	6.5 at	950	68.2 lbs. sq. in.	85.2 lbs. sq. in.
Dr. Watson's.....	2 of	3.5 in.	4 in.	3.7 "	590	64.3 " "	80.4 " "
				4.4 "	700		
12 h. p. Siddeley...	2 of	4.5 in.	4.5 in.	12 "	1,000	66.4 " "	82.8 " "
15 h. p. Siddeley...	4 of	4 in.	4 in.	19.2 "	1,200	63 " "	78.8 " "
25 h. p. Siddeley...	4 of	4.5 in.	5 in.	35 "	1,200	72.6 " "	90.7 " "
				31 "	1,200	64.2 " "	80.2 " "
28-36 h. p. Daimler.	4 of	4.32 in.	5.9 in.	35.6 "	1,000	83 " "	103.8 " "
				32 "	1,000	74.6 " "	93.2 " "
32 h. p. Siddeley...	4 of	5.25 in.	5 in.	45 "	1,200	68.5 " "	85.6 " "
28 h. p. Humber...	4 of	4.5 in.	5.75 in.	28.5 "	900	68.6 " "	85.7 " "
Siddeley Racer, 1904.	4 of	7.125 in.	6 in.	85 "	1,150	61.1 " "	76.4 " "
Vertical Gas Engine (National Gas Engine Co., Ltd.)..	3 of	9 in.	12 in.	75 "	450	57.6 " "	M. E. .85 67.8 " "

From these tests I would suggest that for all gasoline engines power might be calculated on the assumption of a brake equivalent of 70 pounds per square inch on the area of the cylinder, and for engines up to 12 horse power piston speed of 800 feet per minute, and over 12 horse power, 1,000 feet piston speed per minute. A rule based on these assumptions would be of the form

$$\frac{D^2 \times N}{C},$$

where D is the diameter, N is number of cylinders and C is a constant. The constant will be different for engines up to 12 horse power and engines above 12 horse power.

It is true that such a formula is not really what one would call scientific, because it takes no note of the fact that higher piston speeds can be attained with longer than with short strokes. Mr. Remington, of the Wolseley Company, has proposed the formula $\frac{D^2 \sqrt{S} \cdot N.}{C}$, where D is diameter, S is stroke, N number of cylinders and C a constant. This formula takes account of the fact that, from various causes, p piston speed does increase with stroke. Curiously enough this for exactly that given by Bourne in used for low pressure engines of type.

It would, it is true, be more s tory, and certainly more scientific could suggest a formula which clude all the main factors determ er. Unfortunately, but little is as yet as to some of these factors. Take ample, the question of mean pressu depends:

(1) Upon ratio of compression inder;

(2) Upon flame temperature of ture;

(3) Upon temperature of the fore compression;

(4) Upon cooling surface and tion of the cooling surface, and

(5) Upon the time of exposure

All these things vary in ever The effect of some of the factor known; others are by no means The law of the change of mean with the compression is accurate The change is proportional to th of efficiency, and this has been d with some accuracy by a commit Institution of Civil Engineers o mo-dynamic standard for internal tion motors. Although the chang pressure with increasing compre be accurately calculated, yet this exhaust the matter. The questio ignition comes in, and makes cases impossible to predict what in the absence of direct experim

The question of flame temperatu pretty well understood, and i that too rich a mixture with a flame temperature tends to produ economy and trouble in running tion of charge weight is also u both from a mechanical point o quiring large and free inlet v and from the physical point o heating the mixtures during e exact effect, however, of surfac shape of the surface is very stood, although the time elem accurately calculated.

From this it will be seen that the question of mean pressure alone is a very complex one, so complex that experiment is the only safe guide.

With regard to the other important factor of power—that is, piston speed, broadly, the conditions arising with increased piston speeds are clearly understood. The limit comes from undue inertia strains. In many large gas engines the work of pulling up the piston at the end of each stroke produces pressure on the crank pin almost as high as the explosion itself. It is difficult to predict any limit to piston speed with reasonable accuracy, because it depends so much upon weight of reciprocating parts, strength of material used, length of stroke, and so on. Altogether it seems to me hopeless to expect to get any real accurate formula in our present state of knowledge. It is quite possible, however, to obtain more accurate information than we have at present. It will be noted, in looking at Table I, that mean pressures vary very much; but that 70 pounds per square inch on the piston as brake equivalent is not far out from the ordinary result.

The brake power at which many engines are rated seems to vary within wide limits, partly because, I think, many makers are content with a few minutes' run upon the brake at full load. I would suggest that all full load brake tests be made for at least five hours, with the water leaving the cylinders at a temperature of not less than 70° Cent., and that the full brake load be given as the power to be got from the engine under these conditions. A few minutes' brake test is very misleading. I would suggest the same test for piston speed—that is, no piston speed be given which cannot be maintained for five hours at full load.

If such tests were made (under conditions which would insure accuracy) of all the principal engines at present at work in Britain, we should soon be able to so increase our information as to determine easily the load which should be given by any good gasoline engine of certain dimensions. This, I presume, is the real reason of requiring a rating rule.

It is interesting to note that in these engines the gasoline consumption varies from .1 to .08 gallon per brake horse power per hour, depending largely on the load. Generally the best economy is got somewhat under full load—about three-quarters load.

In reply to an inquiry of Mr. Weir in the British House of Commons recently, the Home Secretary stated that in London the number of accidents to persons or property known to the police to have been caused by motor cars (including cycles) during this year was: For January, 301; February, 263; March, 385; total, 949. Of those caused by motor omnibuses the number was: For January, 211; February, 235; March, 331; total, 777.

Contests at the Empire Track.

The contests to be held at the Empire Track, New York City, May 24, 25 and 26, in connection with the first open air show and carnival under the auspices of the New York Automobile Trade Association, have been announced as follows:

Classification of cars: Class A—One cylinder, Class B—Two cylinders, Class C—Four cylinders, Class D—Six or more cylinders, Class E—Shall include all steam propelled cars whose horse power shall be determined on accepted standard formula. This class may enter in all events except where specified otherwise.

FLEXIBILITY CONTEST.—Open to stock touring cars equipped as sold for four passengers or more, and classified as follows: Classes A, B, C, D and E. One mile with flying start on high gear. One-quarter mile with flying start on high gear. Slowest speed without stopping motor or disconnecting clutch. Not less than two persons to be carried; one to be an official observer. The prize offered for highest percentage obtained by dividing the highest speed by the lowest on high gear and result divided by H. P. x F. S., divided by L. S. divided by H. P.

EFFICIENCY TEST.—The standard to be figured on piston displacement as one pint per H. P. hour on standard formula; 1-10 of the cubical displacement. One pint standard gasoline reservoir will be supplied by the committee with proper attachments to dash. Contestants must be prepared to attach connecting one-quarter inch hose to carburetor. The prize will be given for the highest percentage of the greatest distance traveled per H. P. hour. For Classes A, B, C, D and E.

POWER TEST.—Starting on low speed 10 yards from sand pit in which the depth increases gradually. Prizes will be awarded to car in each class covering the greatest distance. For Classes A, B, C, D and E.

TRACTION TEST.—H. P. to be determined as in previous event. Prize to be given for the car making the best performance per H. P. hour per ton mile; based on the following formula: Weight multiplied by speed divided by time multiplied by H. P. This test to be run in two events; one for touring cars and one for commercial vehicles. For Classes A, B, C, D and E.

BRAKE TEST.—Test 1—All touring cars claiming 40 miles per hour or better, to be given one-half mile start and travel marked one-eighth mile in less than 11¼ seconds when brakes will be applied. Minimum distance to count. Brakes must not be applied until car reaches brake line. Cars to be given two trials. Observer to be carried in each car. Test 2—The same rule for all touring cars claiming not more than 30 miles, but over 24 miles per hour. Must do one-eighth mile within 18¾ seconds under same conditions. For Classes A, B, C, D and E.

VIBRATION TEST.—All gasoline touring cars eligible. Will be required to carry standard pail supplied by committee filled with water on any part of car floor selected by owner. Prizes will be given for car covering 200 yards, standing start, with least amount of water spilled. Car must be traveling on high gear before crossing finish line. For Classes A, B, C and D only.

TUG OF WAR.—This event shall be open for all kinds of cars on challenge which the committee will hold and referee for all acceptances. The only rule being that cars shall be provided only with any regular and standard make rubber tires.

RELAY RACE.—Management will accept matches between any makes, providing three cars each are duly entered. Match to be agreed upon by both parties in which each car shall make one lap, stop, discharge passengers, who will transfer to second car, make a second lap, stop, passengers transfer to third car for last lap. Matches made and accepted will be entered in program.

REVERSE GEAR 75 YARD DASH.—In two classes. Class 1—Touring cars to carry five passengers with sliding gear transmission cover 75 yards from standing start in minimum time in reserve. Class 2—Open to all classes with planetary gear transmission carrying five passengers. This race to be run by time only. One trial. For Classes A, B, C and D only.

OBSTACLE RACE.—Two classes. Class 1—All cars over 100 inch wheel base. Class 2—All cars under 100 inch wheel base. Open to all cars. Barrels, flags, dummy pedestrians and other obstacles will be placed on the track. Operator covering the prescribed course and touching the least number of obstructions. Prize will be given to car coming nearest to covering prescribed course within specified time.

DRIVING TEST.—Open to all cars of Classes A, B, C, D and E. To be standing start. Operator to start his crank motor, then remove his hat, coat and vest, hanging them on separate pegs provided for the purpose, going one-half mile and returning to place of starting, stopping his car, getting out of the car, putting on his hat, coat and vest, get in his car, turning around obstacles and returning to the one-half mile mark, turning around and finishing at place of beginning.

CHAUFFEURS' TEST FOR PUTTING ON AND TAKING OFF TIRES.—All tires must be blown up properly before the start. Cars will be required to go around the track once, keeping together, and upon coming to a stop in front of the grand stand the chauffeur will be told to remove one of the tires and to replace the inner tube. Chauffeur will remove the tire, replace the inner tube, pump up the tire and travel once around the track, finishing at the grand stand. The journey around the track is simply to test the tire being pumped up properly. The prize goes to the man making the quickest change from the time the word is given till the time he is told to make the journey around the track. Standard clincher tires only to be used, not more than six months old. No tire men allowed in competition. No cutting.

SECOND HAND CAR RACE.—Open to all cars selling at less than one-third of the cartalogue selling price. Distance, 1 mile. After this race all cars that participated to be auctioned off to highest bidder; entrant agreeing to sell at price of class in which he enters if higher bid cannot be obtained. Cars selling at less than $500; at less than $1,000; at less than $1,200; at less than $1,500; at less than $2,500.

COMPLETE TOURING CAR.—Prize for the best equipped touring car shown either on the track or in the spaces. Prize to go to the car which is best equipped for a thirty days' tour. Points awarded for H. P., for size accommodations, accommodations in case of stormy weather, for touring, for complete tools in case of breakdown, for equipment of supplies in case of accident.

All these contests are for stock cars, as per makers' catalogue specifications. Although, if desired, lamps, baskets, tops and mud guards need not be carried.

Where passengers are carried they must weigh not less than 140 pounds each if men, and 120 pounds each if women.

CERTIFICATES.—A certificate will be awarded by the trade association to the manufacturer or local agent of the car winning any event, in addition to the regular prize which will be awarded to the contestant.

Prizes shall be medals, cups or other articles selected by the association of the value of not less than $20 each. Special cups may be offered for special events later.

Entry fee of $5 for each event, which must accompany the entry.

Entries close May 15.

COMMERCIAL APPLICATIONS

Commercial Cars in Minneapolis and St. Paul.

Had St. Paul and Minneapolis been fortunate enough to select the commercial car with the gasoline engine rather than the electric truck, there is but little doubt that today both cities would be farther advanced in the use of the commercial automobile. One firm in St. Paul—George Smith, the largest retail confectioner in the city—has been using a light electric delivery wagon for the last six years, and for his trade it is a pronounced success. So successful was it that about a year ago he added another to his delivery service.

He keeps both machines in his private garage at the rear of his store, where he has three charging plugs—two for his delivery wagons and one to charge his two touring cars The capacity of the wagon is 500 pounds, but it is never loaded to its fullest capacity. It is used to deliver light boxes of candy to all parts of the city, and in the three deliveries the two vehicles make each day most of the city is covered.

Mr. Smith estimates that it does not cost him more than between $8 and $12 to maintain and operate each machine for a month. Employees connected with the store operate the machines, and take entire charge of them in the private garage.

One of the main reasons why Mr. Smith can operate his delivery system so cheaply is due to the fact that he has his own garage and charging station. Not a day was lost last year. The vehicle was run through the severest weather without difficulty. Mr. Smith locks the machine at a speed of 15 miles an hour, and finds this fast enough to do his delivery sevice in an efficient manner.

The dealers in the Twin Cities will watch with interest the test which Allen & Co., wholesale grocers, will make this month of a four drive wheel gasoline truck which was put in commisison May 1. It will be the first test of the gasoline truck in St. Paul, and is being put in there by the manufacturer in an attempt to demonstrate the fact that the situation can be solved by the use of the gasoline truck.

A few weeks ago the New England Furniture Company, of Minneapolis, installed a 1 ton gasoline truck for delivering goods betwen St. Paul and Minneapolis. The operator stated that it was working satisfactorily, and that much quicker time was made on the long runs than by horse power. He stated that it was too soon to say definitely whether the commercial vehicle for their delivery service was a success. The machine had been put in to test its usefulness, and no extension of the service would be made until the present vehicle had been thoroughly tested.

The G. F. Wilcox Lumber Company have purchased a heavy gasoline truck for the purpose of making quick deliveries of lumber to the various buildings in course of construction about the city. Should the lumber companies see fit to take up the use of the commercial vehicle in Minneapolis, one of the largest lumber markets in the world, a very wide field would be opened to the commercial vehicle. There is an excellent outlook for this class of trade. The lumber firms are watching with great interest the experiment being made by the Wilcox Company.

The Washburn-Crosby flour mills for the last two years have had two 5 ton electric trucks in their delivery service. The superintendent of delivery states that the trucks are a very good means of delivering flour in small consignments to the local grocery stores, when the roads are in good condition. The greatest difficulty has been encountered through the execrable pavements which exist in the district about the mills, and the bad condition of the roads in the outlying districts during the early spring. If the roads were good, the delivery system would be a success, for the trucks have been found very useful in making quick deliveries. They are open trucks, and are capable of being loaded to their full capacity with such a commodity as flour. None of the other mills has yet given the commercial vehicle serious thought.

The New England Furniture Company, the Wilcox Lumber Company and the Washburn-Crosby Company are practically the only large concerns using the commercial vehicle. There are a number of smaller firms using electric wagons for light delivery work, and many owners have turned their runabouts into delivery wagons by affixing a detachable box at the back.

In both St. Paul and Minneapolis the commercial vehicle is in its infancy, with St. Paul slightly in the lead. In the latter city the heavy grades on so many streets present serious difficulties. More because of the high hills than for any other reason the business men have looked with suspicion on the commercial vehicle. They saw the light electric truck unable at times to take its load up the high hills, and were discouraged. This suspicion is being overcome, and it is safe to say that within the next few months a number of commercial vehicles will be put in for experimental purposes.

Several electric trucks are now in use. Griggs Cooper & Co. have a 2 ton electric truck, which is used chiefly to collect freight and for "pick ups" along the route. Owing to poor charging the machine is out of service half the time, but this is due altogether to poor management. When the machine is properly charged, its operator reports that it is a success, as its route is confined to the downtown district, where the streets are always in good condition. The machine will cover from twenty-five to thirty miles a day, and the operator is not paid any more than a regular teamster.

None of the firms using commercial vehicles, with the exception of Mr. Smith already mentioned, have their own garages, and for this reason they must depend solely on public garages. At present the facilities for caring for commercial vehicles in St. Paul are very poor, as the dealers are principally occupied with the pleasure cars.

The St. Paul *Dispatch*, an evening newspaper, uses a one ton electric truck to supply the newsboys and newsstands about the city with papers. This work was formerly done by boys on foot or by wagons. With this machine the Dispatch Company has been able to dispense with several of the wagon routes, and to do the work in half the time. The cost of maintaining the machine is said to run about $25 a month, and the distance covered each day averages from twenty-five to thirty miles. It has proved its usefulness.

A number of the smaller St. Paul firms use light runabouts in their delivery service. MacNider & Co., a haberdashery, have two runabouts transformed into delivery wagons, and the Igo Express Company deliver trunks in a two seated touring car, which is equipped with a patent device for holding baggage.

None of the firms in the Northwest using motor trucks or delivery wagons have yet paid particular attention to gathering accurate data regarding the cost of maintenance, nor have they compared this cost with that of their horse power vehicles. When the machines were first put in they were not regarded seriously, but were looked upon as an advertisement. The introduction of the gasoline trucks into St. Paul will doubtless mark the beginning of a new era in the use of commercial vehicles.

Some Boston Experience with the Commercial Car.

With a view of obtaining some definite information regarding the value of automobiles in commercial use, a representative of THE HORSELESS AGE recently interviewed a number of the leading firms in Boston who either are using or have used motor trucks or delivery wagons. They were asked: "Are your commercial cars satisfactory, and are they a financial success?" The answers were varied, each firm having different ideas on the subject. Nearly all had had their troubles, except in a few cases where the car or truck had been in use but a short time.

One company using five electric trucks said that they would not change back to horses, for their cars had given perfect satisfaction and were very successful. Another company use an electric truck charged from their own current, which they do not consider an extra expense, and for three months during the winter the total expenses for supplies and repairs were said to be a little over $4.

A company operating two electric deliv-

ery cars stated that one or the other was in the repair shop or at the factory most of the time. They said the expense of running their cars was not great, but it was the cost of repairs that made them expensive to operate. The manager of the transportation department of this company said their cars were too frail for running over block pavements, for it loosened the bolts, wrecked the machinery and damaged the cars in various ways.

A large department store which at one time owned a number of electric cars has recently changed them to a more substantial gasoline car.

A short time ago a large machine company located a few miles outside the city limits found it advisable to purchase and put into commission two large gasoline trucks, which they use for general truckage about the factory yards, storehouses and the railroad station; but after operating for a short time they found that the cost of maintenance and repairs was extremely high. The manager of these works said that in his opinion the manufacturers of commercial cars did not fully realize what was required. He believes that the driver of the car could tell better what is needed than some of the men that now design them. He also said that when their two cars were in running order they could do their work satisfactorily, but the cost of maintenance was very great.

A grocery company owned and operated a large delivery car for a year or more, but recently withdrew it from service on account of the great expense of repairs.

In most cases the interviewed party said that when their trucks were in running order they would do the work of many horses, but on the whole the expense was far greater than horses. The drivers no doubt are to blame in some cases through the lack of care of the machinery and often in the method of driving. They become careless and drive at an unreasonably high rate of speed in places where it is injurious to the truck. Only a few concerns have their own garages, for they find it cheaper to keep their cars at public garages, where repair men are employed and can keep them in working condition.

A member of a leading manufacturing company said: "We have cars today that give perfect satisfaction on good roads and under fair conditions, but if anything out of the ordinary presents itself the car gives out. What we want is a motor truck that will hold up under all reasonable conditions, and will successfully take the place of the horse."

The Loudonville Motor Bus Line.

David Jeram, proprietor of the Loudonville-Albany auto bus stage line, will put his new Knox motor bus into operation May 20. He denies the report that he will start a new line. On certain days he will run to Rural Cemetery, at the extremity of the Northern boulevard, instead of proceeding to Loudonville and the neighboring suburbs of Albany. The city terminus will remain unchanged. While the new time schedule has not yet been arranged it is probable that twelve instead of six round trips will be made, six in the morning and six in the afternoon.

The extra machine has become necessary because of the large increase in patronage. The number of passengers varies from a minimum of 70 to a maximum of 105 per day. The line has made a record of 115 passengers.

The present machine uses about 12 gallons of gasoline daily and a quart of cylinder oil. The cost for repairs has been almost nil. The machine has never suffered a breakdown, and the only accident of any consequence was to a bearing.

Motor Delivery Wagons at Pittsburg.

The experience of the Joseph Horne Company, of Pittsburg, with gasoline motor delivery wagons will be encouraging to large retail firms who are considering substituting motors for horse power. This company operates one of the largest department stores in the United States, and began considering the use of motor delivery wagons more than two years ago. It was decided at that time to try the steam delivery wagons and four were purchased. They have proved an expensive machine to operate, both from the standpoint of material and the trouble encountered in securing competent mechanical operators.

In July, 1905, they put in operation a gasoline delivery wagon which has proved satisfactory in every respect. It has been used on every route in their delivery system, including hilly and level, city and suburban, long and short haul, badly paved streets and smooth asphalt streets, and in each case the machine has stood the test in a most surprising and satisfactory manner, and is withal very easy of operation.

Its statistical record, as taken from the company's books for nine months' time, or to April 1, 1906, is as follows:

Material	$152.66
Labor on machine in putting in material; also time spent on the machine as labor, at rate of 60 cents per hour	164.56
Machine oil used	2.08
Engine oil used	10.39
Gasoline	172.84
Total for nine months	$502.53

Average per month, $55.83.

This machine has delivered in the nine months 33,878 packages, and has traveled 6,679 miles. The average cost of delivery per package is 1½ cents; average cost per mile, 7½ cents.

In January, 1906, their second gasoline delivery wagon was received and put into commission, and its statistical record, as taken from the company's books, is as follows:

Material	$36.08
Labor on machine in putting in material; also time spent on machine as labor at the rate of 60 cents per hour	120.88
Machine oil used	.67
Engine oil used	3.17
Gasoline	57.96
Total for three months	$218.76

Average per month, $72.92.

This machine has delivered in three months 9,681 packages, and has traveled in three months 2,817 miles. Average cost of delivery per package, .0226 cent.; average cost per mile, .0777 cent.

Two more machines were placed in commission May 1, and they have an order in for two more, which are to be delivered June 1.

After wrestling for quite a long time with the problem of securing competent operators, a system has been evolved that is proving successful. The company's garage is placed in charge of a competent mechanic, with several assistants, whose duties are not only to repair the machines but to instruct prospective drivers in their operation. A new man is only required to learn how to operate the machine intelligently, and is prohibited from remedying serious defects. He has instructions to telephone the garage if the machine breaks down or meets with an accident. This brings the head mechanic, or one of his assistants, to the scene of the trouble in short order in a runabout kept for the purpose.

Manufacturing Commercial Cars in Canada.

Two types of commercial vehicles are being constructed at the Toronto branch of the Canadian Cycle and Motor Company, Ltd. One has a carrying capacity of 1 ton and is so arranged that it may be fitted with different bodies, for use either as a delivery wagon or a twelve passenger omnibus. It has a two cylinder opposed 16-18 horse power motor, sliding gear transmission with three speeds, shaft drive to rear axle and 32 inch wheels with 4½ inch pneumatic tires. It has a guaranteed speed of 18 miles per hour. If built for passenger service this car has a front seat with room for three persons, and two seats inside extending the length of the car and facing each other, each holding five passengers comfortably. The other is a 2 tor truck with the same engine and practically the same transmission as the former, only in this case a countershaft is used and is connected by double chains to sprockets on the rear wheels. The truck has 36 inch wheels, with 4 inch solid tires.

Commercial Vehicle Notes.

E. D. Easton and Louis Stanton, Oneonta, N. Y., have started an automobile bus and livery service in that town.

Carson, Pirie, Scott & Co., Chicago, have just received two large gasoline trucks with special bodies, to be used for their wholesale department in making deliveries to retail stores.

Four limited liability companies have been formed in London recently for the purpose of operating motor cabs. The combined registered capital of these com-

panies amounts to £400,000. The legal cab fare in England is sixpence per mile, and it is found that motor cabs earn approximately £12 per vehicle per week.

It is reported from abroad that M. Darracq has acquired an interest in the Serpollet patents, and will manufacture commercial vehicles.

The police department of Syracuse, N. Y., are now using a Franklin Type G for patrol work. Heretofore the department has used an electric car.

The Chesapeake and Potomac Telephone Company, Baltimore, have added three commercial cars to their equipment to test their value in the telephone business.

Motor propelled moving vans have recently made their appearance in both Berlin and Vienna, and are used particularly for moving household goods over long distances to the more remote suburbs.

Toronto business houses have recently put in operation several gasoline delivery cars of American manufacture, which may be said to be the beginning of the commercial application of the motor in the Province of Ontario.

Joseph Maw & Co., Winnipeg, Man., have purchased a sightseeing car, which they expect to put in commission about May 15, to take visitors about the city of Winnipeg. The body is so constructed that the seats can be removed with little trouble.

The New York city aldermen have decided that municipal officers may purchase only automobiles of American manufacture, and must limit their expenditures to $4,000 for each machine. Dock Commissioner Bensel was authorized to purchase two machines, one to cost $4,000 and the other $2,500.

M. Escalante Peon, general manager of the United Railroads of Yucatan, writes us that he has had a gasoline delivery wagon in the express service of his railroads for three months past, and that he is so well pleased with the results that he will very soon be in the market for more cars of this type.

The Kansas City Motor Car Company ran one of their six ton trucks over the country roads between Chicago and Kenosha, Wis., on April 20. This is said to be the longest distance test ever given a commercial vehicle of this carrying capacity. The gauge of the vehicle is 74 inches, and it is driven by a 60 horse power, four cylinder horizontal gasoline motor.

O. L. Mead, of Detroit, is planning to establish a motor bus line between the villages of Quincy, Coldwater and Union City, Mich. A fifteen passenger car will make two round trips daily, and fares will be charged in proportion to the distance traveled. The distance from Quincy to Coldwater is 7 miles, and from Coldwater to Union City 13 miles. The roads are of a sandy nature and are good most of the way.

Splendid Work of the Automobile at San Francisco.

Automobiles played an important part in the earthquake at San Francisco, carrying dynamite from place to place in the fight against fire, transporting troops and firemen to places of danger, carrying doctors and nurses to the injured, bringing in supplies and forwarding press matter. Almost every private car owned in the city was in service, many of them voluntarily tendered, others commandeered by the military authority.

Because of the scarcity of water caused by the destruction of the water mains outside the city, and the intense heat from the fire, the automobile proved itself to be superior to the horse. Hundreds of these noble beasts died from thirst and heat. Their lives were not valued like human beings and they were driven until their tongues hung out like dogs panting and they dropped, where they died.

Three hours after the great shock the city was under martial law, and every automobile appearing on the street, whether in charge of the owner or some one else, was accosted by a soldier and put in the service of the militia. The name of the owner, the name of the car, the number of the car and the hour of the day was written down and a duplicate copy given to the owner or driver. Many people driving their cars into the city from a distance to see the sights had to give them up to the military authorities and drive them themselves or get a driver.

The machines were in no way spared, often being run without rubber tires on the rear wheels during the four days of the fire. Rubber tires could not stand the hot streets and pavements that many of the cars traveled and they exploded, never to be replaced until the car went out of commission. Many of the tires were fairly cooked before they would drop off the wheels.

In many places where horses had died drawing heavy loads of valuables away from the fire, automobiles towed the wagons out of danger. As many as three big touring cars were seen fastened to loaded trucks.

The principal use of the automobiles was hurrying doctors and nurses to the injured and carrying explosives to blow up the buildings. There were small quantities of explosives in the city, but the large magazines were several miles out, and it was there that the automobiles were hurried. There was no speed limit and more than one car struck the mile a minute clip, laden with its deadly cargo. For three days it was the motor car that hauled nearly all the dynamite used.

There were a few accidents to drivers, but nothing serious happened. A few times gasoline ran out on some of the cars, or ignition trouble caused a stop that left the car and its occupants in peril, but they were surprisingly few, considering the duty required of the cars.

The motor cars on the occasion did nearly everything that would be required of them in time of war, and the military authorities will, no doubt, hereafter investigate the matter more thoroughly in regard to using them for military purposes.

The greatest drawback in the use of the cars used was the pneumatic tires. In fact, solid tires would have fared almost as badly, especially when they had to pass through fire and over heated surfaces.

Automobile Losses in San Francisco.

Most of the important automobile manufacturers were represented in San Francisco by agencies and will suffer more or less as a result of the earthquake and fire. The Winton agent reports that his garage was just outside the line where the fire stopped, and being of frame and metal lath construction was not injured by the earthquake. L. H. Bill, Rambler agent, was less fortunate. At the time of the earthquake his stock consisted of fourteen cars in his garage at 1331 Market street, eleven cars at Freed's bicycle establishment opposite, and fourteen cars at the warehouse on Bluxom street. All three places were destroyed by fire, and only the cars at the garage were saved. An insurance of $32,800 was carried on the machines. At the same time there were in the hands of the freight company at the yards ready for delivery one carload of delivery wagons and one carload of Model 14's. These were destroyed by fire. A temporary office has been opened at 421 Ninth street, Oakland.

The Electric Vehicle Company had one car in San Francisco on consignment, a Victoria, valued at $1,350, and probably burned. Three of the company's gasoline cars were used during the fire following the earthquake by the chief of the fire department and his assistants in visiting fires in all parts of the city.

A Detroit newspaper gives an estimate of losses of agencies for Detroit firms, which losses are largely covered by insurance, however. In this list the following automobile agencies are included: Cadillac Motor Car Company, $25,000; Ford Motor Company, $10,000; Packard Motor Car Company, $5,000; Olds Motor Works, $30,000.

A. C. of Washington.

At a business meeting of the A. C. of Washington, April 25, articles of incorporation were agreed upon. The club membership is now 127, and growing steadily. A clubhouse to cost $5,000 will be erected the coming summer on Brightwood avenue, one of the most attractive drives in the national capital The site decided on is near the Villa Flora.

The club is raising a fund to help build the boulevard between Baltimore and Washington, which was made possible by the recent action of the Maryland Legislature in appropriating $90,000 to be expended on it during the next three years.

LEGISLATIVE and LEGAL

The Massachusetts Automobile Bill.

BOSTON.—The legislative committee on oads and bridges, to whom the various ıtomobile bills were referred, have re-orted a bill increasing the speed limit om 15 to 20 miles an hour outside of ıunicipalities, and allowing a speed of 2 miles an hour in the thickly settled or usiness parts of municipalities.

The section referring to speed is made road enough to cover all cases, for it ays that any person operating a motor ehicle "shall run it at a rate of speed t no time greater than is reasonable and roper, having regard to traffic and the se of the way and the safety of the ublic." It then provides that a speed xceeding 20 miles an hour for the dis-ance of one-quarter of a mile outside of owns, and for one-eighth of a mile with-n towns shall be prima facie evidence of unreasonable and improper speed. These quarter and eighth tests are novel eatures of the law.

"Thickly settled or business part of a ity or town" is defined to mean "the ter-itory of a city or town contiguous to ıny such way which is at that point built ıp with structures devoted to business, ınd the territory of a city or town con-iguous to any such way which is at the point not built up with structures devot-ed to business, but where for not less than one-quarter of a mile the dwelling houses on such way average less than 100 feet apart."

Last year a law was passed giving fifty residents of the State, ten of whom were taxpayers in the municipality in question, right to protest to the highway commission against speed regulations in municipalities, if taken advantage of within fifteen days. The fifteen days limit has been struck out by this new bill, and, if it passes, Massachusetts automobilists will be able to protest against any restrictions in speed regulations at any time.

Another liberal provision is the veiled intimation to the court that it may place upon file the first and second unintentional violation of the law, or where there appears to be extenuating circumstances in regard to said incidents. Upon the third or subsequent violation in the calendar year, however, a violation of the speed laws shall forthwith cause the revocation of the license of the person so convicted, and the revocation of the certificate for at least thirty days from the date of such conviction.

Section 4 is also a drastic clause, inasmuch as it places a heavy penalty upon reckless driving or driving under the influence of intoxicating liquors, and so as to endanger the life or safety of the public.

As against these liberal provisions a person, if guilty of attaching a number plate assigned to a motor vehicle by the highway commission upon another machine, or of deliberately obscuring the figures on any number plate attached to any motor vehicle with intent to disguise the identity of said motor vehicle, may be punished by a fine not exceeding $100 or by imprisonment for a term of ten days, or by both such fine and imprisonment.

Massachusetts automobilists feel that they will make a distinct gain in legislation if this bill is enacted.

New Jersey's Motor Vehicle Department.

TRENTON, N. J.—Within a few days the Department of Motor Vehicle Regulation and Registration, created by the recent Legislature, will be in operation in this State. Speaking of the department and its aims, Commissioner of Motor Vehicles J. B. R. Smith said:

"We are trying to devise rules that will insure the automobilist perfect convenience and satisfaction. Offices will be opened in Jersey City, Newark, Camden, Phillipsburg and Atlantic City at once and inspectors appointed at those points. The Jersey City office will be on the fifth floor of the Fuller Building, No. 1 Montgomery street. This is near the Cortlandt street ferry and will be handy to automobilists crossing from New York. We haven't settled upon the location of the offices in the other cities yet, but expect to have them in readiness for registration by May 10. The law goes into effect July 1, this year, but automobilists can take their examination and secure their licenses any time after May 5, and I would advise them to attend to these matters at once, so that they may avoid the rush.

"The department has decided that it will not issue a new license on an old number unless the old license is first cancelled or an affidavit is made that it has been lost. In order that there shall be no graft in the department we have decided that owners of automobiles shall not be charged fees. Every inspector employed will be a notary public and will take affidavits free of charge. The headquarters of the department will be in the State House at Trenton, to which point all letters or correspondence bearing upon its business should be addressed.

"We shall send to every automobile owner registered in the State a copy of the law, together with the rules of the department, so that there need be no doubt on the part of the automobilist as to what his duties are. It is not the purpose of the authorities to make the examination of machine drivers severe. They will be required to make affidavit that they are more than sixteen years of age, state their occupation, the length of time that they have operated a machine, approximately how many miles they have driven, that they are competent to run a machine, that they have read the laws relating to automobiles and are acquainted with their provisions and that they are physically able to manage a machine. We purpose making it as easy as possible for automobilists, but will insist that the law be obeyed.

"The law allows us but seven inspectors, but we have communicated with the police departments of all the cities and towns in the State and asked them to co-operate with us in the enforcement of the law. This assistance has been promised and we have been assured by organized automobilists that they will aid the department in every possible way. There are in the State about 16,500 machines."

The department has interpreted the new law as follows:

A motor vehicle includes all vehicles propelled otherwise than by muscular power, excepting only such vehicles as run only upon rails or tracks.

A motor cycle includes only motor vehicles having pedals and saddle with driver sitting astride.

An automobile includes all motor vehicles, excepting motor cycles.

The registration certificate is the authority for the motor vehicles to be run on public roads.

License is the authority of the person to operate an automobile.

A motor cycle must be registered, but its driver need not be licensed (unless specially required by the Commissioner of Motor Vehicles).

The registration fee for automobiles is $3 per annum for vehicles below 30 horse power, $5 per annum of 30 horse power or more. For motor cycles $1 per annum.

The license fee is $1 per annum for privilege to run motor vehicles of less than 30 horse power and $2 for vehicles of 30 horse power or more, and a license allows its holder to run any vehicle of an equal or less power than that for which he receives a license.

Vehicles may be registered by filing (by mail or otherwise) with the department a properly authenticated application upon blanks furnished by the department, which must be used.

Applications for both registrations and licenses may also be made to any one of the department's duly authorized agents. But applications for licenses must be made in person, either to the department or to one of its authorized agents, and the applicant must first be examined according to the statute.

Both registration certificates and licenses may be renewed at expiration upon application to the department upon paying the statutory fee without re-examination, unless the commissioner of motor vehicles shall deem it necessary.

Motor vehicles registered under the old act will receive the same number if the old registration certificate is returned or a sworn statement made that it has been lost or mislaid and the applicant desires to retain the old number, but in no case will a new certificate be issued upon an old number, unless the old certificate is returned or such statement is made.

Registrations may be transferred upon application and the presentation of the certificate for indorsement upon the payment of a $1 transfer fee.

Duplicate registration certificates and licenses will be issued upon the presentation to the department of a statement that such duplicate is desirable upon the payment of a fee of $1.

When the services of an agent or clerk in the department is desirable in administering the oath

connected with any application it will be done without charge, and no agent or other employee of the department is allowed to receive any compensation for any service which he may render except as expressly fixed in the statute or in the printed regulations of the department.

It is the desire of the department that owners of machines, so far as possible, retain their old numbers.

STERLING, Ill.—A jury has assessed Moses Dimon $700 damages because his automobile caused Mrs. Henrietta Martin's horse to run away, throwing her out and inflicting slight injuries.

PHILADELPHIA.—An ordinance has been introduced in the select and common councils making it unlawful for motor cars to use any other contrivance than the toot horn, or horn sounding one note only, for sounding a note of alarm or warning.

BALTIMORE.—All chauffeurs in Maryland must pay a $3 license fee and wear badges after this month. The license will be granted after a satisfactory examination is passed. Just what this will be is a question, but it is thought the usual custom of having a certificate from some recognized dealer will be sufficient.

ALBANY.—The Senate has passed the bills of the joint legislative highway committee. One of the bills appropriates $5,000,000 for good roads to be spent this year under the authority conferred last year by the voters to issue $50,000,000 in bonds for good roads. The bills provide the manner in which the bonds shall be issued and the money expended.

MOUNT VERNON, N. Y.—Judge Simpson, in the Court of Special Sessions, has declared invalid the city ordinance regulating the speed of motor vehicles. He held that it failed to comply with Chapter 532 of the New York State laws of 1904, under which it was passed, in that it did not limit the speed of other vehicles at the same figure as provided for motor cars.

CHICAGO.—Several dealers in automobiles joined in a suit for injunction filed in the Superior Court recently asking that the city be restrained from enforcing its two automobile ordinances which were passed in 1904 regulating the speed of machines and requiring that the owners take out licenses and display numbers. The injunction is sought on the ground that the ordinances are unjust and oppressive.

No Summer There.

John Hogan, of Escanaba, Mich., has perfected an ice and snow automobile, which can be run at a speed of 30 miles per hour. Ought to take in this Northern clime, the only trouble being the lack of a summer season, during which the machine could be laid up for repairs—*The Virginia (Minn.) Enterprise.*

Automobiles for New York City Bridge Department.

The New York city department of bridges contemplates the purchase of two touring cars for the use of the commissioner, the chief engineer and consulting engineers in visiting the bridges under the jurisdiction of the department in the five boroughs of Greater New York.

They have in mind also the purchase of two commercial vehicles, one to be fitted up as an emergency repair wagon, which will carry men, tools and wrecking appliances from some central point to whichever bridge may be in need of its services.

Another proposed commercial application in this department is the construction of a special machine to be used on the Williamsburgh Bridge for sanding the roadways during the winter and sprinkling them with water in summer.

Kingsley L. Martin, the engineer in charge of the Brooklyn and Williamsburgh bridges, has used a Maxwell runabout for some time in going between the offices of the two bridges and in inspecting the work. He has found it a great convenience.

A garage has been constructed under the Brooklyn end of the Brooklyn Bridge for the care of all motor vehicles belonging to the department. It is equipped with the latest appliances.

Clever Theft of an Automobile.

T. B. Jeffery & Co. are endeavoring to locate one of their Type K cars that was stolen recently in an original manner. The car is the property of John W. Lone, of Lake Geneva, Wis., who, on his departure to California for the winter, sent it to the Rambler factory for a general overhauling. It was understood that the car should remain there until Mr. Lone's return in the spring, and, after completion of the work, it was placed in one of the warehouses to await his order.

Some weeks ago a man appeared at the factory, inquired as to the condition of the car and asked to see it. He approved the work done, and asked the amount of the repair bill. A few days later a letter was received, signed John W. Lone, enclosing an express order for the amount of the repairs and directing that the car be shipped to him at South Chicago. The instructions were followed.

A few days ago a letter was received from Mr. Lone directing that the car be shipped to Lake Geneva. He was immediately notified that the car had been shipped to South Chicago, as per his instructions, and was shown the letter authorizing such action. The letter was at once pronounced a forgery, and an endeavor is being made to trace the car, though as yet no clues have been discovered as to either the personality or whereabouts of the thief. The car is described as Model K, No. 4076; [illegible] royal blue body, cream color [illegible] tires, 30x4 inch Dunlop. A reward [illegible] is offered for information leading [illegible] recovery.

Entries for Two Gallon Efficiency Contest.

The entries for the A. C. A. [illegible] efficiency contest next Saturday [illegible] noon May 2. There will probably about forty entries in all. They received up to 3 p. m. May 1 are as follows:

Frayer-Miller Motor Car Company has two 24 horse power Frayer-Miller cars, one by the company, the other by Dr. W. E. [illegible] New York.

F. E. Moskovics, New York, 36 horse power six cylinder, Frayer-Miller car, owned by C. Currie, New York.

Col. A. B. Hilton, of the A. C. A. [illegible] power Locomobile.

The Hol-Tan Company, New York, [illegible] power Fiat car.

A. R. Shattuck, of the A. C. A., 24 horse power Packard car.

A. Ward Chamberlin, of the A. C. A. [illegible] power Packard car.

Dr. Calvin T. Adams, of the A. C. A. [illegible] power Darracq car.

Dave Hennen Morris, president of the [illegible] 30 horse power Smith & Mabley Simplex [illegible]

R. G. Morris, of New York, 12 horse power Franklin car.

Dwight W. Pardee, of New York, 30 horse power Stoddard-Dayton car.

Napier Motor Car Company of America, [illegible] power Napier runabout.

The Decauville Automobile Company has a 12 horse power Franklin car.

Dr. Wm. L. Polk, New York, 15 horse power Panhard car.

Col. John Jacob Astor, 40 horse power [illegible] car.

The Maxwell-Briscoe Company, a 20 horse power touring car and a 10 horse power runabout.

The E. H. V. Company, Middletown, [illegible] 16 horse power Compound cars.

American Generator Company, 12 horse power Panhard car.

Cryder & Co., 40 horse power Lew[illegible]

J. Parke Channing, 20 horse power [illegible]

Mrs. W. C. Martin, 10 horse power [illegible] runabout.

Walter C. Martin, 10 horse power [illegible] touring car.

H. K. Burras, 24 horse power [illegible] can) car.

Carl H. Page, 18 horse power White [illegible]

Wayne Automobile Company, 24 horse power Wayne car.

Percy Owen, 24 horse power Acme.

E. P. Chalfant, 4 horse power Ovest [illegible] touring car and 4 horse power Ovest [illegible] runabout.

John B. Trevor, 14 horse power [illegible]

The entries at ordinary fees for the [illegible] komer contest closed on April 15 [illegible] total number of 146 entries [illegible] ceived. It is thought that the [illegible] participation in the tour of Prussia was largely responsible for the big entry list. There are [illegible] from Austria, ten from England, [illegible] France, two from Belgium, two [illegible] and one from America.

MINOR MENTION

A Good Roads Club has been organized at Greenville, Ohio.

The National Sales Corporation has removed to 296 Broadway, New York city.

The Boston Auto School has opened a branch at 26 Market square, Providence, R I. M. M. Gannon is the instructor.

The Chicago Automobile Club will occupy suite 604 Fisher Building until the completion of the new clubhouse in Plymouth court.

Michelin & Cie., of Clermont-Ferrand, France, have opened a branch at 265 Jefferson avenue, Detroit, of which H. W. Wolcott is manager.

C. Wilson Place is trying to interest Saco (Me.) capitalists in the proposition of some Boston men to start an automobile manufacturing business in that town.

The Technology Club, of Syracuse, an organization composed of engineers, visited the plant of the H. H. Franklin Manufacturing Company Saturday, April 28.

The A-Z Company, of 520 West Thirty-seventh street, New York city, have moved their works to 527 and 529 West Fifty-sixth street, where they will have increased facilities.

An automobile show was held at Montreal last week under the auspices of the Canada Automobile and Motor Exhibition Company. It was the first exhibition of the kind in that city.

The Duluth (Minn.) A. C. have elected the following officers: President, A. E. McManus; vice president, L. R. Martin; secretary, D. A. Willard; treasurer, Victor Huot; trustee, C. A. Brewer.

The Boston Automobile Dealers' Association has arranged to hold a business meeting and banquet at the Hotel Lenox on May 10, at which time all matters in connection with the last show remaining unsettled will be finally disposed of.

The American Locomotive Automobile Company, of Providence, R. I., have delivered their first complete car. This car is fitted with a Berliet engine and change gear, made in France, but the company are now working on their own engine and gear.

The newly incorporated Ithaca Motor and Manufacturing Company, Consolidated, Ithaca, N. Y., will put on the market an air cooled engine for automobiles as soon as the patent is received This company is the result of the consolidation of the Motor Manufacturing Company and the Fairbanks-Grant Company.

The sixth annual session of the summer school for artisans, under the direction of the College of Engineering of the University of Wisconsin, opens June 25 and continues six weeks. Among the subjects to be studied will be gas engines and producers, fuels and lubricants, and applied electricity.

The Rhode Island A. C. will open the season May 5 with a run to Narragansett Pier.

The automobile "bumps" recently placed in the streets of Chatham, N. Y., to retard the speed of motor cars are said to be effective.

The Welch Motor Car Company will erect two new buildings at their factory at Pontiac, Mich., giving them 25,000 square feet additional floor space.

The Edward E. Cary Company, Incorporated, 59 Park place, New York, have taken the agency for the stamped steel bodies of Joseph Sankey & Sons, Limited, Bilston, England.

The Ritter Manufacturing Company have taken larger quarters at 243-245 Jefferson avenue, Detroit. Their capital has been increased and they will manufacture glass wind shields, drip aprons, lamp covers and automobile tops.

The Rev. Alfred H. Barr, pastor of the Jefferson Avenue Presbyterian Church, Detroit, Mich, is using an automobile in making calls upon the members of his congregation. He states that he finds it a great convenience in visiting the hospitals and other places where it is necessary for him to call.

We learn that a test with a floating dynamometer made on the 16 horse power Compound engine by Prof. Joseph C. Riley in the engineering laboratory of the Massachusetts Institute of Technology on April 5 showed 16.1 horse power at 1,285 revolutions per minute. A number of separate trials were made and the engine was tested with its regular 295 pounds flywheel. The company's rating of the engine is 16 horse power at 1,300 revolutions per minute.

The Savannah (Ga.) A. C. have elected the following officers: President, F. C. Battey; vice president, Barron Carter; secretary and treasurer, J. L. Morehead; board of governors, F. C. Battey, Barron Carter, J. L. Morehead, Capt. W. G. Austin, J. M. Dixon, Dr. J. S. Howkins, A. W. Solomon, George W. Tiedeman, Simeon Theus, J. Schwarz and Dr. W. R. Shaplin. The members of the club are interested in securing good roads to Augusta, Ga., and Jacksonville, Fla.

Charles O. Dewey was appointed trustee of the bankrupt Vehicle Equipment Company at the general meeting of creditors held at Long Island City April 24, despite the strenuous efforts of a portion of the creditors to prevent his selection. Mr. Dewey is also the receiver. Referee Tipling said that it was the desire of the court to have the company's assets disposed of as early as possible. These are presumed to amount to about $100,000, while the liabilities are said to be nearly $1,400,000.

F. A. Gardener, of Hamilton, Ont., who has been experimenting for some time on the construction of a new car, claims to have all necessary capital subscribed to market his car on a good scale as soon as he shall have completed his preliminary work. This vehicle, Mr. Gardener says, will embody several new features, his object being to produce a cheap, four wheel drive machine that will be adapted for use in all seasons of the year. He hopes to have his first car ready for a public test early this summer.

The second annual tour of the Albany A. C. will begin Thursday, June 21, and last six days, covering 454 miles, as follows: June 21, Albany to Rutland, Vt., 96 miles; June 22, to Keene, N. H., 76 miles; June 23, to Boston, 88 miles; June 24, spent at Boston; June 25, to Springfield, 101 miles; June 26, to Albany, 93 miles. All doubtful turns will be marked with confetti, and a list of towns en route, with the distances between, will be furnished all drivers. The club has secured a quantity of road markers giving directions and distances, which will be posted throughout Albany County.

Aldermen Pass Gasoline Ordinance.

Dr. Ernst J. Lederle, former health commissioner of New York, presented his report on the recent sewer explosions in New York's garage district to the board of aldermen May 1. The report ascribes the explosions to gasoline in the sewers, and states that examinations of the air and water in the sewers disclosed the presence of large quantities of gasoline, which, in his opinion, had been discharged into the sewers from the neighboring garages. It was stated that in the last two days changes had been made in several of the garages in the methods of handling gasoline, the effect of which would be to prevent its escape into the sewers.

The aldermen then unanimously adopted an ordinance forbidding the turning of gasoline waste into the sewers and imposing a fine of $50 for violation of its provisions.

Alderman Richter, who represents the garage district, said that hundreds of families were moving away from that neighborhood.

Garage Notes.

F. E. McLeary will open a garage on Broadway, Farmington, Me.

The Hamilton Garage Company, Hamilton, Ont., are planning to enlarge their garage.

Jason C. Stamp will open a garage at Sixteenth and Eoff streets, Wheeling, W. Va.

A garage has been erected at Electric Park, Baltimore, for the accommodation of tourists.

The Atlas Motor Company will build a four story garage at 102 to 106 West 107th street, New York city.

The Rockland Garage and Auto Company, Rockland, Me., has opened a garage at Main and Winter streets.

James E. Kennedy is to build a six story garage on Central Park West, New York, between 100th and 101st streets.

The Automobile Company, Ltd., Hamilton, Ont., have purchased the site for a garage on Charles street just south of King street. F. R. Harris,

late of the Canadian Cycle and Motor Company, will be the manager.

R. L. Lemon has sold his interest in the Central Garage, Indianapolis, Ind. C. A. French is now the sole owner.

The garage of the Knox Automobile Company, Allentown, Pa., was destroyed by fire April 27. The automobiles were saved.

George A. Youlden, of Hartford, Conn., and Charles T. Fletcher, of Worcester, Mass., have opened a garage at Ware, Mass.

The William Hughes Company, of Providence, R. I., agents for the Reo cars, have opened a salesroom and garage at Olneyville, R. I.

The Whitten Motor Car Company, Broad and Potter streets, Providence, R. I., have recently opened a fireproof garage, 60x160 feet in size.

O. D. Wheeler, of the former firm of Wheeler & Page, Marlboro, Mass., has opened a garage and repair shop at 19 Maple street in that city.

C. H. Warren, of Northampton, Mass., and C. L. Graves, of Springfield, have opened an automobile sales agency at the Draper garage, Northampton.

The Rogers Automobile Company have closed their garage and repair shop at Ottumwa, Ia., and established themselves at 316 North Main street, Burlington, Ia.

The Thompson-Schoeffel Company, Rochester, N. Y., whose garage was recently destroyed by fire, have opened a new garage on Caledonia avenue, corner Spring street.

The recently incorporated Colonial Automobile Company, Cleveland, Ohio, have leased a building at 2600 Euclid avenue, which they will remodel as salesroom garage and repair shop. They expect to be ready by May 15, and will do a general garage and livery business. They will carry a line of commercial delivery wagons, probably the Northern. Their capital stock is $25,000, and the officers are as follows: President, J. W. Atwater; vice president, J. M. Gee; secretary, L. T. Jones; treasurer, D. G. Nearpass. A. F. Neill will be the garage manager.

New Agencies.

Philadelphia.—D. O. Eaton, Rapid cars.

Norwalk, Conn.—Franklin Judge, Buick cars.

Buffalo, N. Y.—Clarence M. Rogers, Rapid cars.

Traverse, Mich.—D. W. Stewart, White steamers.

Joliet, Ill.—Joliet Automobile Company, Buick cars.

Tacoma, Wash.—Stone, Fisher & Lane, Rapid cars.

Aberdeen, S. Dak.—Charles Sidow, Northern cars.

Gothenborg, Sweden.—John Tragardh, Northern cars.

Milwaukee, Wis.—John Ure, Jr., & Co., Marmon cars.

Berkeley, Cal.—P. B. Boyce and J. E. Newman, Rapid cars.

Pittsburg, Pa.—The Keystone Auto Company, Welch cars.

St. Louis, Mo.—The Morrison Auto Company, Welch cars.

Detroit, Mich.—The Fee-Bock Auto Company, Pope-Tribune cars.

Washington, D. C.—Chapin & Saks, Rapid motor delivery wagons.

Boston, Mass.—H. C. Stratton Co., Eastern agency for Mors cars.

Gloversville, N. Y.—Curtin-Hebert Manufacturing Company, Northern cars.

Minneapolis, Minn.—A. B. Chase & Co., Northwestern agency for the Marmon cars.

Calgary, Alberta, N. W. T.—White & Grasswick, Alberta agency for Marmon cars.

Detroit, Mich.—Dr. Sanderson, Woodward avenue and Witherell street, Fawkes tires

Providence, R. I.—Parker's Trinity Square Garage, 428-430 Broad street, Dolson, Aerocar, Glide and St. Louis cars.

Santa Ana, Cal.—Ben E. Turner and J. A. Hankey, Oldsmobiles, Pope-Hartford, Pope-Waverley and Pope-Tribune cars.

Trade Personals.

E. H. Broadwell, vice president of the Fisk Rubber Company, Detroit, has returned from a trip to the Bermuda Islands.

Allyn A. Stillman, formerly with the Pope Manufacturing Company, is now in charge of the Boston agency of the Mercedes Company.

F. E. Watts, formerly with the Electric Vehicle Company, Hartford, Conn., will be the Western editorial representative of THE HORSELESS AGE, with headquarters in Detroit.

Rossell Drisko, with Frederick E. Randall, Boston agent for the Stevens-Duryea Car, has taken the management of the Bay State Automobile Company, 1008 Boylston street, Boston.

C. H. Taylor has resigned as mechanical engineer of the Alden Sampson Manufacturing Company, Pittsfield, Mass., and will be chief engineer of the E. J. Burrowes Company, Portland, Me., who are about to enter the automobile field.

Upon his return from Mexico, George Arbuckle was appointed Western supervisor by the Winton Motor Carriage Company. He will have his headquarters at Chicago, succeeding Harry L. Owesney, who has been appointed central supervisor with headquarters at Cleveland.

New Incorporations.

The Duo Motor Company, Boston.—Capital, $250,000; automobiles. Incorporators, Christopher T. Whitney, Daniel L. Culton, Nathan H. Harriman, Philip C. Jack.

Observation Auto Company, Boston.—Automobile dealers. Capital, $10,000. President, Norma Drew, 235 Ocean street, Lynn; treasurer, Barton L. Thomas, 107 Warren avenue, Boston.

Fort Wayne Gear Company, Fort Wayne, Ind.—Capital, $10,000, to manufacture a transmitting mechanism for automobiles. Incorporators, Dr. M. I. Rosenthal, Joseph Freiburger and W. H. Olds.

The Automobile Company, Ltd., Hamilton, Ont.—Capital, $40,000, to operate a garage and repair shop and to deal in automobiles. Incorporators William Glendenning, M. W. Moore and H. Hudson.

The Jackson, Church & Wilcox Company, Saginaw, Mich.—Capital, $25,000, to manufacture high grade machinery and automobile delivery cars. Incorporators, John L. Jackson, W. L. Wilcox and E. D. Church.

American Taxameter Company, New York.—Capital, $100,000, to introduce into this country and sell the taxameter, an instrument for recording the distance traveled by a vehicle and the amount of fare.

The Interstate Automobile Clearing Company, 39 East Forty-second Street, New York City.—Marketing second hand automobiles. Officers: President, William E. Metzger; vice president and secretary, G. H. Stilwell; treasurer, C. A. Wardle.

Commercial Motor Car Company, 4390 Olive Street, St. Louis, Mo.—Capital stock, fully paid, $10,000. Incorporators, Charles B. McKinney and Frank E. Stevens, forty-five shares each; Eugenia E. McKinney, of Irving, Ill., and Lou E. Stevens, five each.

De Luxe Automobile Company, Jersey City, N. J.—Capital, $125,000, to manufacture automobiles and all kinds of mechanically propelled vehicles. Incorporators, Ralph R. Caldwell, H. O. Coughlan, John R. Turner, Henry T. Hunt, W. C. Caldwell and Stanley H. Merrell.

The Ithaca Motor and Manufacturing Company, Consolidated, Ithaca, N. Y.—To manufacture propeller wheels, mufflers, engines and an air cooled automobile engine. Incorporators, F. W. Grant, David Reid, C. Fred McWhorter, J. G. Y. Burkholder, E. C. Snow and Arthur B. Wellar.

Patents Issued April 10, 1906.

817,210. Magnetic Friction Clutch.—Harry A. Williams, Akron, Ohio. Filed May 26, 1905.

817,258. Motor Driven Vehicle.—Otto G. A. Littmann, Charlottenburg, Germany. Filed March 1, 1904.

817,266. Starting Device for Explosive Engines.—Gilbert N. McMillan, Buffalo, N. Y. Filed December 3, 1904.

817,391. Gasoline Dispensing Can.—William H. Robertshaw, East Orange, N. J. Filed April 29, 1905.

817,517. Means for Attaching Canopy Tops.—William C. Rands, Detroit, Mich. Filed August 2, 1905.

817,547. Tachometer.—Arthur C. Butler, Wollaston, Mass. Filed June 24, 1905.

817,555. Speed Indicator.—Robert Hartmann-Kempf, Frankfort-on-the-Main, Germany. Filed June 27, 1905.

817,560. Tire for Vehicle Wheels.—James L. Heward, Cardiff, England. Filed January 27, 1904.

817,629. Device for Lubricating Under Pressure.—Louis M. G. Delaunay-Belleville, Neuilly-sur-Seine, France. Filed February 9, 1905.

817,630. Oil Pump.—Louis M. G. Delaunay-Belleville, Neuilly-sur-Seine, France. Original application filed February 9, 1905. Divided and this application filed June 26, 1905.

817,632. Sprocket Wheel.—James M. Dodge, Philadelphia, Pa. Filed May 23, 1898.

817,641. Carburetor.—Coleman B. Harris, Wilmington, Del. Filed November 18, 1904.

817,678. Vehicle Brake.—Wilber H. Smith, Bar Harbor, Me. Filed September 2, 1905.

817,682. Seat Suspension for Motor Vehicles.—Oscar Werner, New York, N. Y. Filed September 16, 1905.

817,721. Carburetor.—Jay C. Lewis, Shelby, Ohio. Filed February 10, 1905.

817,737. Ball Bearing.—Bert G. Goble, Allegheny, Pa. Filed August 18, 1904.

Patents Issued April 17, 1906.

817,787. Vehicle Wheel.—Frederick J. Lancaster, New York, N. Y. Filed January 25, 1905.

817,908. Transmission Gear.—William Folberth, Cleveland, Ohio. Filed October 31, 1905.

817,941. Carburetor.—Charles Stute, Newark, N. J. Filed March 25, 1905.

817,957. Vehicle Tire.—Will Christy, Akron, Ohio. Filed July 2, 1903.

818,060. Pneumatic Wheel.—Richard Thew and Hollis H. Harris, Lorain, Ohio. Filed December 19, 1904.

818,117. Speed Indicator.—Ralph Plummer, Baraboo, Wis. Filed April 27, 1905.

818,184. Tire.—Charles Miller, Binghamton, N. Y. Filed September 3, 1903.

818,331. Friction Clutch.—Edwin E. Andrews, Akron, Ohio. Filed April 24, 1905.

818,372. Spark Plug.—Bert W. Hallstead, Scranton, Pa. Filed November 5, 1904.

818,400. Vehicle Tire.—Robert Wright, Cleveland, Ohio. Filed July 31, 1905.

Trade Literature Received.

Standard Protector Company, Peoria, Ill.—Booklet of Standard tire protector.

The Auto Garment Company, Cedar Rapids, Ia.—Circular of To-Go Rain and Dust Proof Coats.

The Auto and Power Appliance Company, Cleveland, Ohio.—Circular describing the "Auto Power" muffler.

Knox Automobile Company, Springfield, Mass.—Bulletin No. 1, Knox Waterless Commercial Cars, Size D 4.

The Hanson & Van Winkle Company, 219 Market Street, Newark, N. J.—Circulars of the Witherbee storage battery igniter.

Chicago Battery Company, Michigan avenue and Fourteenth Street, Chicago, Ill.—Catalogue of Duro dry storage batteries and electric lamps.

Consolidated Equipment Company, Michigan Avenue and Fourteenth Street, Chicago, Ill.—Circular of the Bell compound indicating pump.

The Edward E. Cary Company, Inc., 59 Park Place, New York.—Circulars of the stamped steel bodies of Jos. Sankey & Sons, Ltd., Bilston, England.

...THE...

Horseless Age

VOLUME 17 MAY 9, 1906 NUMBER 19

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WINTON MODEL-K

Proved Excellent in Months of Service



Model K Winton cars have been in use in all parts of America all winter—in some places since September, eight months ago.

For the 800 and more cars of this model which we have already delivered the average period of service to date has been four months.

And the unanimous testimony of the purchasers and users of these Model K cars is that the market does not offer their superiors.

Here, for instance, is the testimony of Mr. James O. Heyworth, general contractor, of Chicago, who has used his car more than five months:

"I received my Model K Winton on November 20, 1905, and have used it throughout the winter and up to date. It has not yet been in the shop, and has given PERFECT SATISFACTION during its use. I take pleasure in recommending it to any person contemplating a purchase."

Just Compare the $2,500 Winton Model K with any Car on the market selling at $3,500 or higher.

Detailed information about Model K and automobiles in general is contained in "The Motor Car Dissected." Free upon request if you mention this paper.

The WINTON MOTOR CARRIAGE CO.

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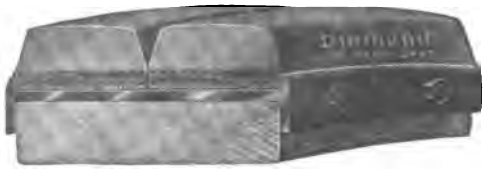
Some Model K features are: Tested Materials; Ground Cylinders, Pistons and Bearings; Patented Twin Springs; Flexible Speed Control; Patented Auxiliary Gasoline Tank; Velvety, Non-Breakable Transmission.

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LOOK FOR GARAGE NUMBER MAY 30

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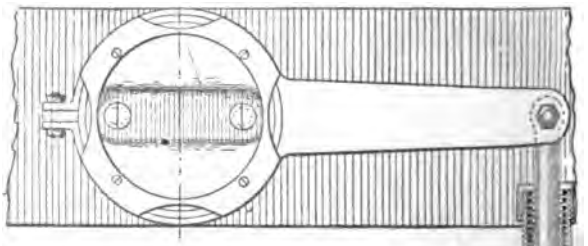
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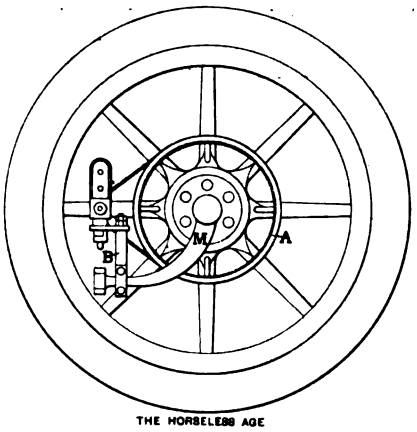
Vestal Shock Absorber Company

1517 Baum Street, East End, Pittsburgh, Pa.

Tire, Lamp and Speedometer Trials of the British Automobile Club.

By V. H.

As mentioned in THE HORSELESS AGE of March 21, page 461, these trials commenced on March 1, and elaborate sets of rules were drawn up for the purpose of determining the properties possessed by each device submitted. A number of scientific men and others, all members of the British Automobile Club, formed the committee of judges as follows: Hon. Arthur Stanley, M. P.; Earl Russell, Prof. Vernon Boys, Colonel Holden, R. A.; W. Worby Beaumont, Sir Boverton Redwood, D. Sc.; Major Lindsay Lloyd (Royal Engineers), Mervyn O'Gorman, Sir David Salomons, J. Lyons Sampson, Dugald Clerk, A. G. New, R. E. Phillips, E. H. Cozens-Hardy. As in all other tests made by the club the vehicles upon which the tires, etc., were fitted were under the strictest official observation for the whole of the month up to March 31, when the tests were concluded. The judges held possession of the cars for a week after this for the purpose of making photometric measurements as to the illuminating power of the lamps, for an examination of the working parts of the speedometers and their accuracy, and for testing the resiliency of the tires, power absorbed, etc. The entrants of the tires had to provide the vehicles to which they were fitted and a driver and mechanic for each car. Two official observers rode on each car, one for the tires and the other for the lamps and speedometers. In addition, a Dennis 20 horse power, four cylinder car, with worm drive to the live axle, was also entered for a 4,000 mile reliability test, and on this car the gentleman who observed the tires acted in the same capacity in respect to the car itself. This



VULCAN ELECTRIC SPEEDMETER.

Dennis car made a world's record for reliability, covering the distance without a single stop for any mechanical trouble or for an adjustment of any kind whatever.

A portion of the garage belonging to the Wolseley Motor Company was placed at the disposal of the club, and at the conclusion of each day's run the cars were taken straight in there and placed under lock and key. Prior to the start each morning a certain time was devoted to washing down and filling tanks with gasoline and lubricating oil, the observers being in attendance and carefully watching that nothing was tampered with. At each luncheon interval, at the halfway point of the day's journey, the cars were placed in locked garages at the different hotels, and to make doubly sure, the observers carried their own chains and padlocks, which were attached to the garage doors. These elaborate precautions were taken to ensure that the trials and the judges' report should be absolutely beyond suspicion.

A different route was covered on each day of the week, and there were no runs on Sundays. The routes taken were as follows: Northleach and back on the Oxford road, 165½ miles; Dunchurch and back on the Coventry road, 163½ miles; Peterborough and back, 166½ miles; Sunrising Hill (one of the steepest hills in England, with a gradient of 1 in 6, or nearly 17 per cent.) and back on the Banbury road, 169 miles; Marlborough and back, 157½ miles; Stonehenge and back on the Exeter road, 159 miles. It had been intended to test the lamps and speedometers for 4,000 miles, but as only three vehicles were available, owing to the paucity of tire entries, they were only sent for half the distance, while the tires went the whole of the long journey.

DETAILS OF SPEEDOMETERS.

The Vulcan differs considerably from any other in that the action (so far as the transmitter and indicator are concerned) is purely electrical. The instrument consists of a very small magneto generator, which is attached to the steering horn M of the right hand front wheel by means of a clamp B, and has a small metal pulley on the end of the armature shaft; a large aluminum pulley A is fixed to the spokes by screws on the inside of the wheel, an india rubber band connecting the driving and driven pulleys. The instrument is connected to the indicator by a flexible copper cable of small diameter. The indicator is really a deadbeat hot wire volt meter, and is graduated in miles per hour. The magneto armature is so wound as to give a small current with a high voltage, the voltage being directly proportional to the speed at which the instrument is driven, consequently the deflection of the needle is proportional to the speed of the road wheel. The hot wire principle insures that the needle moves gradually over the



CARS USED IN THE BRITISH TIRE TRIALS AT THE FOOT OF DASHWOOD HILL.



ELLIOTT SPEEDMETER.

dial without the semblance of a jerk. Record of run: The carrying bracket was removed from the car in the garage at the end of the first day's run and a stronger one substituted before starting the next morning. The instrument scored full reliability marks on the road for 2,000 miles.

[This instrument is manufactured in France, under a different name, and has also been imported into this country by different agents.—ED.]

The Elliott speedometer relies upon a centrifugal fan geared down to the pointer to indicate the speed. The flexible connecting shaft is driven by a small friction wheel off a friction disc bolted to the right hand steering wheel. An ordinary type of trip odometer forms part of and is fixed to the top of the instrument. The Elliott secured full reliability marks for 2,000 miles.

The Kirby speedometer is a new instrument, yet in the experimental stages, and no details of its construction have been made public. It ran for nearly half the period without loss of marks, broke the flexible connecting shaft, losing all marks for that day, and completed the trial without further mishap.

The Staunton speedometer also makes use of a centrifugal fan for its speed indicator, a spur ring driving an inter-meshing wheel on the flexible connecting shaft. A distance recorder is an integral part of the instrument, the total mileage being shown on four circular dials. This instrument also had the flexible connecting shaft broken near the end of the trial, and lost two whole days in consequence.

GRATZE SPEEDOMETER.

The driving gear for this is a spur ring screwed to the front road wheel and meshing with a smaller spur wheel, to which is attached the flexible enclosed shaft. The



KIRBY SPEEDMETER.



ELLIOTT SPEEDMETER DRIVE.

principle of the instrument can be understood by the aid of the two accompanying illustrations, showing a plan of the internal mechanism after the dial has been removed, and also a side section of the complete instrument. M is a circular permanent magnet capable of retaining its magnetism for an indefinite period. Within the circular gap between the pole pieces of the magnet a three part armature A, of soft iron, is rotated by means of worm gearing W from the flexible driving shaft. Concentric with the armature, and between it and the poles of the magnet, is a copper shield C, pivoted in jeweled bearings at either side. To this shield the indicating pointer is attached, which is normally kept in a zero position by means of a coiled hair spring, one end of the spring being attached to the base of the pointer and the other end being fixed to the bracket in which the armature is pivoted. Movement of the pointer proportionately to the speed of the road wheel is secured by the utilization of the fact that



KIRBY SPEEDMETER DRIVE.

an armature, revolving in a magnetic field, distorts that field in the direction of rotation, and to a degree proportional to the speed at which the armature revolves: within the copper shield Foucault currents are set up by the cutting of the lines of force, and the shield is pulled over, as the distortion of the field occurs, against the pull exerted by the coiled spring. The deflection being exactly proportional to the speed of rotation, an equally divided scale is used. By pressing a button P at the bottom of the instrument, the pivoted shaft of the armature C is gripped by a small band brake so that it is possible to obtain a permanent record of the speed at any moment. The pointer is absolutely dead beat at all speeds, and the scale is made in two sizes, the larger having a range up to 100 miles per hour and the smaller up to 60. A distance odometer of the normal type forms a



STAUNTON'S SPEEDMETER.



STAUNTON SPEEDMETER DRIVE.

rt of the instrument and is driven by the rm wheel R. A peculiarity of this in-ument is that it can be driven at speeds gher than it is capable of registering thout affecting its accuracy in any way. ie Gratze scored full number of marks r the 2,000 miles over which it was run.

JONES SPEEDOMETER.

This instrument is so well known in merica that a description is unnecessary. his also performed excellently, scoring the ghest possible number of marks for re-ibility for 2,000 miles.

WARNER SPEEDOMETER.

This is another instrument made in e United States and does not need de-iled description. After running some 400 iles, five minutes (equal to five marks) ere lost for adjustment of the driving ar at the road wheel; when not quite oo miles had been covered the flexible iving shaft was broken, the remainder that day's run being lost and a new aft being fitted in the garage the same ening under official observation. The mainder of the distance of 2,000 miles as covered without further mishap.

COWEY SPEED INDICATOR.

This is driven by a bevel ring screwed the spokes of the right hand road wheel, meshing with a smaller bevel pinion coupled up to a flexible shaft. To allow for the full "lock" of the steering wheels one telescopic and two universal joints are employed, which allow of the full angle of movement. The indicator is composed of three principal parts, viz., a heavy balance wheel, a coiled spring around the shaft carrying the wheel, and a ratchet propeller. The spring is connected to the balance wheel so as to pull it constantly to zero, while the propelling device on the end of the flexible driving shaft gives a series of intermittent impulses to the balance wheel, which tend to pull it in the opposite direction. The faster the car travels the more numerous will be the impulses given to the balance wheel by the ratchet propeller, and the spring having more work to do in overcoming the effect of these impulses will be deflected and allow the balance wheel to be angularly displaced to a greater or lesser extent. The balance wheel operates the indicating pointer. The instrument is of the dead-beat type. The flexible driving shaft of the Cowey broke after running for some 700 miles and the remainder of that day's trip was lost; a new shaft was fitted at the garage under observation the same evening, and the remainder of the journey was completed without any further loss of marks. A distance recorder forms a part of this instrument.

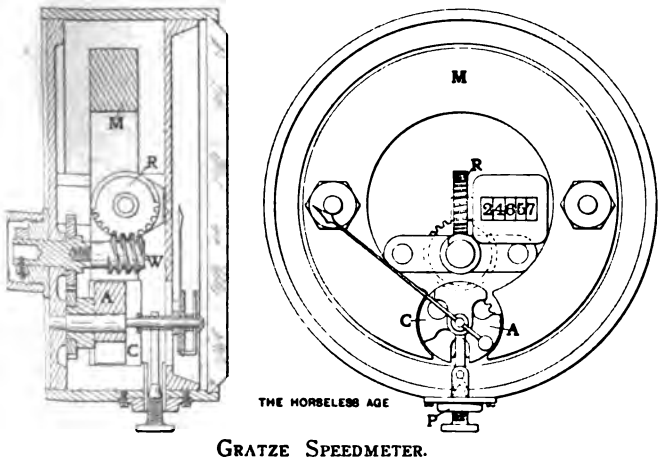


COWEY SPEEDMETER.



COWEY SPEEDMETER DRIVE.

speedometer hand or pointer works around nearly the whole circumference of the dial, and by exactly the same means as in the other Cowey indicator described above. Within the mileage indicating circle is a smaller ring, painted a dead black and with thirty slots cut therein, each slot being shaped to a peculiar curve at not quite a true tangent to the centre of the indicator; inside each slot a small white pointer can move from end to end. Reference to the illustration will make the position of the slots and pointers quite clear, and will show that the blackened portion does not extend right around the dial. At what might be termed the bases of the black circle small divisions are marked, these being graduated from 5 to 50 miles. Within the space surrounded by the blackened portion of the dial is a third ring, with divisions marked equally in yards, from 50 up to 750 yards. What happens can now be described. After the first 50 yards have been covered by the car the white pointer in the bottom left hand slot moves out from the centre toward the circumference of the black dial,



GRATZE SPEEDMETER.

COWEY RECORDING SPEED INDICATOR.

This was one of the most interesting of the devices submitted for trial, as it gives an absolute record of the various rates of speed at which the car has been traveling at every point during the whole of the preceding quarter of a mile. The

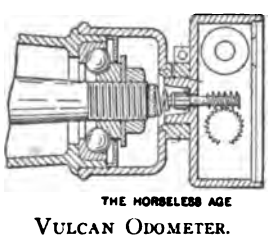


COWEY RECORDING SPEED INDICATOR.

the distance it moves in the slot being dependent upon the speed at which the car is traveling. (The mileage base marks extend concentrically around the black dial, but these cannot be traced in the illustration.) The first pointer remains fixed until another 50 yards have been covered, and the 100 yards pointer then flies out in its slot. If the car is then traveling at a speed of 25 miles per hour the 100 yard pointer reaches the midway point in its own slot. From this point onward each pointer remains until the 450 mark, or a corresponding distance equal to a quarter of a mile, has been covered, when the 50 yard pointer goes back to zero in its slot. The pointers are thus constantly following each other up, and as a total distance of 800 yards is indicated on the inner white dial, nearly half the pointers must therefore remain at rest for every quarter of a mile. This result is exactly shown in the illustration; up to 75 yards the pointers are at zero, from there to 200 yards the pace has been 20 miles per hour, and has then dropped to 5 miles at 275 yards; it has again gone up to 20 miles at 300 yards and has remained there to the 550 yard mark, the remainder of the pointers keeping to zero until they are required in their turn. This instrument scored full marks for 2,000 miles.

VULCAN ODOMETER.

So far as the recording mechanism of this instrument is concerned, it does not differ from the Veeder and similar types, where a star wheel is fixed to the instrument and forced forward once in every



VULCAN ODOMETER.

revolution by a striker attached to the road wheel; but the star wheel is removed and the first actuating spur wheel is driven directly from the front wheel axle. A hole is drilled in the hub cap and an adapter, with female thread, is soldered thereto into which the odometer is screwed and locked in position by a clip; the spindle of the spur wheel shaft extends into the hub for a short distance, the end being drilled out to take a light spiral spring, while the other end of the spring has a circular plate attached with serrations which are of sufficient depth to grip against the end of the road wheel axle. The instrument has two sets of figures, the upper horizontal line giving readings by one-tenth of a mile up to 10,000; the lower set consists of five dials, each showing only one figure at a time, and these by means of a button can be set for use as a daily trip record. The size of the

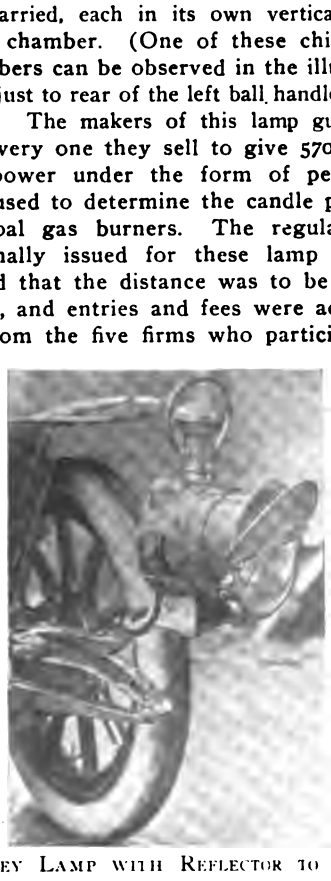


VULCAN ODOMETER DIAL.

instrument is 4 inches diameter by 2 inches thick, and the weight is 1¼ pounds. Full marks for reliability were recorded throughout the trials.

POLKEY KEROSENE HEAD LAMP.

The special feature of this lamp is the employment of a circular wick surrounded by a long glass chimney of a similar pattern to those used on ordinary household lamps. The chimney is cushioned at its base on a cork bed, and a spring ring encircles it near the top, the ring being supported by four arms from the interior of the long metal cowl. The cowl is divided into three concentric chambers to secure ample ventilation, and yet to prevent any down draught even in a gale of wind. The reflector is semiparabolic, and to the rear of it, but within the lamp casing, two spare chimneys are carried, each in its own vertical felt lined chamber. (One of these chimney chambers can be observed in the illustration, just to rear of the left ball handle support.) The makers of this lamp guarantee every one they sell to give 570 candle power under the form of pentane test used to determine the candle power of coal gas burners. The regulations originally issued for these lamp trials stated that the distance was to be 4,000 miles, and entries and fees were accepted from the five firms who participated



POLKEY LAMP WITH REFLECTOR TO SHOW LIGHT TO OBSERVER IN DAYTIME.

in accordance therewith. Without consulting the entrants the committee a first cut the distance by half, and whe the Polkey Company raised a pro test that their money was paid fo a full trial, the committee climbed dow Then another difficulty arose, because th lamps were only supposed to be lit a dusk, which would have reduced the to tal time the lamps were in use to les than 1,000 miles, and a concession wa made to this firm for the lamp to b lighted each morning when the car le the garage and to be kept alight for th whole of each day's run. Hence the fi ting of the peculiar shaped backwar reflector, which enabled the observer t watch the flame in daylight. Lam makers had to supply their own bracket to carry the lamps, but for some reaso or other the one sent with the Polke lamp was not used, the club substitutin another. On two days in the first wee this lamp jolted out, and the same thin happening once again at the commencemen of the second week, the makers with drew it from further competition. The stated that a quite unsuitable bracke had been used to support the lamp, and further, that the lamp had been sub jected to unfair usage by the driver o the car to which it was attached. Ther seems to be some foundation for thes statements, as these lamps are being largely used by automobilists, mainly o recommendations, little or no advertis ing having been done to push sales Litigation is likely between the Auto mobile Club and the Polkey Company

WORKSHOP ACETYLENE HEAD LAMPS.

These are constructed to work from a separate generator, the latter being a long vertical cylinder, similar in shape t the compressed gas bottles used for lim light purposes. The generator work on the drip principle, with a rubber ex pansion bag placed in the line of pipin between generator and lamp. The lamp have concave, plain front glasses, with central bullseye lenses supported by thre spider arms from the circumference o the reflecting bell or dome. They me with many mishaps. In the first week the off side lamp went out several time through the supply pipe becomin choked, and the same trouble occurre to the near side lamp on one day. Th second week saw a repetition of th troubles. During the third week thing became still worse. Here is the week's record: March 19, near side went out holder being loose; 20th, near side lam removed to repair loose burner; 21s off side lamp relit twice, owing to ta closing from vibration; 22d, off side lam went out and could not be relit; 23d both lamps burned badly through faulty charging of generator; 24th, near sid bracket broke, lamp fell off, glass brok en, otherwise undamaged; same day, of side lamp went out and could not be re-



SAFETY MIRROR TELLTALE.

lit. They burned better in the last week, but the mishaps in the first few days quite removed any possibilitiy of an award.

RYTA REFLECTING TAIL LAMP.

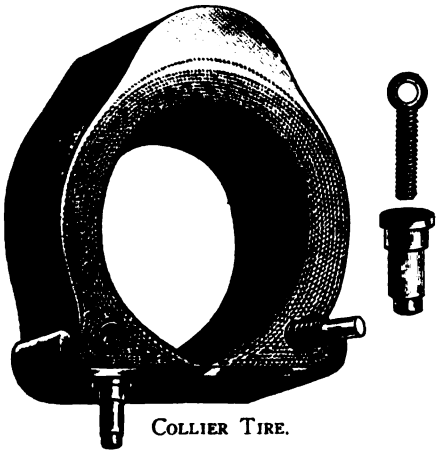
This burns kerosene, the special feature of its construction lying in the use of a mirror attached to the lamp and at such an angle as to reflect a beam of light along the side of the car to another mirror on the dashboard; both mirrors can be adjusted to the proper angles by suitable clamps. British automobile laws require rear number plates to be illuminated at night, and also a red light to be shown to the rear of the car. Failure of the lamp to burn is usually visited by the infliction of a fine of $25. The Ryta mirror system is designed to act as a telltale to the driver. This lamp failed to burn on five nights, two of these failures being due to gross carelessness in not fitting new wicks.

METALLIC MIRRORS TAIL LAMP.

In this device the numbers are painted on glass, the lamp being contained at the end of an oblong box by which the number plate is supported, and the light being reflected along the interior by highly polished nickeled plates, hence the name. During the first week the lamp went out three times, owing to insufficient ventilation, and jolted out on two other occasions.

WORKSHOP KEROSENE TAIL LAMP.

This is of ordinary construction and



COLLIER TIRE.

met with no better luck than the head lamps of the same makers. After the third week, although no official notification was issued as to this being done, it was apparently withdrawn from the competition.

THE TIRE SECTION.

The trials were originally intended for tires only, but the prohibitive sums charged for entry fees, in combination with the fact that the trade was far too busy to waste time and money in the spring season, resulted in only three sets of tires being entered, all by one firm, the Collier Tyre Company. One set of these had beaded or clincher edges held on to the rim solely by inflation. These tires were a new introduction by this company, and of much lighter construction than any they had before marketed. The diameter was 815 m. m. by a cross section of 105 m. m. and the tires were fitted to a 20 horse power Rolls-Royce car. During the first week one cover had to be replaced in the motor house, a bad cut from broken glass on the road having penetrated sufficiently to loosen the rubber from the fabric; three punctures were later sustained by one or the other of the four covers, leaving twenty-three days as non-stop runs, free from loss of marks, out of twenty-seven days' trial.

COLLIER TIRES REGULAR PATTERN.

The two sets fitted on a 28 horse power English Daimler car and a 28 horse power Dennis car were exactly alike in construction, there being only a slight difference in diameter and cross section. The cover is held mechanically to the rim, a large number of canvas layers being emebdded in the walls and the tread having about double the thickness of rubber found in other tires. The thickness of construction makes it nearly puncture proof, but at the expense of some loss of resiliency. In the shoe or bead of the cover, a hole is moulded, concentric with the run of the rim. That part of the shoe bedding on the rim has holes cut at intervals meeting the concentric hole and coinciding with holes drilled through the steel rim and wooden felloe. Through the concentric holes a coiled wire is passed, and up through each hole in the shoe a bolt with eye, the eye resting in the shoe, with the threaded end of the bolt pointing downwards. A hoop of stout wire is cut through at one place, and on one end of the wire an eye bolt is fixed, the other or free end of the wire ring being pushed into the tire shoe and through each eye bolt in succession, until it meets the fixed bolt on the ring. This latter end is then forced into the shoe, into a recess made to receive it. Both beads of the shoe are treated in the same manner, leaving about twelve bolts projecting through the shoe on either side. The wire ring practically "floats" in the shoe and there is little difficulty in detaching or replacing the cover, despite its thickness, by two ordinary tire levers. The eye bolts almost automatically find their way through the rim and are held in position by brass nipples, similar to but of course on a larger scale than those used for bicycle spokes.

The tires fitted to the Daimler car had no troubles on twenty-two days; one cover burst at the end of the third week, forty minutes being occupied in fitting a new cover and new inner tube on the road. The tires on the Rolls-Royce car also scored full marks for reliability on twenty-two days, punctures causing loss of marks on the other five. Just as these notes were being posted from London the following telegram was sent to the Collier Tyre Company by the secretary of the Automobile Club: "The judges have decided that the club's gold medal should be awarded to the Collier Tyre Company, Ltd., for the tires entered by them." Although no official notification to this effect has been issued to the press, it may be accepted as correct.

DENNIS 20 HORSE POWER FOUR CYLINDER CAR.

This vehicle carried the 34 inch Collier tire and was entered for a 4,000 miles trial under official observation, the same precautions being adopted to secure rigid observance of the rules as were used in respect to the lamps, speedometers, etc. The manufacturers are Dennis Brothers, of Guildford, Surrey. The special feature of the car is the use of a worm drive from the propeller shaft to the live axle. The firm have a patent on the particular method used, which they have successfully exploited on pleasure vehicles for the past three years and on vans and omnibuses for the past twelve months. On the very first day of the trials real hard luck was experienced, dirt getting into the gasoline tank while it was being filled, and completely choking the carburetor supply pipe at 85 miles. This only took 1½ minutes to remedy, and thereafter, for the remainder of the 4,000 miles, the car had an absolutely unblemished record of nonstop runs. Permission was granted by the judges to make up the lost 85 miles, the car actually running 4,092½ miles, and thus obtaining a world's record, for a reliability trial of 4,000 miles under observation. It must be understood that this trial and similar trials of the Automobile Club are carried out under conditions which would apply to regular touring, viz., the car is properly washed down each night or morning, one hour is allowed for luncheon at midday and a few minutes for tea, the engine being stopped during these periods.

The publication of these notes has been held back until receipt of the judges' reports and awards, but although the trials ended on March 31, no decision had been announced up to April 20, save the notification respecting medal for tires mentioned above.

The A. C. G. B. and I. contest committee at its meeting on March 20 decided not to hold a race for big cars this year, but to organize, in addition to the tourist trophy race, a similar race for steam cars, provided at least six cars by at least three different makers are entered.

MAINTENANCE AND REPAIRS

[Suitable contributions to this department, accompanied by sketches, are solicited and will be well paid for.]

Derangements in Gasoline Tanks, Piping and Carburetors.

By Frank X. Hanchett.

During an experience extending over a number of years and dealing with motors of various kinds, the writer has had to deplore among other things the paucity of information in books of instruction pertaining to gasoline engine practice, on the small details of operation and maintenance which go so far to spell success or failure for the operator.

The trouble seems to lie in the fact that men who are competent to write on the subject confine themselves solely to technical and theoretical points, which, while they may be very pertinent in their way, do not in the least appeal to the man who is stuck out on a country road and doesn't know what is the matter, or if he does know the trouble, cannot, through lack of experience or knowledge, figure out an emergency method of repair.

A case in point is that of a man who waited two hours by the roadside for some one to come along from whom he could buy a spark plug because he had lost the binding nut from one and could not devise any method whereby he could fasten the wire to the stem. When he related his experience to me I asked him if he did not have a nut from off a dry cell; he replied that he did, but that it was too big for the plug stem, and when I told him that a rap with a hammer would have flattened the nut sufficiently to make it grasp the thread on two sides, and thus pull down comparatively tight on the wire, he looked at me in surprise, and then called himself several kinds of fool.

A man with a knowledge of these little expedients will go long distances with no tools except a screwdriver, monkey wrench and a pair of plyers, where the man with a box full of tools and no ability to use them will in nine cases out of ten hang up every few miles.

In the hope that it may benefit some of this non-mechanical class, I would like to offer a few hints as to how trouble may be avoided whenever possible and how to meet it if it does come.

Nothing is too small or unimportant to be considered in the running of an automobile. For instance, the gasoline tank, though it is simply a metal box, quite frequently does its share towards making trouble, especially the tank with the gravity style of feed. On more than one occasion a weak engine has been made strong by simply opening up the vent hole in the tank filling plug or drilling one where none was provided, as with no vent the gasoline is held up by the formation of a partial vacuum above it, and will not flow to the carburetor freely enough to make all the gas needed. Another point in the gravity system is the liability of stalling on a steep hill when the gasoline becomes low in the tank, on account of the lack of fall from the tank to the carburetor, but the wily driver overcomes this by simply backing his car up the hill, thus putting the tank at a higher level than the carburetor and giving the gasoline the needed fall.

A very hard thing to discover sometimes is the cause of a loss of pressure in the force feed style of gasoline delivery, when it arises from a number of small leaks in the tank seams or air pipes, and where none of the leaks are large enough to locate by sound or feeling. In such a case as this, if the pipes, seams, etc., are painted with soap suds the leaks will disclose themselves by forming bubbles wherever there is an escape of air. Occasional washing out of the tank will assist in keeping the carburetor in good working order by removing the small particles of scale and dirt which accumulate and preventing them from getting down between the carburetor float valve and its seat. The location of strainers, if any, in the gasoline pipes, should be ascertained by the operator and a frequent examination of the same made, as their clogging will seriously interfere with the efficiency of the flow.

If a stoppage be located in the gasoline pipe, and no means be at hand to take the pipe down, the trouble may frequently be eliminated by forcing air through it with the tire pump until the air can be heard bubbling through the gasoline in the tank. Simply holding the end of the air hose against the delivery pipe makes a tight enough joint for this purpose. When this is done it is advisable to allow sufficient gasoline to escape from the pipe to thoroughly flush out the dirt which has been loosened up.

In handling cork floats from such carburetors as the Holley and Schebler, be careful and do not drop them, as the cork is coated with a preparation to prevent it absorbing gasoline and any break or cracking of this coating will allow the gasoline to enter and permeate the cork, making it heavy and throwing the carburetor out of adjustment. In that type of carburetor where the spraying nozzle is placed in a mixing chamber which is entirely separate from the chamber containing the float, there will generally be two or more small holes found in the bottom of this mixing chamber, placed there for the purpose of allowing any accumulation of gasoline which might come from a leaking float valve, to drain away. These drain holes must be kept open; otherwise, should the carburetor flood badly while standing the gasoline will find its way into the cylinder and crank case in fluid form, destroying all lubricant with which it comes in contact and laying the foundation for an accidental explosion.

A coiled spring, such as that which holds the air valve of a carburetor to its seat sometimes breaks, and a good temporary repair for this or similar broken springs is to insert a washer of suitable size between the broken parts, which will prevent the coils of the spring from twisting into each other, thus losing their length and tension.

Where a carburetor failure occurs through the non-production of gas, though the float chamber floods—and this can be told by cranking the engine over and smelling at the cylinder cock when the compression stroke is on, the absence of any gasoline smell denoting the condition described—the fault will be found in the spraying nozzle itself, either from the needle valve which controls the flow of gasoline through the nozzle being closed or through the nozzle stopping up with dirt. This can be either blown out with the tire pump or cleared out by inserting a wire after removing the valve. Care must be used in keeping all joints of the gas pipe between the carburetor and engine cylinder tight. Mysterious cases of engines missing fire can frequently be traced to leaks in this pipe, the vibration of the machine causing the leaking joints to open up, at times to such a degree that enough air will be drawn through them to dilute the gas until it loses its ability to explode.

Soldered joints are especially liable to this trouble, and with them it will sometime be found necessary to take the pipe down to locate the trouble, as with the engine standing still and the pipe bolted in place the looseness will not show. These are a few of the things that have fallen under my observation and only pertain to one or two parts of the machine and these, in my estimation, are the simpler parts and least liable to make trouble.

Ceylon Rubber Exhibition.

A rubber exhibition is to be held at Peradeniya from September 13 to 27, under authority of the Ceylon Government. In a circular letter the Director of the Royal Botanic Gardens draws attention to the rubber plantations of Ceylon and the Federated Malay States, where rubber equal, if not superior, to the Para rubber of Brazil is now being cultivated. The exports are still inconsiderable, but they are doubling every year, and it is anticipated that in about seven years' time they will reach about ten or fifteen million pounds weight, and that in fifteen years' time they will exceed the exports from Brazil. It is claimed for the plantation product that it possesses great advantages over wild rubber, which it will ultimately displace. The exhibition is being held with a special view to evolving ideas and machinery which may be of assistance in the manufacture of rubber.

The value of the automobiles exported from France during January was $2,046,000.

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Need of Testing Laboratories.

The quality of an automobile is principally dependent upon the character of the materials which enter into it, and upon the strength and efficiency as mechanisms of its various elements. It requires properly arranged and carefully conducted tests to determine the sufficiency of the materials used, the manner in which the various parts of the car are performing their respective functions and the strength which can reasonably be imputed to them.

Almost every automobile manufacturer operates what is known as a testing department, principally devoted to the determination of engine performance and not a testing laboratory in any broad sense of the term. The equipment of a department capable of handling the many automobile problems to which tests may be profitably applied is necessarily a very expensive matter, not only in point of instrumental arrangements but as regards personnel, and not many motor car concerns would feel justified in installing such a plant. Factories are engrossed in mere commercial production, and little time and meagre facilities are at hand for the tests which their engineers would much like to have made.

The engines, change speed gears, drive mechanisms and other important car elements manufactured are in general tested only rather crudely, large dependence being placed upon the performance of the car, as a whole, upon the road to determine whether the particular design and arrangement shall be approved or disapproved. It is, however, only by the careful testing, from the standpoints of strength, durability and mechanical efficiency, of each element of the power plant, that defects can be surely and promptly located and improvements indicated. Such a careful and systematic scheme of testing is hardly to be realized at an ordinary automobile plant, owing to the urgent press of production and lack of equipment.

Furthermore, now that manufacturers are so largely buying of outside producers, and have to select each purchased part from among the varied assortment which the market affords, tests of a competitive nature are almost imperatively demanded. It becomes a serious problem for each manufacturer to determine which spark coil, which carburetor, or which radiator, for instance, is best adapted to his purpose. By no means all factories are equipped for settling these questions in a thorough manner, and the very considerable amount of time and labor required to do so is by no means an unimportant matter.

In the early history of the electrical industry, conditions prevailed very similar to those at present existing in the automobile business. The art was rapidly developing and tests of all descriptions were most urgently required, in order to insure its technical progress. In the factories crude testing methods were the rule, and recourse was very extensively had to the laboratories of technical schools and colleges, which were early equipped with the instruments and personnel requisite for testing purposes. Such institutions usually were and even now are rather averse to entering the commercial field, and performed the work unwillingly, if at all. Automobile manufacturers are beginning to apply to college laboratories for testing services, with similar results.

The lack of adequate testing facilities in the electrical field finally led to the organization of special electrical testing laboratories, conveniently located, and making a special business of performing, in an accurate and fair manner, all commercial electrical tests which the industry required. It would seem that, considering the important place which technical testing occupies or ought to occupy in the development of the automobile art, special automobile

testing laboratories, under entirely disinterested auspices, would be able to perform an important service to the industry, aid in its development and relieve the productive end of the business from labor which is really outside its sphere. A laboratory primarily devoted to the testing of materials is already part of the equipment of one of the automobile manufacturers' associations. Some testing work is now done by certain automobile schools, and a few engineers are prepared to perform services of this kind, but the available testing facilities are believed to be much less than the automobile business actually requires. Too much stress can hardly be placed upon the value of honest, intelligently conducted tests upon all parts of motor cars, and it is to be hoped that the facilities for their performance may be increased in the future.

Unlawful Obstructions and Traps.

The newspapers recently have mentioned several instances where obstructions and traps were placed upon the highways, for the purpose of impeding the progress of automobiles, and compelling motor car drivers to slow down to a low rate of speed, under the penalty, even at lawful speed, of not only suffering discomfort in riding over the obstructions but of serious danger to the machine and occupants. Without doubt, those who placed these obstructions upon the public ways had little understanding of the legal liabilities in which they were involving themselves. No form of criminality is to be more severely condemned than that of blocking the public avenues of travel, and the law has for centuries dealt harshly with those who have intentionally or negligently created obstructing nuisances in the road.

A private individual has no authority to interfere with a highway, and obstacles placed in the path of traffic, such as those which have been used in some of the towns for the purpose of interfering with the driving of automobiles, constitute a public nuisance, subject to indictment at common law, and under statutes. Not only are the parties subject to criminal liability for obstructing the highway, but any traveler who is injured by any obstacle unlawfully placed in his path may recover damages from the parties responsible for the obstruction. Local municipal bodies allowing obstructions to be placed upon the highways may be liable, if such obstacles are knowingly allowed to remain. There could be no more condemnable practice than that of intentionally placing upon the road an obstacle which would prove dangerous to a traveler. Any practice of that nature is malicious. It amounts to conspiracy, and from no standpoint is it lawful, but is a direct and intentional violation of the law, to be condemned by all.

Second Hand Cars.

Each year at the opening of the driving season a large number of used cars are thrown upon the market, and a goodly portion of them undoubtedly find purchasers. The rate of first year depreciation has gradually become less, and as the prices of some classes of cars have also gone down in recent years, it is now not such a very expensive luxury to buy a new machine each season, especially since during the first year's use of a car comparatively few repairs are required, and these are in many cases covered by the guarantee. The demand for cars having seen only a year's service, especially for a number of popular makes, is quite brisk, and, consequently, the second hand market is more active than ever before, though, owing to the fact that there are fewer apparent changes in the models of successive years, relatively fewer owners of cars care to part with them at the end of their first season's use.

Cars which are offered for sale "second hand" may roughly be divided into two classes, viz., those which are offered by their first purchasers and have seen only a limited amount of use, and those which are perenially on the market and have changed hands perhaps ten or more times. Of the models made some five or six years ago several in outward appearance are not unlike modern types, and are undoubtedly built of good material, yet so imperfect in design as compared with present machines that anyone familiar with them would not buy them at any price. As a general thing these very old models should be avoided, though exceptions may be made in the case of persons limited to a very low price and having facilities for making mechanical repairs themselves. The best bargains are generally to be found among machines of the better makes, which have been in use only a year or two. Where cars have received fairly good care and are of reputable make their serviceability has suffered very little at the end of the first year, and prospective purchasers of limited means, especially if they are novices, can often do no better than to buy a second hand car of good construction. But as the range of intrinsic value is much greater in second hand than in new cars, the greatest care is necessary in the purchase of the former. The value of a second hand machine depends not only on the make but on the period of its manufacture and on the care it has received. Misrepresentation of the type and condition of used machines is not altogether unknown, and the inexperienced would-be motorist will do well to solicit the advice of some experienced friend in considering the purchase of a used car.

The Odors of Gasoline Exhaust.

The exhaust gases from a gasoline engine possess a characteristic odor, more or less unpleasant to the sense of smell. Every passing automobile leaves behind a trail of these gases which are wafted into the nostrils of pedestrians on the sidewalk, and the dislike of the automobile on the part of the general public is at least aggravated by this effect. As long as automobiles are not much more numerous on our city streets than at present, the objection to the bad odors of the exhaust may not be of much weight, but it can hardly be doubted that when, say, every second vehicle in city traffic is motor propelled, the unpleasant odors from the exhaust will present a serious problem. Of course the presence of the horse does not contribute to the purification of the atmosphere either, but the aim should always be toward improvement in all things, and it would certainly be highly desirable if the automobile could be made preferable to the horse in this particular as in others.

The cause of the characteristic odor of gasoline engine exhaust seems never to have been thoroughly investigated. The odor is entirely different from that of the products of combustion of a gasoline burner, as used on steam automobiles, and is also rather different from that of carbon monoxide, the compound produced when a hydrocarbon is burned with an insufficient supply of air. These are the two oxides of carbon which are produced in ordinary combustion, and as their presence in the exhaust gases does not explain the peculiar smell of these gases, it may be of interest to state that a new oxide of carbon has recently been discovered, the molecules of which consist of three atoms of carbon and two of oxygen. This compound can be produced in the laboratory

ry a somewhat involved process. Is it not possible that it is produced in the cylinder of a gasoline engine when the charge is too rich? It has a penetrating odor and burns with a smoky flame.

Mention has repeatedly been made in the press of preparations which, when added to the gasoline, would obviate the objectionable smell from the exhaust. The effectiveness of anything thus far discovered in this line is much to be doubted. So long as the real cause of the trouble remains unknown, it is, of course, very difficult to provide a remedy. There are those who believe that the evil smell is more due to the products of combustion of the lubricating oil than to those of the gasoline. If that be the case any admixture to the gasoline would hardly remedy the trouble.

The Two Gallon Contest of the Automobile Club of America.

The results of the Two Gallon Efficiency Test held by the Automobile Club of America, which are given elsewhere in tabulated form, will prove of much interest and a surprise to many. Of the sixty-five starters sixty were checked, the missing ones being two Orient buckboards and an Indian tricar, which entered for a certificate only, besides two cars that were withdrawn. Owing to the fact that the winning of the contest depended upon a system of marking by which single and double cylinder cars were handicapped, the small, single cylinder buckboards, which were credited with only 70 per cent. of their weight, did not score very highly, in spite of their great mileage. The highest score was made by a four cylinder Franklin car, and a four cylinder Frayer-Miller secured second place, both being air cooled cars. These results are known, although the official report of the committee has not yet been made public at this writing. As the day proved rainy and the roads were consequently in poor condition, the performance of the cars is all the more remarkable.

Such contests as this, if properly conducted, would be of considerable value, and it is, therefore, to be lamented that so far our tests have not been run on the strictly scientific basis upon which they are carried out in Europe. It is, of course, an extremely difficult matter, with such a variation in the types of cars competing, to devise any system of handicapping which will give an equal chance to all, but the data secured by this test ought to allow of arriving at a very just basis of marking for future contests of a similar nature.

The fact that this was the first test of its kind does not excuse the rather lax management of the event—the careless inspection of the cars as to whether their tanks were empty, and the practice of allowing the operator of a car to fill his own tank without the presence of an inspector, and before his observer had been appointed; neither does it excuse the bungling manner in which these observers were appointed and the noticeable lack of system in starting the cars, some drivers being required to crank their motors on the scales while others were given a start by hand down an incline without their engines running. Furthermore, as a result of this contest, the rule may be laid down that such trials should never be run through crowded thoroughfares, where one competing car may have the misfortune of getting pocketed and being forced to stand idle with the motor running, while another may have the good luck of passing through without coming to a stop. It would seem advisable to start in a more open district, thus making the conditions more equal and the results more reliable.

The English Tire, Lamp and Speedmeter Trials.

Our leading article this week deals at length with the above trials and the devices which were entered in them. Although, as judged by the number of entries received, the trials were not as successful as the organizers may have wished, yet they were of a thoroughly practical nature, and this, combined with the fact that they related to automobile appliances which have never before been the object of public competitive tests, is our reason for giving so much space to them. The speedmeter section was really fairly well patronized, probably because there is considerable activity in this particular field at the present moment, and possibly for one further reason. Every motorist must have tires and lamps, but he does not absolutely need a speedmeter. If, however, the speedmeter can be shown to be a reliable and durable device, it may appeal as a useful instrument to a large body of motorists, particularly in England, where there is so much prosecution for speeding. Hence the need for public demonstration. The trials developed that the driving gear and flexible shaft transmission still remain the weakest part of the speed measuring apparatus. On the whole the speedmeters appear to have come through the trials very successfully, and much better than the lamps.

Book Review.

Gasoline Engine Ignition. By E. J. Williams. Published by the Gas Engine Publishing Company, Blymyer Building, Cincinnati.

Although the book bears the general title of "Gasoline Ignition," it appears from the author's preface that he refers particularly to marine gasoline engine ignition practice. It is evidently written by a practical man, largely from personal experience, and contains a good deal of helpful information on the subject with which it deals. The book contains a fair number of line drawing illustrations, but most of them are rather crude. The style of expression used by the author is rather faulty and unscientific. The following quotations may serve as examples: "A wire, when charged with an electrical current, contains a property adverse to the natural state of the wire when not electrified." "Alternating current is therefore unlike a direct or battery current, because it has no positive or negative wire." "An ampere is the unit rate of flow or amount backing up the volt." The best portions of the book are those dealing with actual practice, as they contain a good deal of useful information on ignition matters, and the book as a whole would have been a creditable production if it had been a little more carefully edited. An increased number of illustrations would also have been an advantage. The last several chapters of the book are devoted to gasoline engine subjects other than ignition, including "Links in the Power Installation," "Horse Power," etc.

Pennsylvania Motor Federation.

Eleven clubs are now affiliated with the Pennsylvania Motor Federation and a large number of individual members have been registered. Quite a number of new clubs are being formed in the State as a result of the efforts of the Federation.

During the past two weeks three clubs have joined the organization. These are the Automobile Club of Blair County, with headquarters at Altoona, a recently formed organization with thirty-odd members, of which Dr. O. H. Shaffer is president and R. H. Fay secretary; the Automobile Club of Central Pennsylvania, with headquarters at Milton (F. R. Sliver, secretary), having a membership of over fifty, and the Automobile Association of Center County, located at Bellefonte, of which Robert F. Hunter is secretary.

The A. A. of York County is being organized.

The Federation is taking an active interest in the project for improving the Philadelphia-Pittsburg road.

High Powered Cars—Their Advantages and Abuse.

By Albert L. Clough.

The present extraordinary demand for and interest in high powered cars of 30 or 40 horse power and upward is very noteworthy. The cry for cars of greater power is being heard everywhere, and the "large car," that is, the car of high horse power rating, is the cynosure of all eyes. In the year 1900 about 9 horse power was the maximum rating of any American gasoline car; in 1902 16 horse power was a fair rating for well powered American touring cars; in 1904 24 horse power or thereabouts was regarded by domestic manufacturers as about the limit for touring purposes. This year 35 to 40 horse power is the rated engine capacity of what are regarded as first-class touring cars. To a certain extent this increase in horse power is only nominal, as of late years many manufacturers have become less conservative in rating their engines, but even after due allowance has been made, the increase of power is very remarkable.

WHAT WILL BE THE LIMIT?

If one were—technically speaking—to exterpolate the curve of increase of horse power with time, trying to look into the future and conjecture what horse powers would be demanded in 1908 and 1910, the result might prove startling, even if not very dependable. Some people think that the limit of desirable size of a four cylinder engine is reached with a 5½ inch bore, which is rated at about 50 horse power this year. If this is a fact, the six cylinder engine may have to be generally adopted in next year's touring cars in order to meet the demand for more power, if this continues as persistent as in the past. One can hardly help wondering what will come after that. Possibly the crest of the wave, so far as the demand for power is concerned, has been or will soon be reached, and it may even happen that a reaction against very high powered cars may set in and save us from the eight cylinder proposition, which may be regarded as the logical successor of the six cylinder motor.

A PERTINENT QUESTION.

Occasionally some hard headed layman asks the question why his fellow citizen needs a 40 horse power car with which to take his family out for a drive, and points to the fact that his friend's delivery wagon handles a ton and a quarter load as fast as the law allows by means of a 16 horse power engine. Very little heed is paid to such queries. Of course, everyone knows that the 16 horse power engine, properly geared to the family car, will carry it at the maximum legal rate, wherever it is comfortable or safe to run at that speed. It may not do it over extremely rough or otherwise difficult roads, or over an excessively hilly country, but in both of these instances any considerable rate of speed becomes painful or dangerous.

It is a truism to remark that so far as a large class of motorists is concerned the additional 16 or 20 horse power installed upon the big cars is there for just one purpose—the attainment of very high speeds—45 to 60 miles per hour under favorable conditions—speeds the attainment of which practically every State in the Union brands as a misdemeanor. Manufacturers are advertising their cars by stating that each one, before leaving the factory, is tested to show a speed of 60 miles per hour. The impression that such claims make upon the general public and even upon some conservative motorists is not perhaps so favorable as is intended.

VALUE OF RESERVE POWER.

It is only common fairness to say that a considerable proportion of the purchasers of 40 horse power cars do not buy them with the slightest intention of running them, habitually at least, at speeds dangerous to themselves or to traffic in general. Many owners of these cars have a just horror of high speed running, and buy high powered cars for entirely different reasons—reasons, indeed, which appear to justify the employment of these very powerful vehicles. Modern high powered cars are generally vehicles of high ability, with a larger proportion of power to weight than found in those of lower engine capacity. This condition results from the fact that the weight of the motive power plant increases at a slower rate than the output, as its capacity is augmented. The high powered car of high ability possesses a very large amount of reserve effective power, which may be legitimately employed in hill climbing, and in the negotiation of extremely bad road conditions; or it may be made use of in a manner which the law of the land at least regards as illegitimate, in overcoming the air and traction resistances met with in very high speed running. If the reserve power of high powered vehicles is actually "reserved" for use under conditions where a powerful tractive effort is necessary to secure a reasonable and legal speed, there can be no criticism offered against the high powered car. Unfortunately, the reserve energy in the motors of such machines is too often expended otherwise and gives rise to legislative discussion as to the advisability of limiting the gear ratios of such cars, so that at maximum motor speed the vehicle shall not be able to exceed a certain rate That such expedients upon the part of lawmakers would prove ineffective as well as oppressive no one who has given the matter much thought can doubt.

CONVENIENCE IN OPERATION.

It has always been the ideal of the automobile manufacturer to produce a gasoline car which should be able to travel practically everywhere on the high gear and "pick up" nicely, even on considerable gradients when running on this gear. It has equally ever been the desire of the gasoline vehicle user to possess such a car. Possibly the annoyance of gear changing has been overestimated, but the desire for a car of practically gearless operation h been felt by all who use gasoline machine This ideal has virtually been attained b the use of high powered, flexible, mult cylinder motors, driving cars of high abi ity, correctly geared. Almost every oper tor has a horror of being forced to chan to a lower gear.

DRIVING SLOW WITH COMFORT.

The writer recently asked a friend wh had just superseded a two speed, two cylin der car of 10 or 12 horse power by a horse power four cylinder machine, if h bought the new car so that he could ru faster. The reply was, "I bought it so th I could go slower, with comfort." This by no means paradoxical. The user of low powered car, especially if it has onl two speeds, will often "hang on" to th high gear with throttle wide open, and ru at an uncomfortably fast pace over roug going, well knowing that if his speed i relaxed he cannot make his engine pick u again on the high gear, and will be force to change to the monotonous and wastefu low speed. He will also be forced to ru his car at its maximum speed, irrespectiv of the roughness of the road, when ap proaching all hills, in order that he may surmount the grade, or at least ascend i as far as possible, on his high gear.

The man who is driving the car of large reserve power with a flexible motor finds that his engine develops an adequate torque at low speed to carry him smoothly and comfortably over rough places in the road, and through sandy or muddy stretches. He does not have to rush the stony approaches of hills in order to negotiate the grades on his high gear, but can call upon his engine's reserve power gradually as needed to maintain a comfortable and sane pace, as the grade increases. The use of the high powered car really does enable the conservative operator to run more slowly and comfortably than he is willing to do with the low powered machine.

ABUSE OF RESERVE POWER.

When the user of the powerful car comes to the top of the hill and is once more upon smooth level going, one can tell whether he is to be trusted with his 40 horse power or not. If he immediately closes his throttle so as to give his car only a reasonable rate of speed, one is glad that he has a good, able car that he can enjoy driving, but if he leaves the throttle wide open, as it has perhaps been set when climbing the steep grade, and advances the spark to the limit, so as to demonstrate that the manufacturer's claim of "60 per" is being made good, one may wonder if he, rather than the rural agriculturist, is not the first cause of speed regulations and gear limit suggestions.

A considerate, law abiding driver of a high powered car can maintain an allowable and nearly constant rate of speed over hill and dale with practically no gear changes, calling upon his reserve engine capacity only when tractive resistance demands it, in order that his comfortable and moderate

progress may be maintained. Oh, if that reserve power were only "reserved," how little criticism of that really magnificent creation—the modern high powered touring car—one would hear! Incidentally, the occupants of the tonneau would spend more of their time upon the cushions and less in the air, and would receive less involuntary massage treatment.

PRINCIPAL ADVANTAGE OF ACTUAL HIGH POWERED CARS.

Setting aside the large number of high powered cars which are bought because some friend (often better able to afford it) has one, there are a number of a good reasons why these cars are so popular and sold in such large numbers. The high powered car is, on the average, the well built and reliable car. Manufacturers as a class really desire to produce machines which will be a credit to them, and the public is ready to pay prices which increase at a very rapid rate with the horse power furnished. Now, as a matter of fact, the labor and material cost involved in the construction of an automobile power equipment of large output increases much less rapidly than does the energy developed by the engine. A 50 horse power engine costs much less than twice as much to build than does one of the same type developing 25 horse power. The same is true, to a certain extent, of the rest of the car—cost of production does not increase at as high a rate as do the size and capability of the product.

PRICE ADMITS OF REFINEMENTS.

The manufacturer who gets a round price for the high horse power which he is offering is better able to do a good piece of machine work and assembling than if he were building a lower powered car, which must be sold at a more modest price. He is able to add many comforts and conveniences to the high priced car that, owing to the higher proportionate cost, he could not furnish with the small car. The high powered car is thus as a rule the comfortable and convenient car.

These considerations cause manufacturers to push the sale of high powered cars, and they have undoubtedly played their part in retarding the development of low priced vehicles of good, practical design and construction. The automobile agent, too, finds it is not proportionally difficult to sell a costly, high powered car and that it is a much better financial proposition, so far as he is concerned.

LIMIT OF CYLINDER DIMENSIONS.

Each type of automobile engine, single, double and four cylinder, has, after its introduction, been progressively increased in bore and stroke in order to increase its output. The practical limit of bore in all three cases has been found to be 5½ inches, or, at the very utmost, 5¾ inches, with a stroke not much exceeding 6 inches. Cylinders of larger bore give rise to explosion reactions which are rather uncomfortable. An engine which has cylinders of as large bore as practical considerations warrant seems to become the ultimate size to be generally employed, as its increase of dimensions are attained at so moderate a cost in labor and materials as to make it an attractive manufacturing proposition, considering the prices which can be obtained. Although the four cylinder motor has become universally popular, more, perhaps, on account of its freedom from vibration and superior flexibility than on account of the greater amount of power which could be obtained from it, the dimensions of its cylinders have been increased to the above mentioned figures by many manufacturers, and cars of rated 50 horse power or more are the result. Four cylinder motors of small cylinder dimensions are expensive to build considering their output.

THE SENSE OF POWER.

The car with a very large amount of reserve power, derived from a 45 or 50 horse power engine, gives its owner a feeling of superiority to road conditions and a confidence which is a source of very substantial satisfaction, and such cars will probably always be desired by motorists and chosen by such as can afford them. The force of public opinion and the use of cars more for legitimate pleasure than for "sport" will, it is hoped, accomplish much toward a more judicious use of this power by owners of these very able cars.

Steel Balls.

By Samuel S. Eveland.

In connection with the manufacture of steel balls, no method has yet been discovered which allows of finishing them all true to size. For instance, in a lot of one-quarter inch balls there will be some which measure exactly .250 inch, others will be one-quarter of a 1,000th inch large or small, etc. When the balls are packed all are properly marked, and all those of one size, .250 inch or OK size, for instance, are placed in one box, those one-quarter of 1000th of an inch small in another box, those one-quarter of 1000th large in still another box, and so on. Unfortunately, this is not always understood by the purchaser, who throws them all together and uses them as required, with the result that balls often vary as much as .001 inch or more in the same bearing, which would not be necessary if the trade method of packing them was understood.

In addition to the special or "high duty" balls, there are two principal grades, known as grade A, or first quality, and grade B, or second quality. In addition to these standard grades there are several lower grades, down to culls. In general it will be found best to buy steel balls directly from a manufacturer and not run the risk of getting a poor article, as it is unfortunately true that many hardware dealers and jobbers buy second, or even lower grade balls and sell them as first grade, and often mix the various sizes, so that the user cannot secure satisfaction. Grade A steel balls vary about one-quarter of 1000th of an inch; grade B varies about .001 inch to .002 inch, while the special or "high duty" balls are furnished varying not more than .0001 inch.

The crushing strength of balls, often mentioned in catalogues, is a factor that is likely to be misleading, and had better not be given, as it has very little effect on the load a ball bearing will properly carry. The load capacity of a ball bearing depends upon the speed of revolution as much as on the crushing strength of the ball. An ordinary commercial one-quarter inch ball will crush under 6,000 to 6,500 pounds, while a one-half inch ball will crush under 25,000 to 30,000 pounds. The same size of "high duty" ball will carry 25 per cent. more load, and if made of special steel will carry 100 per cent. more load, but balls of special steel are too expensive for general use. The fact, however, that a one-quarter inch ball will crush at 6,000, 9,000 or 12,000 pounds, according to the grade, has little bearing upon its actual strength in commercial use, owing to the influence of speed, and no bearing can be designed to carry a given weight regardless of speed.

Take, for example, a bearing 3 inches in diameter. The track of the balls in such a bearing will be approximately 9 inches in circumference, and it requires twelve revolutions of a one-quarter inch ball, six revolutions of a one-half inch ball and four revolutions of a three-quarter inch ball to make one circumference. Looking at the matter from a different standpoint, we may assume the bearings to have a speed of 1,000 revolutions per minute, in which case the one-quarter inch ball will have to make 12,000, the one-half inch ball 6,000 and the three-quarter inch ball 4,000 r. p. m. This shows very plainly the effect of speed on the carrying capacity of a ball bearing.

Another point requiring consideration in determining the carrying capacity of a ball bearing is the fact that the temper of the balls greatly affects their crushing strength, and the weight they will successfully carry. For instance, some typewriter companies use what is termed a "glass hard" ball, which will stand less than 50 per cent. of the strain that a ball of the ordinary temper will carry, and which would crush instantly under even moderate shocks. These balls are literally as hard as glass. On the other extreme we have balls which are drawn to a temper to specially suit them for use where extreme shocks have to be supported. Where ordinary one-quarter inch balls would crush at 6,000 pounds, the glass hard ball crushes at 1,500 to 2,000 pounds, and the specially tempered ball at 10,000 to 12,000 pounds. It should be repeated once more, however, that these crushing strengths do not determine the load capacity of the bearings. Great care should therefore always be exercised in designing bearings, and every effort be made to use the largest balls possible, especially for high speed.

NEW VEHICLES AND PARTS.

1906 Acme Cars.

The Acme Motor Car Company, of Reading, Pa., manufacture this season two distinct touring car models of different sizes, and a delivery wagon. The following is a description of the large car, known as Type XV. This car has the following specifications: Engine, four cylinder vertical, under the hood in front, 4½ inch bore by 5 inch stroke, with range of speeds from 150 to 1,500 r. p. m.; a four speed and reverse sliding gear transmission is used with jack shaft and side chain drive to the rear wheels. The wheel base is 114 inches and the tread 56 inches, and the car has a 10 inch road clearance. The frame is pressed steel, with semi-elliptic springs in front and rear; the wheels are 34 inches in diameter, with 4½ inch tires. The body, as will be seen in the photograph, is of the side door tonneau type, with a seating capacity of seven persons, there being two extra seats which are made to fold up in the tonneau. Sufficient gasoline for a run of 250 miles is carried in the 20 gallon tank under the front seat. The space under the rear seat is used for carrying luggage, and there is also fitted beneath the frame at the rear a large box for carrying tools and a repair kit. In addition to this a metal lattice work is so arranged that it can be slid out from under the body for carrying a trunk or other baggage. There are also provided on each running board liberal sized tool boxes.



THE ACME TOURING CAR.

AXLES AND SPRINGS.

Both axles are made of nickel-chrome steel, the front being a drop forging of I section, with the spring saddles riveted to it, and the rear being a square section 1¾ inch solid axle, with the spring saddles fitted over it and held by through bolts on the outside. The springs, both front and rear, are semi-elliptic, those in front being 44 inches long by 1¾ inches in width and under the frame. The rear springs are 52 inches in length, 1¾ inches in width and shackled at both ends, the forward shackle being pivoted on the jack shaft hanger bracket.

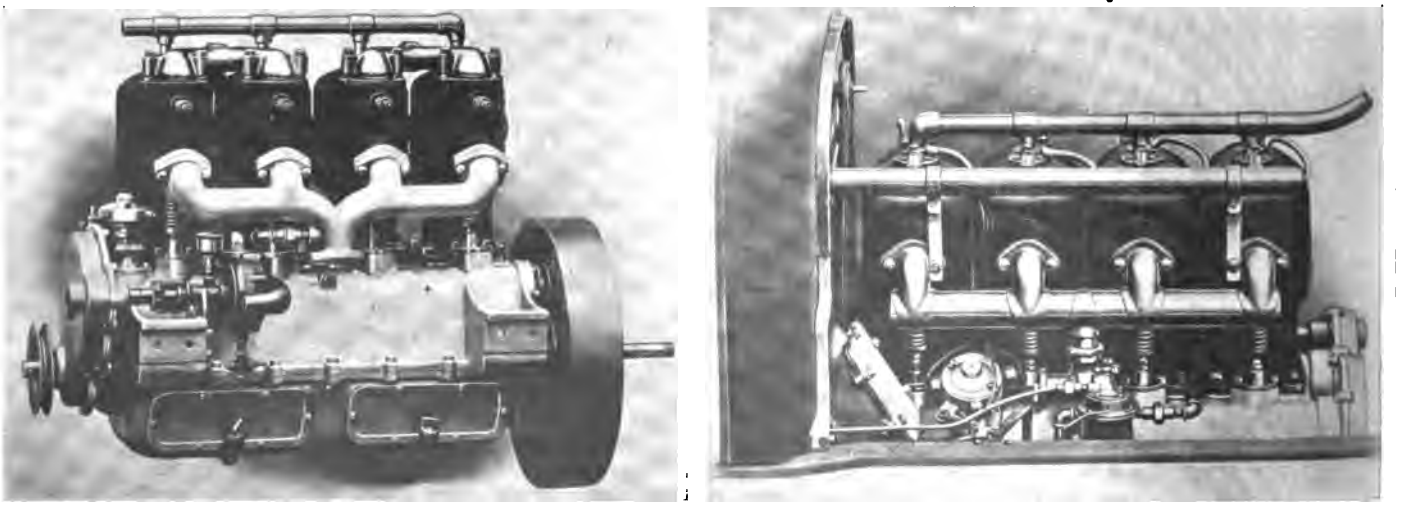
The frame is made of cold rolled, cold pressed nickel steel, three-sixteenths inch thick, with a depth at the middle of 4½ inches, tapering at the ends to 2 inches. It is narrowed at the front to obtain steering wheel clearance. The supports for the spring eyes are drop forgings riveted to the ends of the frame; the cross members are also of pressed steel of channel section, the forward and middle one forming supports for the engine subframe, which is also of channel section pressed steel.

STEERING GEAR AND WHEELS.

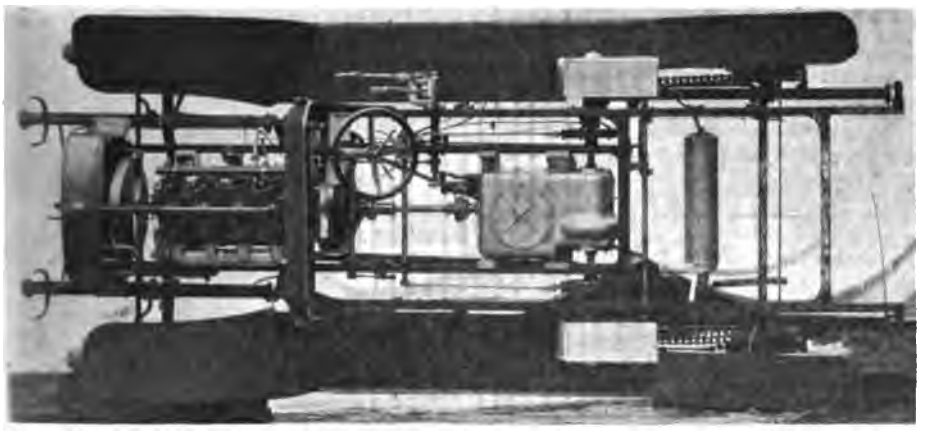
The steering gear is of the nut and screw type, and is located just forward of the dash under the hood and provided with a removable cover, which makes it very accessible. The nut is of bronze, split at one side, and can be adjusted for wear by means of take-up screws. The screw is of steel. The connections to the steering knuckle are the usual ball and socket jointed rods, the cross link connecting the wheels being in front of the axle. The wheels are of the usual artillery wood type and run on American roller bearings. The front wheels are slightly set in at the bottom to facilitate steering.

MOTOR.

The four cylinders are cast separately, with valve chambers on opposite sides and with integral water jackets; the tops of the valve chambers are fitted with the usual screw plugs, made tight by asbestos gaskets, and are held to the crank case by four hexagon headed nuts on studs. These cylinders are finished by grinding. The accompanying photograph shows very clearly the inlet side of the motor and the steering gear mechanism covered by the flat plate. The valves are of nickel steel, with heads and stems integral, and are both mechanically actuated. The pistons are rather long, slightly domed on top, and carry four diagonally cut eccentric rings, three of which are at the top above the pin and one is at the bottom. The wrist pin is of solid steel, hardened and ground, and retained by being split and slightly spread at the ends. The connecting rods are the usual I section steel drop forgings, provided at the upper end with a bronze sleeve bushing and at the lower end with the usual cap construction held by through bolts and lock nuts, the bearing surface being provided by a divided bronze bushing set up without shims. The caps of each connecting rod are fitted with oil scoops, which supply the oil to the crank pin bear-



TWO VIEWS OF THE ACME FOUR CYLINDER ENGINE.



PLAN OF CHASSIS.

ings. The crank shaft is a nickel-chrome steel forging, with an integral flywheel flange and five liberal width bearings. It is supported by the upper half of the aluminum crank case, each bearing being held by four through bolts. This construction allows of the removal of the lower half of the case without disturbing the shaft. The supporting arms are cast integral with the upper half, are of channel section and rest upon the engine subframe. On each side of the lower half of the case large rectangular hand hole plates are provided, and also two vent tubes enlarged at the upper end and fitted with dust screens. The cam shafts are made of a single piece of chrome-nickel steel with the cams integral, and run in three bronze bushings; they may be removed by taking out the middle and end bushing. Two to one gears are bronze encased in aluminum and run in an oil bath. The valve lifting rods are made of steel, with the usual rollers at the lower end, and work in bronze guides held to the crank case by cap screws. The upper ends of these push rods are adjustable in length. The valve springs are the ordinary type and retained by a cupped washer, and a pin through the valve stem. The exhaust pipe is a manifold casting with four cooling ribs, and conveys the gases through a large iron pipe to a muffler of the concentric cylinder type, placed crosswise of the frame at the rear. Just at the rear of the dashboard the muffler pipe is fitted with a T, in which is placed a muffler cutout valve operated by a foot button from the driver's seat. The inlet pipes consist of four brass fittings cap screwed to the cylinders and brazed to a single horizontal tube which supports the carburetor, as shown in the side view of the engine. This carburetor is of their own make, is composed of brass, is of the float feed type, with an inlet to the float chamber at the top and with a chamber around the nozzle for heating purposes by means of the exhaust gas, which is led to it through a small tube from the exhaust pipe. The auxiliary air opening is operated in conjunction with the main throttle from the steering wheel, and is of the cylindrical type, the opening itself being of a peculiar shape, which has been found to give the proper quantity of air at each position.

COOLING.

A brass plated centrifugal pump encased in aluminum and driven by a shaft from a spur gear meshing with the exhaust cam shaft gear furnishes the water circulation. The pump shaft has a flexible connection in it to protect it in case of freezing, and the driving gears are enclosed in the cam gear case. All of the joints are made by rubber tubing, which is made so tight a fit that no clamps are deemed necessary. The usual circulation is employed. The radiator is of the horizontal fin tube type, three tubes deep from front to rear. At the upper part a tank is formed which carries a sufficient volume of water, and the whole is enclosed in one outside shell. The pump shaft is provided with a hand grease cup upon the dashboard, and from the bottom of the pump a tube leads downward with a drain cock at the end.

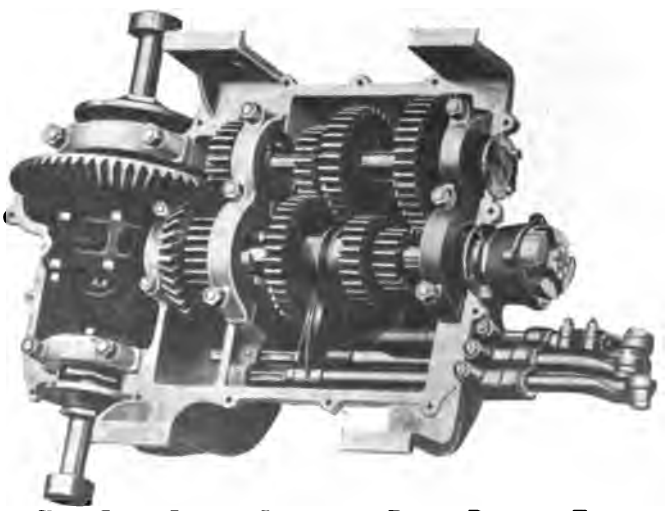
A Hill precision oiler is located on the dashboard and operated by means of a circular section leather belt from a pulley on the rear of the inlet cam shaft. There are two leads, one to each compartment of the crank case, each of these leads being connected to two of the plungers in the oiler. This supplies oil for the splash, which takes care of all bearings as well as the cylinders.

Ignition is by jump spark from storage batteries carried in the box on the running board. The plugs are inserted over the inlet valves. A Splitdorf quadruple coil and timer are used. The timer is on the small shaft projecting from the rear of the crank case between the last two cylinders and is driven by bevel gears from the inlet cam shaft.

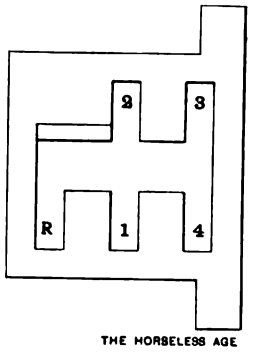
CLUTCH.

Inside of the flywheel, which is bolted to a flange at the rear end of the crank shaft, is placed an ordinary leather faced aluminum cone clutch. At the rear of this clutch is bolted a sort of hollow hub, inside of which is the clutch spring of the ordinary type, and on the outside of which are two flanges, between which work the hardened steel rollers of the forked arm which operates the clutch. When the clutch is disengaged it comes in contact with a small padded piece of spring steel, which retards its motion as a brake, and therefore quickly reduces the speed of rotation of the change gears, doing away with the clash and facilitating gear shifts.

A short shaft connects the rear of the clutch hub with the change speed gear. Its forward end is squared and fits into a square opening in the clutch hub, and its rear end is formed into a lug clutch and is surrounded by a casing packed in oil, and acts as a flexible joint. The change gear is of the four speed and reverse sliding gear type, as shown in the accompanying illustration. The gears are all made of chrome-nickel steel and are bolted wherever possible to flanges integral with the transmission shaft. All the bearings are Hess-Bright. The case is of the usual type, of aluminum, divided horizontally into an upper and a lower part. The lower portion supports the case by four arms, which rest on the subframe, and on top of the upper half is a very large cover plate, which can be quickly removed, giving access to the whole interior. The rear of the case forms a housing for the large driving bevel gear and for the differential, which is of the bevel gear type. The jack shaft is supported at each end in long bronze bearings held in special supports of cast steel bolted to the side members of the frame. At each side the jack shaft has a flexible joint, in the form of a half Oldham coupling. One peculiarity of this change gear is the fact that it is not direct on the highest speed, but is made direct on the third speed, the fourth being still higher. The reverse is obtained by a wide faced idler, which is swung upward into mesh with the gear on the driving shaft, and one on the lay shaft. The change speed gear is controlled by a side lever operating on the selective principle in a slot, as shown in the accompanying sketch. The



FOUR SPEED CHANGE GEAR, WITH DIRECT DRIVE ON THIRD.

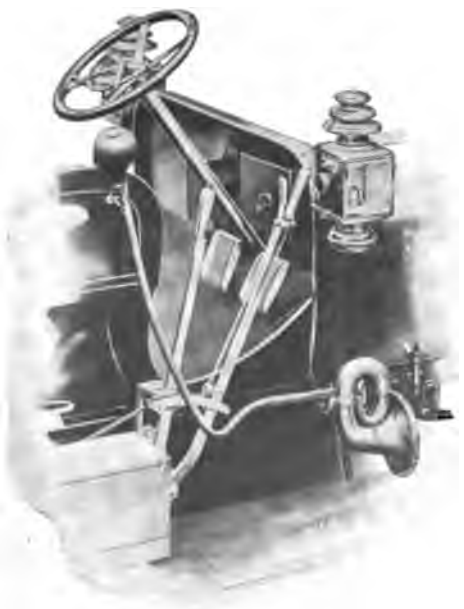


ACME GEAR LEVER SECTOR.

opposite ends of one slot give the first and second speeds and the opposite ends of the other slot give the third and fourth speeds, while the reverse is obtained by pressing a thumb button on the top of the lever, which allows it to be moved over into the slot marked R.

CONTROL AND BRAKES.

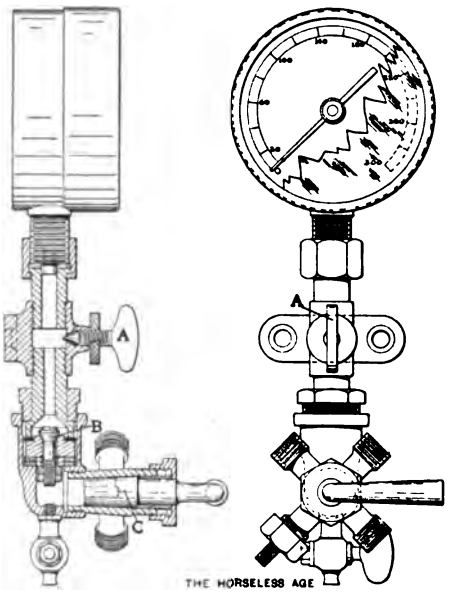
The usual spark and throttle levers are located on a stationary quadrant on the steering wheel, and the lever previously mentioned operates the gear shifts. Operating on the same quadrant is a ratchet pull lever which controls the emergency brakes on the rear wheels. These brakes consist of steel drums 13 inches in diameter by 2 inch face, which are bolted to a flange integral with the rear wheel hubs and are operated on by double acting steel bands with bronze faces. On the inside of the drum is a ratchet arrangement which, in conjunction with a pawl which may be allowed to engage from the seat, constitutes a sprag. The pivot for these brakes is supported on an arm cast integral with the spring saddle bolted to the rear axle, and the radius rod, which is solid and adjustable in length, does not carry the strain of the brake. On each side of the differential on the jack shaft are cast steel drums operated upon by contracting steel bands with bronze faces. These brakes are operated in unison through an equalizing arm by means of the right hand pedal, which, as shown in the photograph, is extremely large. The left hand pedal operates the clutch. Both brakes are inter-connected with the clutch and disengage it.



ARRANGEMENT OF CONTROL DEVICES.

The Gibson Power Indicator.

A novel and interesting testing instrument for automobile engines, the invention of Hugo C. Gibson, an English automobile engineer, at present located at 194 Broadway, New York, has recently been brought to the attention of the American trade. The principal element of the device is a pressure



GIBSON'S POWER INDICATOR.

gauge indicating up to 300 pounds or more per square inch. At the bottom of the gauge proper there are a number of fittings, including an adjustable leak valve A, a check valve B and a four way hand operated cock C, which in conjunction with the gauge permit of rapidly and accurately determining either the explosion or compression pressure in every cylinder of the engine. The action will be readily understood by reference to the accompanying cut, showing two views of the instrument, one of them in section. At each explosion in the cylinder with which the gauge is put in communication by the four way cock, a small quantity of the burnt gases passes through the check valve B into the tube of the gauge, so that in an instant the pressure in the gauge is the same as the maximum pressure developed in the cylinder. The gases escape from the indicator through the leak valve A at a considerably slower rate than they can pass to the indicator through the check valve B, so that the reading of the indicator will decrease with decreasing pressure in the engine and the pointer will return to zero when the communication with the engine is shut off by means of the four way cock. By means of the four way cock the four cylinders of a four cylinder engine can be rapidly tested and any differences in their maximum pressures noted. The compression pressure in each cylinder can be determined by closing the leak valve and turning the engine over by hand with the current off, or by preventing ignition in that cylinder while the engine is still running.

In the regular use of the device, when the engine is running, if the ignition is imperfect and misfires occur, the action of the gauge hand will be erratic, the hand advancing a considerable distance and then slowly returning to the compression pressure. If ignition is perfect, the beat of the hand will be regular and can be adjusted by means of the leak valve. Other defections of the engine are indicated by the device as follows: If ignition does not occur at all the pressure registered by the hand will be that of compression only. If pre-ignition is occurring the pressures shown will be considerably higher than normal, accompanied by "knockings." If the valves or piston rings are leaking the pressures developed will be regular but not so high as usual. If the inlet valves are stuck "shut" the indication will be a very low pressure less than normal compression. If the exhaust valve is stuck "open" the indicator will remain at zero, etc.

The instrument is fastened to the dashboard and connected by four metal tubes to the respective cylinders. It is therefore in constant view of the operator and may be used at any time while the car is in operation. We understand that it is fitted to a number of the motor buses in operation in London, and the engines are periodically tested by a superintendent, whose task is very much facilitated by the instrument. The indicator is in use by a number of leading English manufacturers in their testing departments, and samples have been ordered recently by several American firms. Mr. Gibson is endeavoring to make arrangements for manufacturing the device in this country.

Motor Street Sweeper Competition.

The competition for motor propelled street sweepers in connection with the Milan Exhibition, to which we referred recently, carries two prizes, one of 5,000 lire ($1,000) and the other of 2,000 lire ($400), offered by the municipality of Milan. The conditions attached to this competition are: (1) That the machine must clean the street and collect the mud into a receiver not more than 1 cubic metre in capacity; (2) that it must work equally well on paved, asphalted or macadamized roads; (3) that it must be an automobile, and not require more than two persons to control it; (4) that it must be able to travel fully loaded at a speed of not less than 10 kilometres (6.25 miles) an hour. Entries for this competition, for which there are no fees, can be made until July 31, and every machine competing must carry its sale price. Motor street sweepers have been repeatedly proposed, but have never come into use.



LESSONS of THE ROAD

A Comparison.

By Dr. W. H. Bergtold.

The writer has already reported in this journal (June 18 and 25, 1902) his trials and tribulations and joys with his first automobile. Concerning this first carriage suffice it to say that it was a small 3½ horse power steam runabout model of 1900. It was discarded in February, 1905, after having been in constant use for four years, and after it had been driven a known distance of 24,600 miles, and an unknown distance of many more miles during times when cyclometers failed. For purposes of comparison this car will be considered as having run 24,000 miles. The question of cost of running and maintenance of this car will be considered later on.

In February, 1905, the old car was displaced by a two cylinder opposed "gas" car of the convertible runabout tonneau type, presumably developing under favorable conditions 12 horse power. This car has now been in use a year (and more), and we can therefore use the past year's experience to make a comparison between the two cars.

CAREFUL RECORD KEPT.

Let us somewhat hastily review the satisfactory and unsatisfactory things that befel us in the use of the second car. It may perhaps be not without interest to say that a monthly record has been kept, each month's events, cost, etc., being noted on a single sheet of foolscap (or more sheets if needed), the sheets being bound together on a board hung in the garage; in fact these sheets make an automobile diary as it were. Every gallon of gasoline put into the machine and the mileage for each filling, the date of putting in new dry cells, and the amperage reading of these cells when put in and when "dead," and all such items have been faithfully recorded at once, not trusting to memory for any single item.

The car has been satisfactory in that its wheels, chassis, body, gear, axles and similar parts are still as good as new, and so are the wheel bearings; all these parts wear well, while in the old car there was constantly recurring trouble with the light running gear, and the small balls and cones in the wheels. The new car was run constantly, and for the greater part of ten months was ready for use day and night without the time consumed in "firing up."

Another feature of great comfort was the large gasoline capacity, giving 200 miles or more on one filling. The mileage per gallon of gasoline has also been very satisfactory.

A WIRING WRINKLE.

It was soon seen that the coil (under the seat) was not readily accessible, so a box was made for it, and the combination put on the dash, where one could reach down and adjust the trembler with ease and dispatch. In rearranging the coil the wiring was completely overhauled and rearranged, to which an almost entire absence of electrical troubles may be ascribed. A little "wrinkle" in this wiring may be useful in the future to others; the primary wiring (the new one being of the heaviest flexible house light cable), from the dash to the well under the seat, was threaded through a piece of discarded cloth-covered gas hose. It made a perfect conduit, and one of my friends criticised me for my extravagance, thinking it had been purchased new of electrical dealers. The new secondary wires were of large flexible cables, and the whole arrangement has never given the least trouble. It was found that the ground wire from the battery box to the chassis had to be unfastened each time the body was lifted off the frame, and to do this one had to open the battery box. To obviate this the battery terminal was led to an ordinary telegraph binding post on the outside of the box, and thereafter it was easy to screw or unscrew the ground connection in this binding post without taking off the box cover.

The only trouble with the electrical system, outside of watching plugs and testing batteries, was the occasional breaking of the primary wire going to the commutator. This was finally fixed for good by using a piece of heavy flexible picture wire, threaded through small rubber tubing, the latter for insulation. This has proved a very satisfactory combination, as in this way the constant vibration, to which the commutator primary wire is subject, has no effect.

A VOLTMETER VALUABLE.

It seems almost needless to say that one of the first accessories purchased for this car was a volt ammeter. It has been worth its weight in gold in its help in locating loss of power through poor ignition, etc.; without it much trouble would have been experienced a good many times in eliminating batteries as a source of trouble.

The tonneau, though weighing but 100 pounds, was found to be awkward to handle, so a traveling block and tackle on ordinary barn door tracks was rigged transversely across the garage, and, presto! it was a simple thing to sling the tonneau in the air and push it over into place, all taking but a moment, and being done with ease and comfort. Aside from a soiled plug, or a cracked porcelain, or the need of new plug washers, the spark plugs have given little trouble.

GEAR LUBRICATION DIFFICULTIES.

It has been impossible to keep the transmission (planetary) gear case filled with lubricant. One side plate is not precisely square with the shaft, so that this plate, as it revolves, wabbles as it were, and just enough to allow the lubrication to escape through centrifugal force of the revolving gear. The intention has been to have this plate ground to a fit when the engine had to be taken down, but as this has not yet been necessary the fault is still patent. This leaves the gears somewhat dry at times, and noisy, too.

The gasoline consumption has been very satisfactory, the mileage per gallon never falling below 18, and sometimes going to 26, ordinary store gasoline having been used, and when strained found perfectly satisfactory. The original carburetor was not very flexible, and was also given to "laying down in the harness" at most unexpected and unfortunate times. It did not have the so called compensating devices. The writer devised and attached to it a compensating device, which helped to do away with these troubles. In brief a hole was bored through the two shells of the throttle (this consisting of two cylinders, one revolving on its long shaft inside the fixed outer one) in such a way that when the throttle was fully opened this hole admitted additional air to the mixture, and when the throttle was closed the holes in the throttle cylinders failed to tally, and were to all intents and purposes non-existent. The new air supply was controlled by an automatic (spring) shutter, which admitted more and more air the deeper it was displaced. This device really converted a fair carburetor into one giving much more flexibility and a more constant mixture.

NEW CARBURETOR.

A new carburetor was put on about the middle of August, one of the modern makes, with compensating device. It has been satisfactory in warm weather, giving a good deal more power to the car, but impossible to adjust so as to allow the engine to run slowly when idle; the engine would race or "die," according as one opened or closed the gasoline supply beyond a given point. This is a peculiarity of this make of carburetor, for my friends who use them have the same experience. These two carburetors differ. too, very greatly in the ease with which they start. The old one will start on half a turn of the crank, no matter what the atmosphere conditions may be, while in cold weather the new style was dreadfully slow in starting, balking, no matter what sort of adjustment was made with it, and requiring raw gasoline poured on the intake gauze. Because of this these two carburetors were fitted with similar and interchangeable iron unions, and can now be switched back and forth onto the engine intake pipe in a few moments. The old one has been in use since the cold weather came on in the fall, and will be displaced by the newer one as soon as settled warmer weather comes in.

SOME ATTACHMENTS ADDED.

After our experience with mud and water getting into the carburetor a simple canvas apron under the forward part of the car stopped further trouble from this source. A muffler cut-out has been a useful addition, both to enable one to better watch the engine and to use after dark to wake up

some of the grown up children who stand about in the streets or near corners under the shade of electric lights; it also wakes those who walk along the street after dark, forgetting that a physician has to make night calls once in a while.

After using the car for the first two weeks an inspection showed every bolt holding the engine frame to the chassis to be loose, because no set nuts were used. These were supplied, locked firmly in place, and not a bolt or nut has slipped since then. The copper circulating pipes were joined to the engine, tank and radiator with half unions (if that be the way to designate the connection), and made water tight with rubber washers. Those in the engine and tank connections were constantly jarring loose, leaking enough to soon empty the water tank. The pipes between the engine and tank were cut, and then reconnected by hose, which has obviated the strain on the joints, and the half unions were packed with asbestos wicking, these two changes stopping the leaking and preventing a recurrence of the trouble.

DRY CELLS DETERIORATING.

A careful record has been kept of the dry cells used since last May. A study of this data shows that the cells have steadily grown poorer and poorer in efficiency. It is a constant surprise that such cells can be sold, and that some enterprising firm does not start in and conquer the market. A cell was never accepted at the supply house unless it read well, so we may be sure that as much care is exercised now as a year ago in selecting cells. There can be no question in the writer's experience but that there has been a steady deterioration in the product put on the market by the maker of these cells during the past year. It is right to add, too, that only those cells of most recent manufacture were accepted, i. e., a cell a month old would not do if one made a week ago could be purchased. One can determine this by the marks on the bottom of the cell.

During one spell of hot weather a heavier lubricating oil was used, because the ordinary oil seemed to flow too freely. This heavy oil gummed after a few days' use, and it took several doses of kerosene to purge the engine and get it fairly clean.

Incidentals in the way of clutch adjustments, taking up play in main and crank bearings, have, of course, been necessary, but on the whole these parts have done good service.

COOLING DIFFICULTY.

During the warmer weather the engine failed to cool if the car carried a full load (tonneau and four passengers), especially if there was a rear wind. Everything which might cause overheating was looked for and eliminated, such as water in the gasoline, too rich a mixture, insufficient lubrication and clogged circulation, and the conviction was forced on me that the car was underpowered and the pump too small. The present arrangement of piping from the tank to the engine seems to the writer to be faulty; this, however, can only be determined by trying other ways of circulation, and it will be tested this spring. So long as the weather is warm the lubrication, once adjusted, works fairly well; it is of the so called automatic type, the oil reservoir deriving its pressure from the crank case. It is altogether a wretched apology, and needs constant attention as soon as the oil becomes at all thick through lower temperature. The several checks in the delivery pipes going to the cylinders have had a way of sticking, and so preventing lubrication.

WATER IN GASOLINE.

In September (after seven months' use), while running in one of our parks, the pin holding the commutator cam to the half time shaft slipped out of place, stalling the engine. Fortunately it took but a short time to replace the pin and correctly reset the commutator. The original timer has been replaced by a second similar one. Both were at best miserable affairs, made of fibre, wearing loose very quickly. In November the engine ran badly, missing for some inexplicable reason, but not enough to stall the car. Trial of the engine by elimination forced the conviction that there was water in the gasoline. It then occurred to me that the gasoline tank had not been entirely emptied or cleaned for some months, and that perhaps water had gradually accumulated in it, particularly after the arrival of colder weather, which lessens the solubility of water in gasoline, the water then going to the tank bottom and back through the supply pipe when the car was tilted in going up hill. Be this as it may, however, this missing ceased when a pint of gasoline was drained from the tank, care being taken to have the car tilted, as mentioned above. It is possible that dirt as well as water may have been removed.

After running nine months the inner main bearing could no longer be fully taken up, and shims had to be put next to the brasses so that the adjusting wedge might push the brasses more closely together. About this time two tires began to give out. Good luck had been with all the tires for a distance of 5,100 miles, in all of which time there had not been a single puncture. These two tires gave way simultaneously all along the tread half way up from the rim. I later learned that this is the way all the tires of this particular make go to pieces, so I've shifted to another make. The fabric in the tires seemed to go to pieces all at once, as though it were rotten. Two new tires, complete, have been purchased during the year. A broken commutator spring delayed the game one evening while the writer was making calls; luckily the car came to rest under an electric street lamp, when a diagnosis was promptly made and a new spring adjusted. This was the only spring broken while using the original type of timer. A new kind of timer is now on the half time shaft, and is satisfactory in that it is much more accessible and easy to adjust.

FIRST SHOP REPAIRS.

At the end of ten months' use the car had its first spell in a repair shop. The toggle joint in the expanding brake had broken, and to replace it one-half of the rear axle and compensating gear had to be taken down. Here was the place when a difference in the ease of repairing a moderate weight gas car and light steamer became apparent. There was nothing the writer could not do to the steamer in his own garage, even to tapping a burned boiler or putting in a new one, though the heavy time consuming work on the steamer was done for the writer by the repair shop. When it came to doing this heavy work on the gas car the writer balked. He soon found that a vastly greater amount of time could be charged up in repairing a gas car than in remedying analogous troubles in a steamer. This difference has been rubbed into me ever since, for the car has needed shop attention several times since then. It is only just to say that I have been treated fairly and squarely in the shop where this second car has been repaired; nevertheless it does take an everlasting lot of time at 75 cents per hour to take down, repair, replace and adjust a moderate weight internal combustion engine or its parts. After eleven months' use a link had to be taken out of the chain, and one month later this chain was thrown away, for it showed symptoms of riding on the sprocket teeth, a sure sign a chain is about played out.

The first real trouble occurred with the compensating gear, the side plate holding the spurs laterally in place stiffening its thread, throwing the spurs out of mesh. This happened twice, once while on the road, when it was temporarily repaired by wiring the side plate to the central part through the holes made for the original cotters, which were used to prevent the side plate from unscrewing. This trouble was finally fixed by a set of bolts so placed as to engage both side plate and centrepiece at once. It has stayed in place since then.

DECREASED VALVE LIFT.

In December there was a marked falling off in power, even when running under the most favorable circumstances. Investigation showed that the heads on the rods between the cams and the valve stems had worn so loose that there was a marked loss in the lift of all the valves. These intermediate rods have thistle shaped heads, and abut against the cams eccentrically so that the rod may revolve at each thrust. This throws a side strain on the heads which had loosened every one. A new set of rods was made, the cam end set of heads was

nned and brazed on the rods, while the ad of the valve side was threaded on the d and set tight by a lock nut, care being ken in making all these new heads to give em all the length possible, so as to in-ease their hold on the rods.

COOLING SOLUTION ATTACKED TUBES.

In January (this year) the rear cylinder rew progressively weaker, owing to the alves sticking, apparently due to an excess f lubrication. On a recurrence of the diffi-alty the plug was re-examined, and this me it showed a salty deposit, which tasted ke chloride. This aroused suspicion that ere was a spongy condition or a leak omewhere between the water jacket and. ie intake line. The next day it was found hat, despite liberal lubrication, the rear iston stuck, at times so fast that it could ot be moved. On taking this cylinder off ts inside was found copper plated, as also ere the piston and rings, the latter being tuck fast in their grooves, and were broken n their removal. The chloride solution ad evidently become acid, and had at-acked the copper circulation tubes, the opper chloride which resulted being taken nto the cylinder through a leak between he jacket and the intake chamber, just out-ide the intake valve. This leak was found o be due to porosity in the casting, and was revealed by a fine sweating on the walls of the intake passage in the neigh-borhood of the intake valve, and also in and about the entrance of the intake gas pipe.

AN UNSUCCESSFUL EXPERIMENT.

An effort to close this leak was made by first filling the jacket with a strong solution of sulphate of copper, the jack-et being first cleaned of grease by a soaking with gasoline. After several days' soaking in the copper solution the jacket was filled with a strong solution of molasses in water. After this had been given time to soak into the porous iron the jacket was drained and the cylin-der baked in a hot oven. It was fondly hoped that the porous iron would fill up with molasses, which in baking would be converted to carbon, and so fill up the pores. It was a dismal failure, how-ever, and a new cylinder was sent for and put in. In replacing the cylinder it was found advisable to put in a new wrist pin in the rear piston. The car has not run as well since then.

These, in brief, are the major troubles experienced during the year's use of the car. The minor troubles, i. e., leaking or flooding carburetor, fouling of radia-tor, loosening of keys in the rear wheels, etc., are negligible.

EXPENSES COMPARED.

Following is a tabulation of the total expense of the two cars. Under the head of gasoline is included lubricating oil for both, and for the gas car, also, the cost of dry cells. Gasoline costs in Den-ver 16 to 21 cents a gallon, according to the dictates of the powers that be:

	Steamer. Total, Four Years.	Steamer. Third Year.	Gas. Car. One Year.
Gasoline	$378.95	$115.40	$91.60
Repairs	235.05	22.90	55.30
Replacements.	319.15	232.35	60.75
Improvements	44.00	20.90	20.10
Tires	136.25	59.25	74.90
Miscellaneous.	38.20	5.00	19.70
Total	$1,151.60	$456.80	$322.35
Total mileage.	24,600+	.....	6,400

No attempt will be made here at an exhaustive analysis of these figures, and the reader may study over them as he pleases. It is interesting to note, how-ever, that the cost per mile for the steam-er (not counting depreciation) is about 4 5-6 cents, and including depreciation (which can be determined absolutely, as the car cost $775 and sold for $100), about 7 7-12 cents per mile. The cost for the second car (excluding depreciation) was about 5 cents a mile, and in-cluding depreciation ($250) estimated at 25 per cent. per year; taking the first car as a standard, the cost is about 9 cents per mile. The writer believes that this estimate of depreciation in the second car is too low, if anything, and this is in the car's favor, certainly not against it. The expense figures have not been mini-mized. Every item for both cars has been included, and a fair comparison has been constantly aimed at, and, it is be-lieved, achieved. It may be held that the defective cylinder ought to be excluded in the cost items, as being an unusual and extraordinary expense. If it be exclud-ed (amounting to $59.85 first cost, express and shop work), it brings the total year's cost to $262.50, which gives a cost per mile of 4+ and 8+ cents respectively. Throwing every factor into the balance in favor of the second car, the cost per mile is still in favor of the steamer, as the total cost for the first two years to-gether in running the steamer was but $313.80. The writer was greatly sur-prised when he had finished tabulating these expenses to see how much lower were these expenses for the steamer when compared with the gas car. The gas car cost more to run it the first year than running the steamer the first two years together.

The single year's expense of the steam-er in the table is that of the third year, selected purposely so as to show the car at its worst, a year when a new boiler had to be installed at a cost of $100. A new compensating gear and reboring the cylinders also ran this year's expenses up to the top mark. Yet, in spite of this, the four years' average compares very favor-ably with that of the second car.

CONCLUSIONS.

Of course such conclusions as are here subjoined are drawn entirely from per-sonal experience, and with only two cars; fortunately they are based on a somewhat long period of use, and rather an extensive mileage, though it is regrettable that the gas car has not been used as long as the steamer. In comparing the performances of these two cars it must not be forgotten that the first was a small two passenger steamer, weighing about 800 pounds (gaso-line and water included), of not more than 3½ horse power, and using 2½x28 inch single tube tires. After five years' use of an automobile the writer feels safe in say-ing that the actual running cost, i. e., cost of gasoline, lubricating oil and batteries, is negligible, that is to say, they are the least important items in maintenance. When one is considering the choice of cars, the big items are shop charges, replacements and tires, and it's a question whether the last should not be first. My present car is neither "fish nor fowl." It's too heavy for a runabout, and entirely too low in power as a touring car. A car for my daily use should be of the runabout type, as light as is consistent with good design and staunch-ness, and equipped with the smallest tires useful for the given weight of car. All things equal, my steamer was not one whit more bothersome during the first year than the gas car. There has never been one occasion during this year's use of the gas car when trouble was not located, usually at once.

Nevertheless, the internal combustion en-gine (including all that is implied in this term when the engine is part of a modern automobile) is in reality a delicate mechan-ism, very prone to get out of adjustment, and in so doing its power is reduced, and so is its reliability. It gives one a sub-conscious feeling of unrest and dissatisfac-tion, unrelieved until the engine is once more readjusted. On the other hand with a steamer there are more things to watch, but no more to keep in adjustment, and a steamer is certainly much more sure to keep going with imperfect adjustment.

In other words with a steamer one can limp along and get about with the mechan-ism in condition of extreme disarrangement; an equal lack of adjustment in a gas car would put it out of action at once. Perhaps the writer was unfortunate in the selection of the make of car, or in the car dealt out to him; be this as it may the writer must confess that he would be much puzzled, were he to buy a new car now, as to which type of car to purchase, steam or gasoline, to say nothing of the difficulty in making a choice among the many light runabout gas cars now on the market.

Some months ago automobiles were barred from Hyde Park, London, but it is now officially announced that licenses and badges will be issued by the Commission-ers of His Majesty's Works and Public Buildings for the admission of electric car-riages to Hyde Park between the hours of 4 p. m. and 7 p. m. in the months of May, June and July. The original order was not intended to bar electric cars.

ELECTRIC IGNITION

The Magnetic Vibrator.

The magnetic vibrator as applied to ignition coils has undergone considerable development in recent years. The original hammer vibrator, the invention of which is generally credited to Neef, has too low a rate of vibration, does not break the contact rapidly enough, and is too much inclined to lose its adjustment. All improvements in vibrators have been in the direction of overcoming these defects.

The rate of vibration of an ordinary hammer vibrator depends upon the length of the spring and the mass of its armature, and the most obvious method of increasing the rate of vibration is, therefore, to shorten the spring and to make the armature smaller. A limit is soon reached, however, in this direction, as when the spring is shortened it becomes stiffer and requires a greater magnetic force to pull it away from the stationary contact, so that a bigger armature is really required, instead of a smaller one. That the break in an ordinary hammer vibrator must be comparatively slow is obvious, because the circuit is broken the very moment the spring blade begins to move; the velocity of the spring is at first zero and its acceleration is proportional only to the force of magnetic attraction. In order to render the break more sudden, different expedients have been resorted to, all tending to complicate the vibrator mechanism, yet having sufficient merit to have warranted their extensive adoption in place of the hammer vibrator.

In a number of vibrators the moving part is composed of two distinct pieces, one of which is attracted by the magnetic core and moves through a certain distance before effecting a break in the circuit. This result may be obtained in two different ways. In the first, generally known as the Carpentier type, the piece which is magnetically attracted and which does not carry any platinum contact point, after having moved a certain distance and consequently attained considerable speed, deals a blow to the other piece, a spring blade which carries near its free end a contact point bearing against the platinum tipped

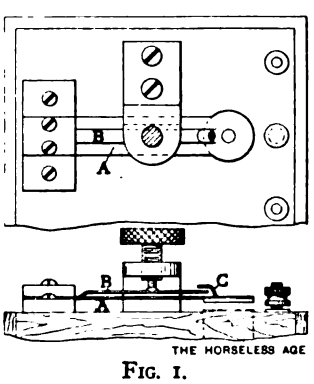


FIG. 1.

contact screw. During the motion of the armature spring, before it strikes the contact spring, a considerable amount of energy has been stored up in the former and a portion of this energy is at the moment the blow occurs instantly transferred to the contact. One particular vibrator of the

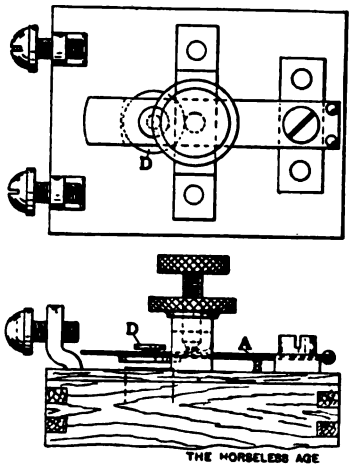


FIG. 2.

Carpentier type is shown in Fig. 1 and another in Fig 2. In the former vibrator the armature spring A is formed with a central longitudinal slot, in or over which is located the contact spring B. The armature spring is formed with a catch C at the inner end of the slot, which engages the free end of the contact spring B after spring A has moved a certain distance, and pulls the contact point on B away from the point of the contact screw. In the type of vibrator shown in Fig. 2 the armature spring B and contact spring A are of the same width and are placed one on top of the other and riveted together at one end, which end is securely held to a block on the coil box by a screw. The armature is in the form of a rivet with one small and one large head; it is securely fastened to the armature spring and its stem extends through a slightly larger hole in the contact spring. The length of the stem is something more than twice the thickness of the contact spring. When the core becomes magnetized it attracts the armature, and the latter begins to move in the direction of the core, bending its spring. When the motion of the armature is equal to the difference between the length of the armature stem and the thickness of the contact spring the small head of the armature deals a blow to the contact spring and quickly and abruptly separates the contact points. The particular vibrator here illustrated is one used by the Autocoil Company.

In the second type of vibrator referred to, known as the Arnoux & Guerre, both contact points are carried upon springs of magnetic material, which both move toward the core when the magnetizing effect first begins. After a certain equal motion, during which the points remain in contact, one of the springs abuts against a stop, which suddenly checks its motion and effects a very abrupt break at the contact points. The device is illustrated in Fig. 3, in which A and B are the two springs, which are both supported at one end and insulated from each other. The spring B is longer than the other and its motion is limited by the stop C. As the break occurs when both springs have attained a considerable speed, it is very abrupt. D is a sort of magnetic bridge, the object of which is to increase the strength of the magnetic field around the spring B, thus insuring that the magnetic attraction of this spring is substantially the same as that on spring A.

There is one theoretical defect in the operation of practically all vibrators, which it has been the constant aim of coil makers to overcome, but which thus far appears to have been found impossible to entirely eradicate. When the current flows into the coil, the core becomes magnetized and attracts the armature, thus breaking the circuit. This may be regarded as the first phase in the operation of a vibrator. Immediately the contact is broken, the magnetism of the core ceases and the armature returns to its original or normal position, re-establishing contact. This is the second phase in the operation. There is, however, still another, a third phase in the action of the magnetic vibrator. Namely, when the contact spring returns to its normal position and the stationary and movable contact points are brought into contact with more or less force, the contact spring is thereby set into vibration and the contact points are prevented from remaining in firm contact for a sufficient length of time to allow the current in the primary winding of the coil to attain its full value; hence, the spark will be small.

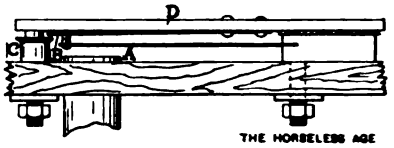


FIG. 3.

A vibrator for which it is claimed that the extra vibration has been practically eliminated is the Nieuport, illustrated in Fig 4. The armature A of this vibrator consists of soft iron one-thirty-second inch thick and has the peculiar shape shown in the drawing. The diameter of the armature is slightly larger than that of the core, in order that it may be traversed by as much magnetic flux as possible. Toward its free end the armature carries the platinum contact point, and on each side a small tip designed to guide the end of the supplementary spring A. The armature is supported by a short steel spring B, which is bolted to a block on the coil box. The supplementary spring C is held between nuts on the stud D; at its middle it rests on the heads of the screws securing the spring B in place, and at its free end against the armature A. The contact screw E passes through a bridge F of soft iron which increases the intensity of

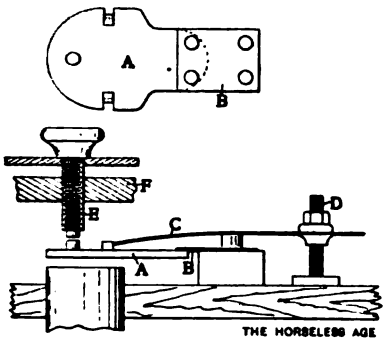


FIG. 4.

the magnetic field in which the armature is located. It is claimed that by extended experimentation such a relative location of the contact point and the tips on the armature has been arrived at that when the armature is set into vibration by the striking together of the two contact points a node is formed at the contact point on the armature, so that it does not move and maintains good contact with the point on the screw until the current has attained such a value that the magnetism of the core overcomes the spring B and draws the points apart. To those to whom the term node is unfamiliar, it may be explained as follows: If two persons at some distance apart hold loosely between them a rope, and this is set in motion by one of the persons whipping his end up and down, the rope will assume a sort of wave form, an experiment that is familiar to all. It is found that certain points along the rope, midway between the crest and the trough of the wave, do not move at all, but remain stationary, and these points are called nodal points.

A similar principle appears to be involved in the design of the bow spring vibrator shown in Fig. 5. Here the contact point is carried by a bow shaped spring B of magnetic material which is riveted to a spring A of non-magnetic material at one end and rests against it at the other, which end is wedge shaped. The spring B carries the contact point slightly to one side of the centre, which may well be a nodal point.

The only means of adjustment with the old type hammer vibrator is the contact

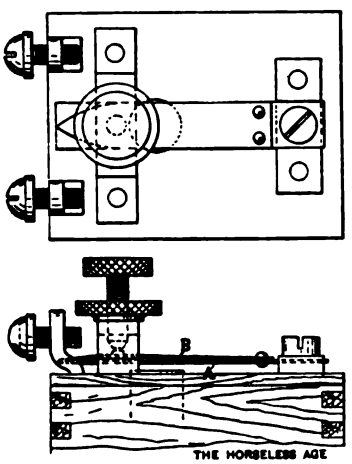


FIG. 5.

screw. When the screw is turned out farther not only is the pressure of the spring reduced, but the armature is moved farther away from the core, which is a disadvantage. The armature in its normal position should be as close to the end of the core as possible and still be able to vibrate, as the magnetic field is densest or strongest near the core, and as the vibrator requires a certain strength of field to operate it, when its armature is near the core, less current is required to supply this strength of field. A method of adjusting the spring tension without changing the position of the contact srew is illustrated in Fig. 6, which shows the vibrator of the Connecticut Telephone and Electric Company. The vibrator spring A is secured to a brass block B mounted on trunnions, on which it can be slightly revolved by means of a tension adjusting screw C. The latter, as well as the contact screw D, is

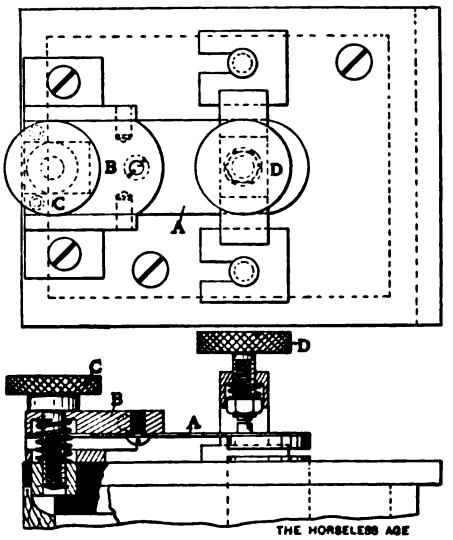


FIG. 6.

locked in adjustment by a stiff coiled steel spring of a few convolutions only. The action of this locking spring is easily understood. It draws one side of the threads of the screw tightly against the corresponding side of the thread in the nut, and the resulting friction between the surfaces in contact prevents the screw from loosening owing to jarring and vibration. Some positive method of locking the contact and adjustment screws in place is very desirable. Among the locking methods employed in connection with these screws may be mentioned the following: The edge of the head is slotted and a spring latch is provided adapted to engage into the slots; the part through which the screw passes (the bridge) is slitted and clamped together tight upon the screw.

The contact screw is generally permanently adjusted at the factory, and all subsequent adjustments are made by means of the spring tension screw only. The ordinary method of making this adjustment is to connect a suitable ammeter in circuit and then turn the screw one way or the other until the coil, while continually vibrating, consumes the current indicated as proper by the maker. The current consumption of coils under these conditions varies between one-half and one-quarter ampere, though some very recent coils are claimed to consume even less than one-quarter ampere.

The Automobile Trade in Canada.

The claim often heard in Canada that the British automobile manufacturer is losing the Canadian trade to the American manufacturer is scarcely accurate. The British maker never had the Canadian field to lose.

In Toronto, where there are more cars than in any other two Canadian cities, the number of English cars already sold is not more than 1 per cent. The American manufacturer has always had the field on account of the nearness and in spite of the duty which was imposed three years ago. With preference of 25 per cent. the British car is now gaining some hold. Canadian buyers of small cars for convenience far outnumber those who buy cars for touring, although the demand for touring cars has been much greater this spring.

At Montreal French cars are much in demand. One firm sold fourteen Clement-Bayard cars at the recent automobile show there.

British and French motor cars have been much criticised because of the narrow gauge, 52½ inches, on account of which they are found rather difficult to operate on Canadian and American roads when not in the best of condition.

United States Consul Ifft writes from Chatham, Ontario, that the establishment of an automobile factory there and the recent automobile show in Toronto call attention to the growing popularity of the motor car in Canada.

During 1905 there were imported into Canada 408 automobiles, valued at $489,000, the previous year's imports having been 362 cars, valued at $317,000. Last year the three concerns operating manufactured and marketed in Canada probably 200 cars. It is estimated that there are now in the Dominion about 1,500 cars. The demand is on the increase, and it is predicted that not only will the importations this year increase, but the home production will probably be 500.

French Speedmeter Trials.

The laboratory tests on instruments entered for the odotachymeter contest organized by the A. C. of France were held on May 3, in the absence of the entrants, while the road trials were to be held on May 9, near Montgeron, in the presence of the entrants. Only eleven instruments were entered, including some of American, German and English manufacture. It will be remembered that Baron Henri de Rothschild offered a prize of 1,000 francs for this contest.

The A. C. A. Two Gallon Efficiency Contest.

By Harry B. Haines.

At last the Automobile Club of America has succeeded in organizing and carrying through another practical competition. That was the verdict of automobilists in general in regard to the Two Gallon Efficiency Contest held on Saturday last, in which high fuel efficiency records were established and a rather convincing demonstration was made of the fuel economy of the air cooled type of car. Pitted against the highest types of water cooled cars, both American and foreign, a 12 horse power, four cylinder, air cooled Franklin runabout secured first place, according to the club's system of classing, and a 24 horse power, four cylinder, air cooled Frayer-Miller car scored second highest.

While giving the A. C. A. credit for originating the test, one naturally hesitates to say anything that is not highly complimentary of the men in charge, but unfortunately there was the usual delay prior to the starting of the contest that invariably characterizes all of the club's affairs. Promptness in starting an event at the time that it is scheduled to start doesn't seem to be regarded as of much importance by the men who conduct these events.

Prior to Saturday notices had been sent out asking the contestants and observers to report at the scales of the brewery in Sutton place, between Fifty-sixth and Fifty-seventh streets, at 10 a. m., and a number of them were on hand promptly. The observers, composed of Columbia College boys and representatives of the various trade journals, were also on hand at 10 o'clock, and all were surprised to find that absolutely no one representing the club or in any way in authority was on hand. It was long after 11 before any of the club officials arrived, and at noon the work of giving the drivers and observers their instructions was just begun.

There was confusion and no end of it prior to the time that the inspectors began their work, and no one seemed to know what to do. Complaints were heard on all sides as to the delay.

The various machines were lined up as they arrived, and the drivers prepared to empty their tanks and carburetors. It was noticed that on a number of the machines special galvanized iron (and in some cases copper) tanks, holding the prescribed 2 gallons had been made, placed in convenient localities over the dashes of the cars, and duly connected with the carburetors. This was done in order to make sure that every drop of gasoline could be fed to the carburetor, and probably ten cars were so equipped. H. K. Burras had a special arrangement on his 24 horse power Berliet. He had placed a cork in the top of his tank connected with a rubber tube, which he could blow through from his seat, enabling him to force every drop of gasoline down to the carburetor.

The much talked of inspecting was finally begun, and was of the most hurried and cursory character. Most of the drivers had drained off their tanks into pails or buckets and thrown the gasoline into the street. Several small fires started as a consequence, and Augustus Post had two slight blazes while draining out his White steamer, but no damage was done. After a tank was drained the inspector was summoned and looked into the tank in some instances, while in others he required that the switch be put on and the motor cranked, and if it did not start all the gasoline was said to be out. A special 2 gallon can was then given the driver, and he was allowed to dump it into his tank. He was then ready to take on his passengers and have his car pushed down to the scales to be weighed.

As a result of this hurried method, Dr. Butler, owner of Car No. 10, the 24 horse power, air cooled Frayer-Miller that traveled 47.9 miles, made a protest to the contest committee concerning the lax manner in which the observers performed their duty, or, rather, as he claimed, failed to perform it. He states that in



Scene at the Weighing In.



Scene at the Start.

veral cases there were no observers oversee the putting in of the 2 gal- ns of gasoline, the practice being to ow the driver to do this himself with- t being watched, the observer not be- g assigned to the car until the tank d been filled and the machine pushed wn to the weighing scales.

Dr. Butler further states that he saw all boys with pails of gasoline that d been drained from the tanks of the rious machines offering fuel to the ntestants at reduced rates.

He maintained that for this reason no al awards should be made on Satur- y's showings, but that the six leading s should compete later in a one gal- ı test under more rigid supervision.

bert B. Hilton, whose Locomobile car veled 25.3 miles, also made a protest the same grounds, and from the gen- l tone of the remarks heard it will surprising if still further protests are : made.

All but six of the seventy-one cars en- ed reported for the start, and one of se, a 16 horse power Reo, driven by ierson Brooks, was withdrawn after ng lined up to be weighed in. This chine is fitted with a double cylinder posed motor, and under the rules its ded weight only counted 75 per cent. the total in figuring the score. The) people had refused to enter any of ir machines, as they felt that the dis- nination between cars having one,) or four cylinders was unfair. They e much annoyed when they learned : Mr. Brooks was going to run the himself in the run and compete inst factory men in other machines t had been specially tuned up for the asion. They therefore sent a repre-



EMPTYING THE TWO GALLON CAN INTO THE SPECIAL TANK.

sentative to the starting point with instructions to buy Mr. Brooks' car outright and drive it back to the salesrooms. After some dickering the sale was consummated and the car was withdrawn.

While waiting for the committee to get busy and start some of the machines most of the contestants visited a corner saloon and bought supplies of sandwiches as well as drinkables. All lunched in the open, and for a time the sandwich business boomed merrily.

The first car to leave the starting point, J. Horace Harding's 10 horse power Renault landaulette, was weighed in at 12:30 and got away, and from that time until 2:40, when the last car was sent off, all was hustle and bustle. The last machine away was No. 52, a 24 horse power Packard, driven by J. B. F. Herreshoff, a brother of the famous boat builders.

Each car was numbered and bore the official flag of the Automobile Club of America, the flag having a yellow ground with a green cross and a red wheel with a white tire in the centre. As each car was weighed in the driver was given two 2 gallon relief cans of gasoline to use on the homeward run, and his observer was assigned to him.

After those actively engaged in the test had started, the press car, committee car, captain's car, a White steamer, and the recording cars started.

The autos were delayed and had considerable trouble in making their way through Fifth avenue, and considerable gasoline was consumed in low gear work and in running the motors while the cars were blocked. The coaching parade and the parade of the Seventh Regiment were both in the way, but the worse delay of all was occasioned when several of the drivers missed their turn at 145th street and went several blocks out of their way and returned, only to run into a jam at the viaduct at 155th street. Here the Speedway parade was in progress, and the police refused to allow any of the cars through the lines, compelling them to make a detour of more than a mile to 145th street and Central Bridge.

The weather had been threatening all day, and when the rear guard of the contestants reached New Rochelle the rain was falling in torrents. The roads were churned into a watery, pasty, muddy mess, and the going was hard and slippery. Skids were frequent, and there were any number of narrow escapes from smash ups. The bad condition of the



GIVING DIRECTIONS TO THE OBSERVERS.

roads no doubt cut down down the mileage of the cars. The heaviest rainfall was met between this point and Stamford.

Special warning was given the drivers not to exceed the speed limit in going through Larchmont and New Rochelle, and all of them were careful. As far as is known there was no police interference or encounters throughout the run.

A number of the cars experienced tire troubles, and the only accident reported occurred just outside of New Rochelle, when H. A. Lozier, Jr., driving the 40 horse power Lozier car, came along. A woman and boy driving in a carriage were coming down the road, and the horse suddenly bolted and turned around. The buggy was turned upside down. Carl Paige's White steamer was nearby, and immediate assistance was given. The horse was held and the women and boy pulled out from under the buggy. Both were bruised but not badly hurt, and were later able to continue. The rig was slightly smashed. After straightening out matters Mr. Lozier continued.

The official checking wagons worked both ways on the route, but it was difficult to keep track of all the machines, and when night fell the greater number of the contestants were stalled along the Boston Post road between Rye, N. Y., and Bridgeport, Conn., awaiting the arrival of the official car to record the distance traveled and give them permission to start on their return journey

Owing to some misunderstanding most of the observers were not aware that under the rules they were authorized to compute the distance traveled and requested to telephone the results to the clubhouse so that the official score could be made out without delay. As a result of this even up until a late hour Saturday night it was impossible to make any official announcement as to who the winner really was. It had been figured out by those at the clubhouse, however, that the 12 horse power Franklin runabout, carrying driver and observer, had made the best showing, having completed a phenomenal run of 87 miles, which brought it to a point about 8 miles beyond New Haven. This car weighed 2,300 pounds, including two passengers and a handicap of 800 pounds, and scored a total of 200.100 points, as figured under the club's special formula.

A 24 horse power Frayer-Miller car, driven by A. Levine, was considered second best, having, with a gross weight of 4,070 pounds, traveled 47 7-10 miles, making a score of 194.953. The biggest of all the starters was a Mack Brothers 50 horse power, four cylinder tourist wagon, carrying nineteen persons, mostly women and children. This car had a gross weight of 10,125 pounds, and traveled 17 6-10 miles, scoring 173.441 points. For the first time in this country a six cylinder car figured in an economy test. The 30 horse power Franklin car was of this type, and carried five passengers, the gross weight being 4,000 pounds. The score was 128.315.

Two single cylinder Orient buckboards were reported to have gone beyond New Haven, while an Indian tri-cycle entered for a certificate only was said to have reached that city on a single gallon of gasoline, filled its tank with the other gallon and was still going on toward Boston. These cars, though, were hardly considered in the same class with the touring cars.

The official scores are most interesting, as they will present for the first time accurate data as to the possibilities of economical operation of gasoline motors. Each observer was required to take oath before a notary as to the correctness of his figures and his reports, and it is believed that in this way absolutely reliable data were secured.

The showing of the air cooled cars was a revelation to most of the contestants. In the line up of cars all of the newest types were represented, and it was possible to note the standardization of lines and general body design that will tend to make an automobile more than a one season machine in the days to come. Faddism has given way to the working out of bodies and motors on the generally accepted lines, and apart from Duryea's centre lever car there were no machines that attracted particular attention as a result of their odd or original body design.

The writer was a passenger in the White steamer, driven by Carl Paige, which, despite the fact that it left the course and was delayed considerably by the parades, covered over 23 miles.

It was the general idea that had the

Score Table of A. C. A. Two Gallon Efficiency Contest.

Order.	Car.	H. P.	Cyl.	Entrant.	Pass.	Gross Weight.	Miles.	Score.
1	Franklin	12	4	Agents	2	2,300	87	200,100
2	Frayer-Miller	24	4	Dr. Butler	5	4,070	47.9	194,953
3	Darracq	20	4	S. B. Stevens	5	3,910	40.2	180,642
4	Berliet	24	4	H. K. Burras	5	4,460	39.1	174,386
5	Mack	50	4	A. F. Mack	19	10,125	17.13	173,441
6	Cadillac	10	1	W. C. Martin	4	2,375	56.5	173,240
7	Franklin	12	4	Agents	4	2,940	58.4	171,696
8	Stoddard-Dayton	30	4	D. W. Pardee	5	4,000	40.75	163,000
9	Queen	28	4	Agents	4	3,960	40.73	161,296
10	Lozier	40	4	Makers	6	5,290	30.28	160,181
11	Frayer-Miller	24	4	Makers	5	4,200	38	159,600
12	Renault	14	4	J. B. Trevor	5	4,200	36.61	153,762
13	Compound	16	3	Makers	5	3,410	45	153,450
14	Darracq	32	4	Agents	4	4,400	34.62	152,328
15	Compound	16	3	Makers	4	3,435	43.5	149,422
16	Renault	10	4	J. Horace Harding	4	4,040	36.83	148,793
17	Packard	24	4	A. W. Chamberlin	6	4,910	30.25	148,527
18	Napier	18	4	Agents	2	3,020	48.75	147,225
19	Aerocar	24	4	Percy Owen	5	4,050	33.8	145,890
20	American Mercedes	45	4	C. M. Bouggy	7	5,240	27.78	145,567
21	Frayer-Miller	36	6	Agents	7	4,855	29.4	142,737
22	Packard	24	4	J. B. Herreshoff	5	4,600	30.54	142,316
23	Packard	24	4	A. R. Shattuck	4	4,380	32.49	142,306
24	Franklin	20	4	R. G. Howell	5	3,520	39.82	140,166
25	La Comete	30	4	W. H. Barnard	6	5,340	26	138,840
26	Locomobile	35	4	A. B. Hilton	6	5,440	25.32	137,741
27	Duryea	15	3	Makers	4	2,020	53.12	135,114
28	S. & M. Simplex	30	4	D. H. Morris	5	4,700	28.64	134,608
29	Franklin	12	4	R. G. Morris	4	2,970	45	133,680
30	Franklin	12	4	F. E. Spooner	4	3,020	44.05	133,031
31	Franklin	30	6	Agents	5	4,030	31.84	128,315
32	Martini	40	4	Agents	4	4,770	26.78	127,741
33	Fiat	20	4	Agents	3	4,140	30.43	125,930
34	Compound	16	3	Agents	4	3,160	39.51	124,852
35	Covert	6½	1	C. D. Van Schaick	2	1,654	73.75	121,982
36	Rochet-Schneider	35	4	C. M. Jacobs	4	4,800	25.34	121,632
37	Renault	14	4	Hugh J. Grant	4	3,980	30.55	121,589
38	Mercedes	40	4	Irving Brokaw	3	4,210	28.63	120,532
39	Columbia	40	4	C. E. Knoblauch	5	5,020	24	120,480
40	Elmore	35	4	Dr. E. Steese	5	4,180	28.2	117,876
41	Darracq	35	4	C. T. Adams	3	4,360	26.81	116,981
42	Oldsmobile	7	1	J. K. Mills	2	1,962	57.5	112,815
43	Winton	20	4	J. P. Channing	5	3,880	28	110,580
44	Hotchkiss	35	4	Agents	5	4,700	23.1	108,570
45	White (steam)	18	2	Agents	5	4,180	25.94	108,429
46	Maxwell	16	2	Makers	5	2,780	36	100,080
47	Cadillac	10	1	L. R. Burne	2	2,046	48.6	99,436
48	Columbia	24	4	C. D. Alton, Jr.	4	3,720	26.28	97,761
49	White (steam)	18	2	Carl Page	4	4,025	23.01	94,627
50	S. & M. Simplex	30	4	J. S. Bunting	2	3,910	24.13	94,348
51	Bliss	40	4	F. C. Armstrong	5	4,940	19.01	93,909
52	White (steam)	15	2	A. A. Post	4	4,170	23.51	93,867
53	Wayne	24	4	A. L. Kull	5	3,800	22	85,600
54	Mors	40	4	J. J. Astor	5	5,290	15.72	83,159
55	Oldsmobile	4	1	L. B. Farmer	2	1,731	45.5	78,760
56	Panhard	12	4	American Generator	4	3,990	19.53	77,925
57	Northern	18	2	J. H. Hammond	3	2,870	25.87	74,246
58	Buick	22	2	H. J. Koehler	2	2,510	28.77	72,212



ANOTHER VIEW AT THE START.

weather conditions and road conditions been more favorable a better showing would have been made, but as it was even the oldest automobile men were surprised at the excellent results achieved.

Good Roads in France.

Consul Brunot, of St. Etienne, writes of the excellent roads in France and the Government method of maintaining them. He says:

France had wretched roads in former times, and this notwithstanding the good example left by the Roman occupation. Indeed, highroad accidents were a favorite stock in trade of the old romancers. Now the roads are not only nearly perfect and good at all seasons, but are beautified by artistic stone bridges and frequently lined with fruit and shade trees. Spasmodic efforts were made to better the roads, mostly around Paris, under Louis XIV (1643-1715), but it was not until about 1775 that the serious work of building great roads of national extent was undertaken, and Napoleon I carried it forward vigorously as a part of his military schemes, uniting frontier points with the capital. Never has the work ceased, except during periods of war, and the more difficult sections, at first left to a more convenient season, are steadily being built, while new cut-offs and connecting links are continually being declared open for service. The roads are divided into six classes, as follows:

1. National roads, built and maintained by the Government, 21,300 miles.

2. Departmental (state) roads, built and maintained by the political divisions traversed by them, 15,700 miles.

3. Principal local roads, traversing two or more townships (communes), are maintained by them with Government aid, 124,000 miles.

4. Secondary local roads, the same as the preceding, except that they are of less importance, and are maintained by the townships under supervision by the Government, 150,000 miles.

5. Minor local roads, still less important than the foregoing and maintained by the townships under the supervision of Government engineers.

6. Rural roads, lanes of small importance entirely maintained by the townships without any intervention or supervision by the Government.

LOW GRADES AND GOOD CONSTRUCTION.

The rules for grades are: National roads, 3 per cent.; departmental roads, 4 per cent.; principal and secondary local roads, 5 per cent., which is the maximum allowed, except in extremely mountainous regions or on the most difficult sections of the less important roads, where there is too little traffic to warrant the expense of reducing the grade to within the rule. The method of construction formerly was to grade the bed level and lay a stone dressing of a depth of 17½ inches in the middle, diminishing to 14 inches at the sides, but experience proved that a better plan was to give the earth bed the same rounded form intended for the surface, and the thickness of the stone layer was reduced to 11½ inches. This is the method now generally followed, and about 8,700 miles of the most recent construction have been built on this plan, the others being macadam roads, built of material found on the spot, and some minor roads of gravel and earth.

MATERIALS AND COST.

The materials used vary with the nature of the stone found in the different localities. A standard of the quality of materials has been established to serve for comparison, and each kind of stone used is given a number, ranging from 0 to 20, which represents its particular value. Porphyries, being the best, are numbered from 10 to 20, while puddingstone, the worst, varies from 4 to 8. In the north central departments medium quality material (8 to 13) has been used, this being better economy than transporting a superior quality from a long distance.

The steam roller is now in general use and permits of repairing the whole width of a road at one operation. The new work is always well watered in advance of rolling. Great care is given to the construction of drainage ditches and their relief by frequent traverse culverts. On grades these gutters are separated into short levels by steps of stone forming a series of miniature waterfalls, by which plan the flood water makes it descend without erosion of the ditch or causing damage to the sides of the road.

The cost to the Government for maintenance of roads, bridges included, averages per mile: National roads, $206; departmental, $180; principal local, $129; secondary local, $57, amounting to an annual expenditure of $31,615,668 for maintaining 311,000 miles, or about 65 cents per inhabitant.

Electric Buses in London.

A demonstration of the working of a self propelled omnibus for public service was given in London on Wednesday, April 18, by the London Electrobus Company, Limited, 17 Cockspur street, S. W. The vehicle is arranged to carry thirty-four passengers, and weighs 7,000 pounds. It is propelled by an electric motor arranged underneath the driver's footboard, the motion being transmitted by chain gearing to a longitudinal shaft, which in turn operates a live axle through the usual bevel wheels and differential gear. The motor is said to be capable of developing 14 horse power for a prolonged period, and its speed is regulated by means of a controller. Current is derived from a battery of forty-four Oppermann cells slung underneath the frame of the omnibus, which are said to have a capacity of 300 ampere hours, and can be readily removed and replaced by a fresh set. The batteries weigh about 2,600 pounds, or rather more than one-third the weight of the vehicle. If worked to their maximum output, it is said that these cells would provide sufficient energy to propel the omnibus about 50 miles; but the introducers do not intend to run them more than half this distance on one charge. The chassis is of French construction. The prospectus of the company, in which an estimate of a total expense of 18 cents per vehicle mile is given, has been subjected to rather severe criticism, only 6 cents per vehicle mile being allowed for battery maintenance, which is thought to be entirely insufficient. Karl Oppermann, a storage battery expert, disclaims any connection with the new company.

COMMUNICATIONS

A Traveling Salesman's Experience.

Editor HORSELESS AGE:

Only a few years ago an automobile was a curiosity in North Dakota. Only a few rich people could own one and in many of the small towns the arrival of a "horseless carriage" was an event talked of for the next month. I was working in North Dakota for a patent medicine manufacturer who conceived the idea that an automobile would be about the best advertising proposition that he could invest in. He purchased and had forwarded to me the first steam runabout that ever came into North Dakota. Then my troubles began in earnest. When we unloaded IT from the car I was as proud as a "kid with a new red wagon," but before the summer was over I envied the travelers who could ride on the freight trains. We had a tin can made in imitation of a bottle, with the name of our cough medicine painted on it. This we fastened to the dash and used to carry our extra supply of gasoline.

Ours was a machine that took two men to run and kept them both busy. The book of instructions had it figured out differently. It had a picture of a machine gliding along a beautiful country road. The gentleman driving was steering with one hand, while busily pointing out the beauty spots of the surrounding country to his lady companion with the other. I tried the "one hand" act the first day out, while looking back, and it took me over an hour to get the machine out of the ditch.

We were well paid for the troubles of the road, however, every time we struck a town. The first small boy that caught sight of us would be dumb for a moment, then with a yell he would form the lead of a constantly increasing procession of boys, dogs and not a few "grown ups," who would escort us to the hotel and then stand around the machine every minute of the stay in town. Every horse we passed would try to climb a tree, or anything to get away from the strange "rig," which generally got us a cussing from drivers. Taking it altogether, we attracted as much attention as a circus. We always took our prospective customer out for a ride and very seldom failed to secure an order.

The liverymen did not take kindly to our machine, and even at the present day our Western liverymen are not to be relied on by automobilists for information in regard to roads near their respective towns. I have had them tell me that a road was good and then find it impassable for a machine time and again.

From a business standpoint that old runabout was a success. I got orders. I also got tired. When night came and I had cleaned up I was always ready to sleep.

North Dakota is an ideal State for automobiling for about six months in the year. Our roads are fairly level and well graded. In a few years all the small coulées will be bridged. At present small sloughs that are easy for a team to drive through are as bad as a stone wall to a machine. I have made trips all over the State selling goods, sometimes with good luck with the machine, sometimes with poor luck. I have tried it acting as my own driver and gave that up, as the work was too hard. A salesman must be feeling fairly fresh and good when he calls on a customer if he expects to do business. He can't do it and drive an automobile all day. The strain is too much. I have had a man with me to attend to the machine and made the most successful and pleasant trips one could wish for. H. E. PAYNE.

Carburetor Capacity.

Editor HORSELESS AGE:

Other readers than myself would doubtless be very much interested to see in your columns a discussion of the following questions:

What relation should exist between the size of the carburetor and the size of the cylinder supplied by it?

To what extent does the length of piping connections affect the capacity of carburetors? C. WADSWORTH.

[The size of the air passage through the carburetor should be proportional to the quantity of combustible mixture the carburetor must deliver per unit of time of the duration of the inlet stroke. The speed of the mixture through the carburetor may be taken at 6,000 feet per minute. From the piston stroke and the revolutions per minute the linear piston speed may be found. Multiplying this by the square of the cylinder bore and dividing by 6,000 gives the square of the diameter of the passage through the carburetor.

The length of the piping connections does not appreciably affect the capacity of a carburetor, but has an effect on its operation. If the inlet pipe is moderately long and located close to the cylinders it aids in the production of a thoroughly gasified and uniform mixture, while if the pipe is very long and exposed, the gasoline in cold weather tends to recondense on its way to the engine.—ED.]

Tests on Two Cycle Engines.

Editor HORSELESS AGE:

The results of the tests on two cycle engines by O. V. H., published in your issue of May 2, 1906, are very interesting. O. V. H. says: "Perhaps it has not been my good fortune to have had one of the best forms of two cycle engines," etc. It seems to me that the engine used for the tests published must have been of unusually good form. The development of 9 brake horse power by a single cylinder, 4½x4½ inch engine is not only fair but indeed phenomenal.

It seems that the advantage of a full stroke of the piston for the inlet of the mixture over that of "only a short portion of the piston stroke" has been demonstrated by the above test, and it is very gratifying to know that 2 horse power were gained by allowing the engine to take in a charge into the crank case for a full stroke, instead of only for a short period, as with the original three port construction. The engine, after the change had been made, developed 9 horse power, and therefore produced only 7 horse power before, which shows a gain of 30 per cent. in favor of the full stroke intake.

While the change mentioned allowed a considerably longer time for the new charge to enter the crank case, it did not increase the length of time for this charge to enter the cylinder, which, under favorable conditions in two cycle engines, is only about one-third the length of time of that in the four cycle type. It has been further stated that part of the new charge goes out with the old. This is undoubtedly true, and thereby the charge which enters the cylinders in this type of engine is reduced still more.

Taking these statements as a basis, the charge of a four cycle engine for these reasons alone must produce 30 per cent. more power than the one taken in by the two cycle type. This corresponds pretty well with actual conditions, though the figures from which this result was obtained are undoubtedly greatly exaggerated. This is shown by the following simple calculation.

A very fair value for the mechanical efficiency of two cycle engines is:

$$\frac{\text{B. H. P.}}{\text{I. H. P.}} = \frac{70}{100};$$

then we have

$$\text{I. H. P.} = \frac{100 \times \text{B. H. P.}}{70}$$

or, in the case under consideration,

$$\text{I. H. P.} = \frac{100 \times 9}{70} = 12.86$$

as the indicated horse power developed by this engine.

Further,

$$\text{I. H. P.} = \frac{P \times l \times a \times n}{33000},$$

or

$$P = \frac{\text{I. H. P.} \times 33000}{l \times a \times n},$$

or, by substitution,

$$P = \frac{12.86 \times 33000}{.375 \times 15.9 \times 900} = 79 \text{ pounds},$$

in which P is the mean effective pressure in pounds per square inch.

Seventy-nine pounds mean effective pressure would be unusually high for the average four cycle engine with a clean exhaust and a full stroke for the intake, using gasoline as fuel, and cannot be obtained in the present engines of the two cycle type. In the case mentioned the mean effective pressure was very likely

irer 45 pounds. Substituting this value the formula we obtain

$$\text{I. H. P.} = \frac{P \times l \times a \times n}{33000}$$

$$= \frac{45 \times .375 \times 15.9 \times 900}{33000}$$

$$\text{I. H. P.} = 7.25$$

or, B. H. P. = .70 × I. H. P. = 5

Even this could only be obtained under ry favorable conditions.

J. C. LIEBHARDT,
Instructor at the New York School of Automobile Engineers.

Racing Engines Injurious.

litor HORSELESS AGE:

Having noticed that it seems to be the neral practice among many chauffeurs, ile "tuning" up automobile engines, to e them to the limit, I am interested to ow whether such a method is not in- rious to the engine. Many engineers to iom I have spoken on this subject tell : that the idle racing of any engine is d practice, but the fact that it is so mmonly done in nearly every garage ids me to wonder if the automobile en- ne is an exception. I would like to get ur opinion on the subject. W. A. R.

[Racing engines is a bad practice, as it its unusual strains on many parts of the gine, particularly the reciprocating parts, id tends to wear them out prematurely. he strain on the connecting rods and lve mechanism, for instance, increases ry rapidly with the speed. The reason any drivers habitually race their engines tuning them up is undoubtedly that they) not logically consider the results, think- g that if the engine does not go to eces while being run at a high speed of volution it can do no harm. The harm,)wever, is in the shocks or hammering)me by the parts, which is very much eater at high speed than at normal speed, ese shocks resulting in the crystallization the parts and their eventual breaking.—D.]

Opportunity in Argentina.

ditor HORSELESS AGE:

Argentina offers a wonderful field for the itomobile industry. I would buy and sell achines if I could get one with high wheels, olid tires and 5½ foot gauge, as pretty ar all vehicles in this country are of broad auge. The roads are soft and the cart its deep. I could not get anything to suit ese requirements on my visit to the St. ouis Exposition; but now I see that build- rs are increasing the size of wheels, as ell as inclining toward solid tires.

HERBERT OLSON.

Properties of Gasoline.

ditor HORSELESS AGE:

If you have the information asked for elow I would consider it a great favor if ou will give it to me at your earliest con- enience.

To how many times its own volume does liquid gasoline expand when vaporized?

If the pressure before ignition and the cubical contents of the containing vessel are given, how is the pressure at time of combustion found? In what ratio does the pressure decrease in regard to the increase of the size of containing vessel, as is the case of an engine cylinder? In what ratio does the pressure decrease in regard to time with constant volume? Have you a formula which deals with both time and increase in volume? M. G. CHASE.

[Gasoline is not an absolutely definite product, but a mixture in various proportions of several hydrocarbons, including pentane, hexane, etc. Also, the volume of gasoline vapor increases rapidly with the temperature, so that the ratio of volumes of gasoline in the liquid and gaseous states, respectively, is a function of the temperature; it is also a function of barometric pressure. For these reasons it is impossible to give a general answer to your first question. A definite answer can, however, be given by specifying the quality of gasoline, the temperature and the atmospheric pressure. One kilogram of gasoline (of .663 specific gravity) vapor at 0 degree centigrade and 760 millimeters of mercury atmospheric pressure occupies a volume of .254 cubic meter and 1 kilogram of liquid gasoline of the same grade occupies a volume of .00146 cubic meter. The ratio of volumes is therefore

$$\frac{.254}{.00146} = 174.$$

The explosion pressure for a given compression pressure can be found from a curve by E. J. Stoddard, published in THE HORSELESS AGE of May 9, 1900. The pressures so found are, of course, only approximate, as the form of the combustion chamber and its volume, the point and period at which the spark occurs and other factors affect the result.

As to the decrease in pressure with increase in volume, it has been found that the relation between volume and pressure during the working stroke in a gasoline engine is approximately represented by the equation

$$\left(\frac{v^1}{v^2}\right)^{1.35} = \left(\frac{p^2}{p^1}\right)$$

This equation has been arrived at by measurements made on actual engine diagrams and takes account of the heat loss through the cylinder walls. Some experiments relating to the loss of pressure with time, of a gasoline vapor mixture exploded in a closed cast iron vessel, were described in our issue of October 23, 1901.—ED.]

Solid Tires.

Editor HORSELESS AGE:

I do not desire to join the "Kickers," but I would like to ask the opinion of your readers concerning an experience of mine in regard to the tire question. I have had both steam and gasoline cars, and will say that I have had wonderfully good luck with both cars, the only serious troubles having been caused by the tires. Being a busy man and not a rich one, these troubles have been so vexatious that I have made up my mind not to buy a car this season unless there is a way to eliminate this tire trouble. I have been very much interested in a well known make of solid tires, and been doing quite an amount of investigating on the quiet, and the reports received from persons who are not interested in recommending them, other than a desire to help solve this great problem, proved so very encouraging that I went to Boston and interviewed the firm, and this ended by a demonstration of the tires, on a four cylinder gasoline car, the tires on the rear wheels having been run twenty months and those on the front wheels one year. This car did not belong to the company but to a private individual, a prominent Boston man, who was going to Lexington on a business trip and offered to show me what he thought was comfort in driving a car: Freedom from punctures. There was no more vibration, and from the way the car ran there was no crystallization of the axles, nor did the steering post become loosened and the radiator fall to pieces, all of which would happen according to an automobile agent of whom I wanted to buy a car if he would change the tires. He refused to allow this, declaring in the same breath that it made no difference to him what tires anyone used. I came home without a car, and would like to hear from someone who has tried these tires. There must be some good in them, as the company have just increased their capital stock another $100,000.

INVESTIGATOR.

Balancing an Engine.

Editor HORSELESS AGE:

Being a constant reader of THE HORSELESS AGE I take the liberty of asking you a few questions in regard to my engine. How should the different parts be balanced so that the engine will not vibrate? I have a single cylinder engine driving my runabout by a direct drive with chain to the rear axle, and for some time past I have noticed that at high speed my engine shakes the car very badly. I have not changed anything, except that I have taken up the bearings on the main rod. When first used the engine did not shake the car at high speed, even when standing, but I can scarcely run it at all when standing, and when on the road I can scarcely hold the steering wheel when running, say, 15 miles per hour.

Will you describe in THE HORSELESS AGE how to proceed to find out the trouble? I am aware that the flywheel must be in perfect balance, and that there must be counterbalance for the main rod, but I am at a loss to know how to get at the balance of the parts. W. D. LEGG.

[Ordinarily when a single cylinder motor is allowed to race it shakes the car very badly, and there is no remedy for this. If there is no vibration under these

conditions there is most likely something the matter with the engine, and it will not attain very high speed when the throttle is opened. The vibration may be minimized, however, by balancing the moving parts as completely as possible. The flywheel should be tested by mounting it on a shaft and placing this on runners (perfectly straight and horizontal iron bars). It may be balanced by drilling holes in the rim near the point where it is heaviest. The crank shaft is balanced by securing weights to the crank arms extending in the opposite directions to the arms, and can be tested by mounting the shaft on runners. With the arms in a horizontal position, the connecting rod loosely adjusted on the crank pin and the piston end of the connecting rod suspended at the same height by means of a cord, there should be no tendency for the crank shaft to turn.—ED.]

Small Versus Large Wheels.

Editor HORSELESS AGE:

While reading the recent discussion as to the relative merits of steam and gasoline cars, it occurred to me that if the discussion could be diverted to another subject—to a question that affects both systems—it would be more likely to be productive of results that might be beneficial. In my opinion the wheels on all systems are too small. And I would like to inquire how the present custom among the various builders as to size of wheels has been arrived at. In the first place, there appears to be no standard, sizes varying from 28 inches to 36 inches, and perhaps larger, but if so, I have not noticed any, with the exception of one or two solid tire wheels. Have any builders used large wheels and afterward discarded them for a smaller size? That question is asked because in many lines of manufacturing a mean is arrived at after a trial of extremes, as, for example, the weight of the bicycle. At first it weighed 35 pounds, afterward it was reduced to about 18 pounds. The first was too heavy, the second too light, and now they are all made at about the same weight, which is the result of the experience in the two extremes. At first most wheels were 28 inches. That seems to be regarded as too small, but are we to conclude that the present sizes are large enough? I realize the additional strength that would be required in wheels if they were 48 inches in size, to withstand the side shocks and driving strain, and the added size of the differential case that would be required if shaft drive were used; but could not these difficulties be overcome? Certainly the latter objection would not apply in cars with the side chain drive. My own experience, covering five years' driving with four different makes of cars, teaches me that a car with 36 inches or smaller wheels cannot be driven over the stone pavements and across the street car tracks, with which our American cities abound, at slow speeds with anywhere near the same degree of comfort that the solid tired wheels of cabs and buses allow those vehicles to be driven. During the past winter, at a town in southern France, where a large number of the best makes of touring cars of Europe were driven on the streets daily, I took pleasure in watching the effect on the various cars while crossing a certain street on which there were four street car tracks and a stone pavement. By watching the passengers I could judge to some extent as to how much of the jar was communicated to them, and while the placing of the seats, the spring suspension, etc., enter into the problem, I thought that I could see that there was a great advantage in large wheels. The automobile that made this crossing with the least noticeable effect on its passengers was a front driver electric cab of European make, with rear wheels that I judged to be at least 46 inches in diameter.

I have observed that where a horse-drawn truck is replaced by an automobile truck the wheels of the automobile are usually about one-half to two-thirds the size of those on the former, and that, too, in the face of the fact that the load is to be pushed rather than pulled.

My object in asking the above question is to gain some information as to why what seems to me to be an almost universal demand among users for larger wheels is disregarded by builders. W. W. M.

A. C. of Detroit.

The A. C. of Detroit elected the following officers at its recent annual meeting: President, Edwin S. George; first vice president, C. A. Du Charme; second vice president, Harry G. Hamilton; secretary, Harry Skillman; treasurer, Louis Hamlin Case; consulting engineer, Samuel J. Serrell; directors, Geo. S. Hodges, Authur Pack and James H. Flinn; chairman of house committee, Arthur Pack; chairman of committee on contests, runs and tours, George L. Fleitz; chairman of committee on laws and ordinances, D. M. Ferry, Jr.; chairman of committee on good roads, C. G. Edgar; chairman of entertainment committee, George S. Hodges.

The club will soon occupy its new home overlooking Pine Lake. An effort will be made to have Wayne County receive more benefit from the State good roads appropriation, and the club will also endeavor to have signboards erected at important cross-roads. The next Legislature will be asked to frame a bill making it a misdemeanor for a chauffeur to use a car without the owner's knowledge.

The club now has 188 members. The annual dues were raised from $10 to $15.

Worcester Hill Climb.

The annual hill climbing contest of the Worcester (Mass.) A. C. will be held on the Dead Horse Hill, Worcester, on May 24. The management of the affair has been put in the hands of Chester I. Campbell, 5 Park square, Boston, with whom entries should be made. The hill is 1 mile in length and varies in grade 8.3 to 12.2 per cent. There will be less than twenty-two events if entries received for all. Some are reserved amateurs, while others are open, the classification being based on motive power, weight and price. The timing will be done with apparatus furnished by the Electric Company.

Foreign Notes.

The first two automobiles for the German army in Southwest Africa shipped from Hamburg recently, in charge of Captain Stillfried.

At the small inventors' show held in Paris recently the grand prize was awarded to M. Burtart for his gasoline carburetering methanism, described in our issue some weeks ago.

Persons in Germany interested in cremation are advocating the use of automobiles for transporting corpses to the crematories, to reduce the expense of shipping them by railroad.

No less than eighty-six entries have been received for the speedmeter competition of the Mitteleuropaischer Motorwagen Verein, including both finished instruments and drawings. The devices were publicly exhibited at the Charlottenburg Technical College April 9-21.

Owing to the unexpectedly small number of entries received for the Eastern Circuit the time limit for entries without extraordinary fees has been postponed one week, till May 20. A total of forty-nine entries had been received according to latest reports, including that of Percy Pierce of Buffalo.

Several French papers are printing an advertisement in which it is offered to sell at once 100 cars of any and all makes, ranging in price from $500 to $3,000, for export to South America. Special attention to the advertisement is called by U. S. Consul Ridgeley, of Barcelona, for any commercial suggestion it may convey.

Many French automobile manufacturers are at present suffering delay in the execution of their orders by reason of the general strike now on in Paris and suburbs. Our contemporary *L'Automobile* was unable to appear last week for the same reason, but the publishers in a circular letter assure their readers that the missing numbers will be published as soon as the strike is over.

An English writer claims that automobiles in proportion to population have more use in Buenos Ayres than in any other city of the world. Not only is the service of public motor cabs and heavy vehicles are also great. Every Minister in the country is said to possess several motor cars, while the Minister of Public Works has recently voted a sum of 1,000,000 francs toward the improvement of the roads. It is to be noted that no actual figures are given

A Real Endurance Test.

By Dr. S.

There are certainly occasions in which he horse is superior to the automobile, uch as deep mud, sand or snow, but when t comes to endurance the automobile is still he victor. To all who did not believe in he future of the automobile the San Fran:isco fire was the best of object lessons, in hat it established the superiority of the au:omobile as a utility vehicle beyond any loubt. The most stubborn adversaries of the automobile are now full of praise as to the excellent work done by the automobiles and their drivers. In fact it is recognized that the automobiles of San Francisco were instrumental in saving that part of the city which is still left. With the automobile only was it possible to carry out a systematic blasting along Van Ness avenue, which prevented the flames from spreading beyond this street and destroying the residence district. This truth is undeniable, and even the daily newspapers—not always friendly toward the automobiles—are printing long articles of praise.

A short time after the earthquake, which occurred at 5:16 a. m., and lasted forty-eight seconds, automobiles were tearing up and down the streets. These streets were littered with débris, fallen stones, bricks and pipes, making driving extremely hazardous. Women and children, hardly dressed, carrying a few effects, fleeing from the city to the ferry, railroad or to the park, were the first passengers of these machines. Later on it was mere sightseeing. People whose houses were little damaged were out in their machines viewing the damage done by the big shake to building and streets. Soon the automobile came into real service. The fire had started and threatened the industrial, business and banking centre in the downtown district.

The owners of machines, living in the outlying districts, were going at railroad speed through the crowded and littered streets, looking after their individual interests. Soon one could see them return loaded with books and ledgers, typewriters and small safes, and everything worth saving. From minute to minute this mad rush and the number of machines increased, bringing out women and children and their valuables in safety.

Following the burning of the extreme downtown section of the city the automobiles were seized by the authorities and pressed into service. An adequate conception of the work done by the automobile during the first week of the disaster can probably be gathered from the following paragraph, which appeared in the San Francisco *Chronicle:*

"That the automobile played an all but indispensable part in the saving of the western part of San Francsico, and at the same time has proved invaluable in the serious business of governing the city through its greatest stress, is conceded by every man who has had his eyes open during the ten days or so that have elapsed since the earthquake. Old men in the bread lines, who had previously occupied much of their time in supper table denunciation of the whizz wagons, now have nothing but praise for them. Men high in official service, who know best of all just how efficient has been the service of the gasoline and steam machines, go even further and say that but for the auto it would not have been possible to save even a portion of the city or to take care of the sick or to preserve a semblance of law and order."

"The auto has been the salvation of San Francisco," said a business man—a business man whose business is not the sale of automobiles. Now that the impressing of private machines into public service has been stopped by official order, it is possible to look back calmly upon the first week that followed the earthquake and to view the benefits resulting from a summary seizure of machines by officials. They were devil wagons turned into chariots of mercy. When fire threatened the Mechanics' Pavilion, which had been made an emergency hospital and was taxed to its capacity with the influx of sick and wounded, automobiles rushed to the rescue and conveyed the patients to a place of safety. It is no exaggeration to say that the saving of the lives of many of these patients was due solely to the automobiles. It is probable that the number of automobiles seized for the public service was about 200.

The saving of life was, of course, the most important service rendered by the machines, but the incalculable good effected in the preservation of property cannot be overlooked. It was the automobile which carried the dynamite from place to place—rather a ticklish job at best—but performed with expedition and dispatch by the cars temporarily impressed into the public service. When the water was all gone and the fire laddies had nothing with which to fight the advance of the flames dynamite was necessary. That they were able to secure it at all was due to the autos alone.

The doctors in the service of the Red Cross Society found the auto not only a handy but an indispensable means of getting around from place to place. The relief workers, in the transportation of supplies, also found that they could get around with urgently needed articles of food and clothing much more readily than by any other means of conveyance. The officials of the city, in speeding here and there in the performance of their duty, would not have been able to cover the ground or do half the work they did if it had not been for the automobiles.

At present, when affairs are settling down more to a routine basis, the machines are still rendering service which cannot be calculated in dollars and cents. Until street cars are running again over all the lines they will continue to be indispensable.

The providing of gasoline for these machines was a problem at first which had the drivers guessing. The Standard Oil Company came to the rescue, and the much maligned concern since the earthquake has furnished gratis to drivers and owners all the gasoline that was needed. In all it is estimated that nearly 15,000 gallons of gasoline have been used.

The substitution of police whistles for honk-honk horns and the long, wailing screech of the newer brand of warning to pedestrians have been noticeable every hour of the day since the big shake-up. Both the police whistle and the wailing screecher have evidently done their work, for while the autos have chugged along with no limit on the speed permitted, accidents have been fewer than in the days before the fire.

This fact has demonstrated that the speed limit of 8 or 10 miles is ridiculous, because an automobile at 15 miles an hour is safer than a horse at half that speed. It should not be forgotten that the machines were traveling from 25 to 35 miles an hour (speedometer) through streets covered with débris, packed with panic stricken people, carrying trunks and their belongings and amidst all kinds of vehicles. I am not in favor of high speed, but if the speed limit of 8 to 10 miles would be changed to what is called "a reasonable" speed under certain circumstances, we would have a "reasonable" law.

To come back to endurance. There have been before non-stop runs of 1,000 miles on the track, but the enormous strains to which tires, frames and the whole mechanical outfit of the automobiles in San Francisco have been put, proved to be the severest test. And the automobiles stood this test most brilliantly.

Fortunately there were three garages which did not burn out, and Government headquarters were established in them. Orders for gasoline, oil, tires and batteries were issued, and even repairs were speedily effected. This system has worked admirably well.

There has been some talk among the trade of holding a big parade around the city after the strenuous times have subsided. It is proposed to take out the machines just as they are, with their battle scars. The San Francisco endurance test is undoubtedly the greatest advertisement the automobile has ever had.

A system of parcel post (express goods) delivery by motor wagon is soon to be established in the West Riding of Yorkshire, England. Leeds will be the centre and the routes will be on the roads to Huddersfield, Bradford, Harrogate, Wakefield and Pontefract. The first of the motor wagons was started in service some weeks ago between Leeds and York.

The Berlin Street Railway Company will place ten gasoline motor omnibuses in service at the end of September, and ten more each month until a total of 500 is reached. The order for these buses has been divided between the Daimler works at Marienfelde and the Neue Automobil Gesellschaft of Berlin.

COMMERCIAL APPLICATIONS

Motor Trucks at New Haven, Conn.

Elm City business men have been skeptical regarding the motor truck, and have been watching with critical eyes the performances of the few commercial vehicles that have been in use there for the past two years.

The experiment of the Booth Express line between Wallingford and New Haven has probably awakened the most interest.

Last summer Mr. Booth purchased an 18 horse power gasoline truck, and since that time it has made two trips daily (winter months excepted) between New Haven and Wallingford, about 15 miles. That makes the distance covered each day about 75 miles (including runs about the two places), or about 450 miles a week.

Although Mr. Booth previously ran two double truck vans between these towns he now lets the motor do the bulk of the work, while one horse delivery teams meet it at each end and distribute the packages. It is estimated that it costs about $1 a day to operate the truck, including lubrication.

Repair expense was heavy during his first few months, but Mr. Booth says that this was due to inexperience. A man should have a year's experience with a motor truck before he can make it both a money and time saver, he says. After the past ten months' experience he can operate his motor truck at small expense. He believes that the commercial vehicle dealers are largely responsible for the hesitation of business men in adopting commercial vehicles, as they charge so much for small repairs and for machinery parts. He is considering buying more cars and doing away with the horse vehicles.

Another commercial vehicle which has been watched with interest, especially by the larger firms, is the 4 ton electric truck of F. B. Smedley, of the large trucking firm of that name. This truck has been used daily for two years for carting heavy freight all over the city, and it has proven a great success. Mr. Smedley is greatly pleased with his experiment with this car, and will soon instal other trucks.

The Chamberlain Furniture Company and the Dillon & Douglas Company, a large butter and egg firm, have experimented with motor trucks during the past year rather for advertising than for economy, yet the machines have done such effective work that both firms express their pleasure at having purchased them.

They complain, however, that the machines are not durable, and that repairs have caused large expenditures.

Several large dry goods houses in the Elm City are thinking of buying motor delivery wagons.

Motor Transit Lines in Wisconsin.

The Wisconsin Auto Transit Company began running motor buses between Algoma and Kewaunee, Wis., the latter part of April, and will open the line from Kewaunee to Manitowoc about May 15. The towns of Michicot and Two Rivers will be on this line.

It has been decided to establish lines from Manitowoc to St. Nazianz, Kiel, Chilton and Elkhardt Lake, the summer resort, as soon as possible. A double trip will be made to each place daily.

If business warrants it motor trucks will be operated for the transportation of freight and express. Every effort will be made to extend the service in Manitowoc, Kewaunee and Calumet counties wherever communities desire it.

The regular passenger fare will be 4 cents per mile. Ticket books good for 333 miles will be sold for $10, half to be paid as soon as the line is in operation and half thirty days later.



Carter Delivery Wagon.

Automobiles for Springfield (Mass.) Fire Department.

The Fire Department Committee has recommended to the City Council of Springfield, Mass., the purchase of two automobiles, to be manned by several men each, and to respond to all alarms. No order has as yet been made providing for the adoption of the ideas contained in the committee's recommendation, which is as follows:

It is the opinion of the members of this committee that two suitable motor wagons manned with six or eight permanent firemen each, stationed at convenient points (which could probably be done without any building expense), answering every alarm, would arrive at the most distant box ahead of the chief or deputy (if using horses), and be available for reinforcement to any piece of apparatus on its arrival, and thus be of more real value than three times their number apportioned to the several companies, and only responding to a limited number of boxes. We believe from twelve to sixteen permanent men and two automobiles, responding to all alarms, would be as efficient as from thirty to forty permanent men by the other method, and better than fifty call men, employed in various shops and many times depending upon telephones to give them their notice of a fire. * * * We also believe that in the near future it will be found advisable to supply the chief and deputy with reliable motor wagons in place of horses. We admit that this would be a radical departure from the customary methods of the past, but, judging by the trend of public opinion, we are convinced that we are justified in recommending a test of the plan.

The Winchendon (Mass.) Motor Bus Line.

The Winchendon Auto Transit Company announce that on May 15 they will begin the operation of a motor bus line between Winchendon, Winchendon Springs, Waterville and Baldwinville, Mass., and Lake Monomonac and East Rindge, N. H. They have purchased three gasoline buses, one carrying eighteen passengers and the other ten. The fare from Winchendon to Winchendon Springs or Waterville, each 3 miles distant, will be 5 cents; to Baldwinsville, 10 miles, 25 cents; to Lake Monomonac or East Rindge, 15 miles, 40 cents.

It is reported that the hotel keepers of Gardner, Mass., will start a motor bus line to Baldwinsville to connect with the Winchendon line.

Month's Record of a Delivery Wagon.

We have been furnished with the record of a Carter delivery wagon in use at the store of the J. L. Hudson Company, Detroit, from March 6 to April 7, showing the following averages: 53.28 miles per day, 76.86 stops per day, distance traveled per stop .68, miles per gallon of gasoline 10.6. The averages for the five Saturdays during this time are considerably greater than for other days of the week, as five trips were made that day as against four trips on other days. The average speed was 11.8 miles per hour (including stops).

An English Motor Lawn Mower.

For large estates, and also perhaps for municipal parks, the motor lawn mower presents certain advantages and is coming into limited use. Such movers have been made in this country for a number of years, and have recently also been taken up abroad. The cut herewith shows a machine manufactured by Ransomes, Sims & Jeffries, of Ipswich, England, which was exhibited and demonstrated at the agricultural show held in the Galeric des Machines, Paris, some time ago. It will be seen that the machine combines the functions of a lawn mower and roller.



ENGLISH MOTOR LAWN MOWER BEING DEMONSTRATED IN FRANCE.

Commercial Vehicle Notes.

A motor bus line is being planned for Long Beach, Cal.

The Hotel Men's Association of Atlantic City, N. J., have purchased six Mack motor buses.

It is reported that a motor bus line will be established from Pittsfield, Mass., to Lenox the coming summer.

A motor bus line between Riverside, Pomona, Monrovia, Altadena and Los Angeles, Cal., is being talked of.

A motor bus line has been established between Sanford and Orlando, Fla., 22 miles. A twenty passenger vehicle meets the Clyde line boat at Orlando every morning.

The Oregon Auto-Despatch Company, Portland, Ore., which recently absorbed the Wakeman & Morse Transfer Company, will use automobiles for their hauling on paved streets.

The Burlington Railroad will operate an automobile passenger and freight line between Worland and Thermopolis, Wyo., 35 miles, until the railroad is completed to Thermopolis.

A motor bus line is to be established between Port Jervis, N. Y., and Stroudsburg, Pa. A gasoline car was run from Stroudsburg to Milford last Monday for demonstration. The enterprise is being promoted by X. P. Huddy, of New York.

A motor bus company at Gloucester, Mass., have ordered two buses, each with a seating capacity of twenty passengers, for the purpose of operating a bus line from Gloucester to Manchester and Magnolia, Mass. John F. Perkins will be the manager.

The Aurora (Ill.) city authorities have prohibited the Joliet, Plainfield and Aurora electric railroad from carrying express and freight within the city limits. The company now propose to establish a freight station at the city line and distribute freight and express by motor trucks.

The Philadelphia bureau of public highways has issued licenses for the operation of twenty electric passenger cars on Broad and Diamond streets by the Auto Transit Company, of Philadelphia. They will run from the League Island gate on the south to the Fairmount Park on the north. Operations will begin about August 1.

A. M. C. M. A. Offices to Be Moved to New York.

At a meeting of the American Motor Car Manufacturers' Association at New York, May 4, it was decided to remove the offices of the association from Chicago to New York. The vacancy caused by the resignation of General Manager McMullen was not filled, but probably will be within the month. Offices will be opened here as soon as a location is found, and an assistant secretary will be installed.

F. H. Mason, secretary of the Buffalo Chamber of Commerce, appeared before the committee in behalf of Buffalo as the place for the open air show in the fall. The association decided against Buffalo, however, on account of the adverse attitude of the Buffalo manufacturers. This leaves the choice between New York and Detroit, one of which places will be decided on within a fortnight.

The E. R. Thomas Detroit Company.

The E. R. Thomas Detroit Company has been incorporated with a capital stock of $300,000, and the following officers have been chosen: President, E. R. Thomas; first vice president, H. E. Coffin; second vice president, J. J. Brady; treasurer and general manager, Roy D. Chapin; secretary, F. O. Benzer. Messrs. Coffin, Benzer, Brady and Chapin have been identified with the Olds Motor Works for several years—Mr. Coffin as designer, Mr. Benzer as purchasing agent, Mr. Brady as traffic manager and Mr. Chapin as sales manager. Mr. Thomas is interested financially in the new enterprise.

A factory has been secured at Detroit, and temporary offices have been established in the Majestic Building. The type of car will be announced later, and the entire output for 1907 will be handled by the E. R. Thomas Motor Company, of Buffalo.

The 1906 Glidden Tour.

The 1906 Glidden tour will start from Buffalo about July 19, and the route will lead through Syracuse and Utica to Saratoga Springs, where Saturday and Sunday, July 21 and 22, will be spent; then up the east shore of Lake Champlain through Vermont, with stop overnight at Burlington; then to Montreal and Quebec, spending Sunday and Monday, July 29 and 30, in Quebec; then to Bretton Woods, in the White Mountains, when the tour will end.

An effort has been made to make it appear that the tour really starts from Chicago. This, of course, is erroneous.

Chairman Paul H. Deming, of the A. A. A. touring committee, has appointed Judge James B. Dill, F. B. Howe, of Buffalo, and Augustus Post, of New York, as a route committee to obtain information about the roads.

A. A. A. Wants a Share of Show Profits.

A committee from the New York State A. A., consisting of President Quayle, Secretary F. H. Elliott, of the A. C. of Syracuse; H. S. Woodworth, of the A. C. of Rochester, and Messrs. Meldrum and Hower, of the A. C. of Buffalo, appeared before the A. L. A. M. last week and asked that the A. A. A. be given a share of the profits of the Madison Square Garden Show. They argued that the money would help the association in their good roads and legislative work, which would benefit the manufacturers.

The committee was informed that the profits from the show were divided among the exhibitors.

LEGISLATIVE and LEGAL

Liability for Frightening Persons.

By Xenophon P. Huddy, LL.B.

New and intricate legal questions constantly arise in connection with motoring. The courts have already set at rest many disputes, but only to be again confronted with new controversies relating to automobile matters. The automobilist's liability for frightening horses into committing damage has brought forth many judicial opinions. Now there is a new legal problem to be settled, that concerning the motorist's liability for causing fright to a person.

We can understand why a senseless horse may be terror stricken at the sight of an automobile, but suppose a person crossing the street is overwhelmed and seized with terror at the sight of a motor car coming thundering around a street corner, with every indication that the person will be struck, but in fact there is no compact, and physical injury results from fear only. Is the motorist liable for personal injuries resulting from the nervous shock in such a case?

Frequently persons are required to run for their lives in crossing streets, upon the approach of an automobile driven by an operator having no regard for the pedestrian. A "close shave" is experienced by many a pedestrian, which makes one's heart come up into one's throat, and oftentimes the effect of such a scare is felt for several hours or days. Naturally, different people would be affected in different ways by such a fright. A very nervous person, for example, may be very seriously injured in this manner.

The question here under discussion is not without some judicial authority. In England it has been decided that damages which result from a nervous shock, occasioned by fright, unaccompanied by any actual impact, may be recoverable in an action for negligence, if physical injury has been caused to the plaintiff (Dulieu vs. White, 2 K. B. 669). This is a very interesting and leading case, and would be of great persuasive effect if the question should arise in the United States.* It would seem that if a cause of action accrues from frightening an animal there certainly should be legal liability for causing fright to a person. Counsel in the English case argued that an action for negligence would not lie where there is no immediate physical injury resulting to the plaintiff. The court decided against this contention, saying by Kennedy, J., "That fright—where physical injury is directly produced by it—cannot be a ground of action, merely because of the absence of any accompanying impact, appears to me to be a contention both unreasonable and contrary to the weight of authority."

Of course damage must directly result from the fear caused by an approaching automobile. If there is no damage there can be no liability or recovery. If negligence has caused another neither injury to property nor physical mischief, but only an unpleasant emotion of more or less transient duration, an essential constituent of a right of action for negligence is lacking. Fear alone creates no legal liability.

There is at least one limitation on the right of a frightened person to sue an automobile operator and to recover, namely, the shock where it operates through the mind must be a shock which arises from a reasonable fear of immediate personal injury to one's self. For example, A. has no legal duty not to shock B.'s nerves by the exhibition of negligence toward C., or toward the property of B. or C. So also a party may not be entitled to a recovery of damages if a nervous shock was produced by an automobile, not by the fear of bodily injury to himself but by horror or vexation arising from the sight of mischief being threatened or done, either to some other person or to his property.

With the increase of automobiling in the United States the legal questions which are bound to arise will be numerous and difficult. The one now under discussion is likely to arise at any time, and the prudent automobilist would do well to safeguard himself in driving so as to prevent injuries which are oftentimes more serious than those resulting from actual collision.

* In New York it has been held that no recovery can be had for injuries sustained by fright occasioned by the negligence of another where there is no immediate personal injury. (Mitchell v. Rochester R. Co., 151 N. Y. 107.)

Senate Obstructing Free Alcohol Bill.

Washington, D. C.—House bill No. 17,453, for the withdrawal from bond, tax free, of domestic alcohol when rendered unfit for beverage or liquid medicinal uses by mixture with suitable denaturing materials, bids fair to have a stormy time during its consideration before the Senate Committee on Finance. The bill was taken up by the committee on May 1, discussed at some length and Chairman Aldrich authorized to name a sub-committee of seven members to conduct hearings on the measure.

Chairman Aldrich announced the following sub-committee on May 4: Senators Aldrich, Allison, Burrows, Hale, Spooner, Money and Bailey. When making the announcement of the sub-committee Mr. Aldrich said the sub-committee would take up the matter of the hearings immediately. As far as he knew the committee all favored the widest possible use of alcohol in the arts and industries of the nation, free of tax, so far as it could be done with safety to the revenues.

The fact that hearings are to be held at all, however, is interpreted to mean that it is the intention of the Republican members of the committee to impede the passage of the bill through the Senate as much as possible. Exhaustive hearings were conducted in the House, and the bill passed almost unanimously. The plan seems to be to consume a good deal of time on the hearings, and possibly to delay a report on the bill to a date so late in the session as to make its consideration on the floor an impossibility.

It is understood that the Democratic members of the committee are a unit in favor of the early report and passage of the bill. In this they are joined by several Republican members, and it is supposed that a majority of the committee will insist upon the bill being reported to the chamber at this session.

New Haven Motorists Oppose City Ordinance.

New Haven, Conn.—Motorists in this city are much opposed to an ordinance recently adopted by the board of aldermen which makes it necessary for every person who owns a private auto shed or station to secure a special license from the fire marshal. The purpose of the ordinance is to prevent the careless storage of gasoline, kerosene or other oils, as several damaging fires have occurred in local garages lately. A petition is being prepared, which will be presented to the board of aldermen at the next meeting.

Fire Marshal Gladwin has been making a tour of the garages, public garages also, and enforcing strict rules regarding the keeping of oils.

House Passes Massachusetts Automobile Bill.

Boston.—The House passed the automobile bill May 3 with only one amendment, which struck out the section repealing the provision of the present law, which makes it necessary for opponents of local speed or road regulations to lodge their protest with the Highway Commission within fifteen days after such regulations are adopted. Such protest must be by fifty residents of the State, ten of whom are taxpayers in the town in question.

Automobilists have lost the right of protest on several occasions through the fifteen-day clause, which they were desirous of having abolished.

No Change in New York Automobile Law.

Albany.—The Legislature adjourned May 3 without making any change in the automobile law. The Committee on Rules of the Assembly, by a vote of 4 to 2, refused to report the L'Hommedieu bill. This action is satisfactory to the majority of automobilists, who have found the law in force for two years past as good as any they were likely to get.

MINOR MENTION

Byrne, Kingston & Co., Kokomo, Ind., ill soon erect a new factory.

The Twentieth Century Motor Car Comny, Chicago, have moved to 1421 Michiin avenue.

G. F. Conner, Port Huron, Mich., has ased a building for the manufacture of itomobiles.

The American Motor Truck Company, oledo, Ohio, have reduced their capital ock from $125,000 to $10,000.

The Motor Car Supply Company, 1427 lichigan avenue, Chicago, have doubled ieir floor space by leasing an adjoining tore.

The Hambrick Motor Car Company, of luntington, W. Va., are reported planning o erect a factory at Washington, Ind., to ost $135,000.

The Chauffeurs' Club, formed in Baltiiore recently, has disbanded. An effort to orm a new organization along different ines will be made shortly.

We have an inquiry as to who makes ingle cylinder, air cooled gasoline engines uitable for a light car. Any replies will e forwarded by this office.

Charles O. Dewey, trustee in bankruptcy for the Vehicle Equipment Company, will sell the property of the company at auction at Long Island City, May 16, at 11 a. m.

The Janesville (Wis.) A. C. has elected the following officers: President, Dr. R. W. Edden; vice president, A. G. Anderson; secretary and treasurer, Frank H. Blodgett.

The plant of the bankrupt Peckham Manufacturing Company, Kingston, N. Y., was sold to Joseph S. Tracey May 5. A plan is being considered by the reorganization interests to manufacture automobiles at this plant.

When the A. C. of Cincinnati learned that one-half the dues paid by clubs affiliated with the A. A. A. will be used for erecting sign posts and improving roads it was decided not to withdraw their membership.

The Studebaker Brothers Manufacturing Company have leased the old Woods Motor Vehicle Company's factory at Twentieth street and Wabash avenue, Chicago, and will use it as a general repair shop for their automobile department.

The Pennsylvania Rubber Company, Jeannette, Pa., have opened the following branch stores for the sale of the Pennsylvania clincher tires: 1241 Michigan avenue, Chicago; corner of Main and Tupper streets, Buffalo, N. Y.; 102 North Pryor street, Atlanta, Ga.

At the monthly meeting of the board of directors of the A. A. A. May 2, it was decided that the sign boards to be put up at crossroads would be 24x10 inches in size, with white background and lettering in black. The association headquarters will be removed from the Spalding Building to the Metropolitan Life Insurance Building, Madison square.

At the meeting of the mechanical branch of the A. L. A. M. last Friday a committee was appointed to report upon the feasibility of standardizing, so far as possible, the fastenings for different clincher tires for front and rear wheels.

Robert Goelet, 9 West Seventeenth street, New York, was fined $15 at Trenton, N. J., for not having a license for his automobile. He had attached false numbers to his machine in order to make the run across the State to Philadelphia.

The Bay State Automobile Association has leased a four story building at 261 Dartmouth street, Boston, for permanent headquarters. Many improvements are being made, and the association expects to have the building ready for occupancy about June 1.

The American Medical Association are to have demonstrations of several makes of automobiles during their annual meeting in Boston, in order to study different designs suitable for the use of physicians, to the end of agreeing upon a standard type of doctor's vehicle.

We are informed that the cam shaft on the new low priced Ford four cylinder cars is forged integral with its cams. As these cars are to be manufactured in very large numbers, the cost of the necessary dies was no obstacle to the use of this method of construction.

The Gabriel Horn Manufacturing Company, of Cleveland, Ohio, are introducing a reduced size of their automobile horn, for use on motor cycles, known as the baby Gabriel horn. This horn occupies a space 2x15 inches, and it is claimed that room for it can easily be found on a motor cycle.

The American Metal Wheel and Auto Company, of Toledo, Ohio, announce a display of 1906 models of juvenile automobiles at the showrooms of the Baker & Bigley Company, 77 and 79 Bleecker street, New York, May 8-14. One new design is a child's electric machine that is said to run 20 miles.

The Badger Brass Company, Kenosha, Wis., are planning to open a branch factory in New York near the Brooklyn Bridge, about July 1, for the manufacture of the better grade of Solar lamps. It will be possible to secure in New York the higher grade of skilled labor for hand work.

The Consolidated Manufacturing Company, Toledo, Ohio, which formerly made the Yale car, and some automobile parts, has gone into involuntary bankruptcy, its liabilities being placed at $701,000. The company was the successor of the Kirk Manufacturing Company and the Snell Cycle Fittings Company.

The Rochester Automobile Club has elected H. Seymour Bentley secretary. He will devote his entire time to the business of the club at the new quarters, 25 Plymouth avenue. At a recent meeting of the board of governors President Harry S. Woodworth was re-elected as the club's director in the New York State Automobile Association.

It is reported that the Long Arm System Company has been formed to take over the automobile parts end of the Garford Company's business. The Garford Company will continue to manufacture chassis only.

The Portland (Ore.) A. C. have elected the following officers: President, Robert D. Inman; vice president, Henry Wemme; treasurer, Dr. C. B. Brown; secretary, Will F. Lipman; committee on membership, Sol Blumauer, chairman; Harry L. Keats, J. F. Kelly, Henry M. Covey and Henry Wemme; finance committee, E. Canno, D. T. Honeyman and Henry Wemme.

It is reported from California that agents of the United States Government are confiscating automobile supplies in the sections of the State adjacent to San Francisco. Motor cars are regarded as one of the greatest necessities in San Francisco just now, but the supplies for them have given out. The agents give checks on the Government for whatever they take.

Percy P. Pierce, of Buffalo, N. Y., sailed from Hoboken on the Hamburg-American liner Patricia on May 5, to take part in the two principal Continental touring contests of the year, the Herkomer trophy contest, which starts at Frankfort-on-Main on June 6, and the European Circuit, which starts at Paris on July 26. Mr. Pierce took with him a 40-45 horse power Great Arrow car, which he has entered in both contests.

The board of directors of the Motor and Accessory Manufacturers, at their meeting at Buffalo, May 1, admitted the following firms to membership: Cooks Railway Appliance Company, Kalamazoo, Mich.; M. Strauss & Sons, Newark, N. J.; Noera Manufacturing Company, Waterbury, Conn.; Syracuse Aluminum and Bronze Company, Syracuse, N. Y.; Consolidated Rubber Tire Company, New York city.

The Hermitage Country Club has been organized by prominent Massachusetts automobilists, who have secured the famous Hermitage estate, comprising 275 acres of wooded park lands, 3 miles from Worcester. The two principal buildings on it are the Hermitage and Vista Lodge, both of rustic architecture. A deed cut in the solid rock by Solomon Parsons, a former owner, is a notable feature of the estate about which much has been written.

N. A. A. M. Abandons Brownlow Bill.

At the monthly meeting of the Executive Committee of the N. A. A. M., May 2, the Good Roads Committee recommended that the association's contribution to the Good Roads Bureau at Washington be discontinued. The bureau has been maintained to further the passage of the Brown-

low bill, providing for national aid in the construction of good roads. The committee expressed the opinion that the action of New York in providing for State good roads building is likely to be followed by other States, and for that reason it will be almost impossible to secure aid from the Government. The Executive Committee decided that the association would not renew its contribution to the bureau.

Benjamin Briscoe, of the Maxwell-Briscoe Company; J. B. Bartholomew, of the Bartholomew Company; R. H. Croninger, of the Dayton Motor Car Company, and R. E. Olds, of the Reo Motor Car Company, were elected to membership.

H. A. Meldrum and F. B. Hower, president and vice president of the Buffalo A. C., and F. Howard Mason, secretary of the Buffalo Chamber of Commerce, asked that the national association hold a show at Buffalo next fall. A resolution was passed setting forth that the committee saw no reason to change its previous decision in regard to sanctioning only two shows next year, and also that it was the sense of the committee that a show in the fall of the year would not be profitable.

Garage Notes.

E. M. Cross has opened a garage at Berlin, N. H.

C. H. Sabin, St. Albans, Vt., has opened a garage and repair shop.

H. B. Hallam will build a garage at Sioux City, Ia., the coming summer.

I. H. Sharpe is building a garage on Main street, Bernardsville, N. J.

The North Shore Automobile Company are to erect a garage at Lynn, Mass.

The Columbus (Ind.) Machine Works have established a garage and repair shop.

William J. Brandt recently opened a repair shop at 461 Detroit street, Cleveland.

Mr. Brockway has closed Brock's garage, Bolivar and Erie streets, Cleveland, Ohio.

William Bentley, of Paterson, N. J., is planning to open a garage at Washington, N. J.

The Pasadena Automobile Company, Pasadena, Cal., have built a new garage at 57 West Union street.

The Syracuse Motor Car Company have moved to their new four story garage on Clinton street, Syracuse, N. Y.

The recently incorporated Lubeck Automobile Company, Grand Rapids, Mich., will open a garage at 145 Ionia street June 15.

Crawford & Soper have moved their garage and repair shop into temporary quarters at 1737 Muirson street, Cleveland, Ohio.

William Bartlett, Monmouth, Ill., will erect a garage and repair shop in connection with N. S. Cripe's foundry and machine shop.

The Chester Automobile Company have opened a garage and repair shop at Broad and Crosby streets, Chester, Pa. Phil. Williams is the manager.

The Winchendon Auto Transit Company have opened a garage and repair shop at Winchendon, Mass. They will also carry on an auto livery business.

William P. Miller's Sons have opened a garage at 75-79 Third street, Long Island City, for the benefit of those who wish to put up their machines while in New York on business.

The garage of the Mar-Del Company, at Charles street and Mount Royal avenue, Baltimore, will be doubled in size, giving a frontage of 200 feet on Charles street. It is already half a square ng on Mount Royal avenue. The new building will be a counterpart of the one opened in January, which is built in old English style.

The Davenport Automobile Station and repair shop, North Adams, Mass., which was burned a month ago, has been replaced with a fireproof building that will accommodate fifty cars. A. E. Davenport is the proprietor.

New Incorporations.

The Coleman Auto Top Company, Detroit, Mich.—Capital, $5,000; to manufacture carriage and automobile tops.

Auto Service Company, New York City.—Capital, $50,000. Incorporators, R. Bolshaw, Elmer Stouffer and David Hyams, all of New York.

The Coliseum Garage Company, Toledo, Ohio.—Capital, $3,000; to operate a garage and deal in automobiles. Incorporators, D. J. Ragan et al.

The Myers Automobile Company, Dayton, Ohio.—Capital, $25,000. Incorporators, W. C. Myers, Thomas H. Kelly, John D. Follett, J. W. Durnall and H. T. Bowman.

Rothschild & Co., New York City.—Capital, $30,000; to deal in automobiles. Incorporators, W. H. Mendel, M. J. Rothschild and N. D. Reich, all of New York city.

Grant Square Automobile Company, New York.—Capital, $20,000; to manufacture motor vehicles and parts. Incorporators, C. F. Batt, F. Wilson, W. Weston, Brooklyn.

McKinley Square Auto Company, New York.—Capital, $1,000; to construct automobiles and supplies. Incorporators, G. Herrmann, O. A. Green, M. Herrmann, K. Green, Bronx.

The Albany Garage Company, Albany, N. Y.—Capital, $50,000; one-half paid in. Directors, Matthew Van Alstyne, F. C. Huyck, E. P. Gavit, W. L. L. Petz and Frederick W. Rockwell.

Manhattan Commercial Company, New York.—Capital, $500; to manufacture automobiles, motor boats, etc. Incorporators, A. R. Tator, Brooklyn; A. M. Van, B. W. Wrenn, New York city.

De Barres Automobile Company, New York City.—Capital, $50,000; to manufacture and deal in and rent automobiles. Incorporators, W. H. Barnard, A. E. Solomon, R. De Barres, New York city.

Hamilton Garage and Motor Company, New York.—Capital, $20,000; to manufacture motors, engines, machines, etc. Incorporators, L. W. McFarland, Yonkers; W. F. Nevins, New York city; F. M. Raynor, Brooklyn.

The Broad-Oak Company, Columbus, Ohio.—Capital, $35,000; to build and operate a garage. Incorporators, R. C. Kyle, R. N. Cunningham, Hal H. Moon, Charles A. Field and D. J. Buchanan, all of Columbus.

Minneapolis Automobile Manufacturing Company, Minneapolis, Minn.—Capital stock, $100,000. Incorporators, John M. Johnson, president; Thomas A. Bennett, vice president; James M. Crozier, secretary and treasurer.

The Cornell Manufacturing Company, New York City.—Capital, $100,000; to manufacture Cornell automobile insulator. Incorporators, G. M. Cornell, J. Fowler, T. C. Dougherty, R. S. Fowler, J. E. Kilduff, New York city.

The Central Garage Company, Washington, D. C.—Capital, $2,000; to deal in, store and repair motor vehicles. Incorporators, John W. Points, Frederick L. Mockabee and Richard C. McAuley. Resident agent, John W. Points, 1312 New York avenue, Washington, D. C.

The Auto Transit Company, Philadelphia, Pa.—To operate a motor bus line on Broad and Diamond streets. President, Charles F. Perce; directors, J. O. G. Duffy, Charles F. Perce, Bernard Cassidy and John R. Criswell, of Philadelphia, and Charles Berg, of Pittsburg.

The Imperial Coaches, Ltd., Toronto, Canada.—Capital, $225,000; to acquire by purchase, lease, manufacture, let or hire, sell, dispose of and deal in power machinery and automobiles, touring cars, omnibuses, trucks and other vehicles, or any parts thereof, for the conveyance of passengers or freight, and to operate the same. Provisional directors, Andrew Dods, Robert McKay, Gideon Sampson, Charles Kirkpatrick Unwin, A... liott, Albert Ernest Lyon and Arno Lis...

The New Jersey Motor and T... Company, Elizabeth, N. J.—Capital, ... Incorporators, Edward M. Wood, ... Potts, of Elizabeth; Sidney Harris, A. ... Aaron Greis and Herman Greis, of ... P. Winans, Geo. W. Barr, Clarence ... Geo. W. Barr, Jr., of Linden.

The Automobile Club of Washington, ... of Columbia.—To unite in an associa... who use motor vehicles for business ... or who are advocates or devotees of the ... automobiling, for mutual improvement, ... ment, assistance, interest and educatio... rators, William S. Duvall, Charles E. W... Roy Mark, Robert B. Coverly and Otto ... Moll.

New Agencies.

Monmouth, Ill.—William Bartlett, Gas ... Marlboro, Mass.—O. D. Miller, Motor ... Philadelphia, Pa.—D. O. Eaton, Rapid ... F. L. Keefe, Kalamazoo, Mich.—Mixed ... Bulgaria.—Komanoff & Konstantinoff, ... cars.

Tacoma, Wash.—Reliable Auto Company, ... cars.

Louisville, Ky.—Longest Brothers, M... cars.

Punxsutawney, Pa.—John C. Hart, M... cars.

Wahakoneta, Ohio.—George C. Schenck, ... well cars.

Seabright, N. J.—H. L. Zobel, Jr., the ... Waverley cars.

Omaha, Neb.—Deright Automobile Compa... Pope-Waverley cars.

Dowagiac, Mich. — Dowagiac Manufac... Company, Maxwell cars.

Lancaster, Pa.—Lancaster Automobile Co... the Pope-Waverley cars.

Indianapolis, Ind.—The Central Garage ... liance cars (central Indiana).

Macon, Ga.—Automobile and Machinery ... pany, the Pope-Waverley cars.

Sioux City, Ia.—William Warnock Auto... Company, the Pope-Waverley cars.

Ravenna, Ohio.—Smith & Curtiss, agents ... the Oldsmobiles for Portage County.

Pasadena, Cal.—Pasadena Automobile Co... 57 and 59 West Union street, Reo cars.

Grand Rapids, Mich.—Lubeck Automobile ... pany, 145 North Ionia street, Oldsmobiles.

Charleston, S. C.—The Waverley Electric ... tomobile Company, the Pope-Waverley cars.

Boston, Mass.—French Carriage Company, ... mer street, New England agency for Clé... Bayard cars.

Winchendon, Mass.—Winchendon Auto T... Company, Reo, Oldsmobiles, Thomas, S... Duryea, Franklin, Stanley and Columbia ...

Trade Personals.

F. M. Hoblitt, formerly with the Cadillac ... Car Company, has joined the sales staff ... Aerocar Company.

George D. Crawford has assumed the d... secretary-treasurer of the Crawford Auto... Company, Hagerstown, Md.

L. D. Bolton, formerly with the Diamond Chain and Manufacturing Company, Indianapolis, will go with K. Franklin Peterson, Chicago.

Trade Literature Received.

Gisholt Machine Company, Madison, Wis.—"Something New in Motor Drives."

H. H. Franklin Manufacturing Company, Syracuse, N. Y.—"Clutch," a booklet describing the Franklin clutch.

Hess-Bright Manufacturing Company, Philadelphia, Pa.—Card showing Hess-Bright ball bearings in the British Cressley car.

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...THE...

Horseless Age

VOLUME 17 MAY 16, 1906 NUMBER 20

WINTON MODEL-K



JUST COMPARE
THE $2,500
WINTON
MODEL K
WITH ANY CAR
ON THE MARKET
SELLING AT
$3,500 OR MORE

There are to-day more Model K Wintons in daily use on American roads than any other 1906 touring car.

These Model K Wintons have proved in service every claim made for them by this Company.

And from these facts we are more than ever convinced that the best automobile purchase in the world to-day is the $2,500 Winton Model K.

The WINTON MOTOR CARRIAGE CO.

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Winton Branch Houses in New York, Boston, Philadelphia, Chicago and London. Winton Sales Agencies in all important places.

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LOOK FOR GARAGE NUMBER MAY 20

HARD USE IS THE BEST TIRE TEST

AND RESULTS ARE MORE VALUABLE THAN PROMISES

Diamond Solid Truck Tires

ARE TRIUMPHANT OVER EVERY REQUIREMENT

"We have eighteen of our large trucks equipped with your tire," writes I. S. Scrivenger, Secretary of the Auto-Express Co., Detroit, Mich. "They have been in continual service since the first day of October, 1905, each averaging between sixty and seventy miles a day, and at the present time our entire expense for the maintenance of the tire equipment on all the machines has amounted to only $1.75.

"We have just made a thorough inspection of all the tires on the cars at the present time, and find that they are in excellent condition, and there is no doubt but what we will obtain several thousand more miles before it will be necessary to change."

That's the performance of an Honest Tire—built to deliver the distance at minimum cost per ton mile.

THE DIAMOND RUBBER COMPANY, Akron, Ohio

NEW YORK—78 Reade St.
BOSTON—174 Columbus Ave.
PHILADELPHIA—304-306 N. Broad St.
BUFFALO—715 Main St.
DETROIT—158 Jefferson Ave.
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CHICAGO—1523-1531 Michigan Ave.
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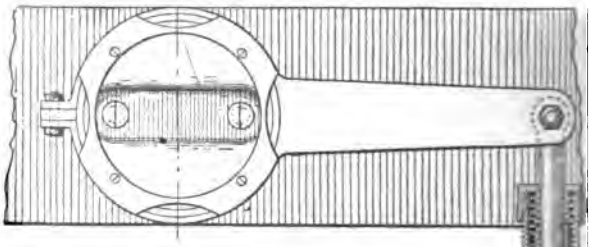
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Speed Indicating and Recording Devices.—I.

By E. S. Foljambe.

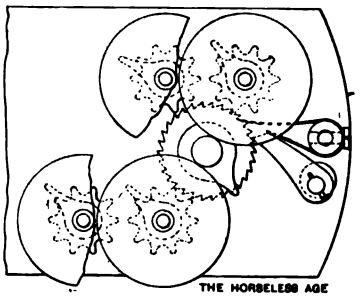
Owing, no doubt, largely to the almost universal adoption of speed regulations in the United States, and the increasing number of arrests and convictions for speeding, there has been a remarkable activity of late in the development of instruments for indicating the speed at which a car travels. As the commercial application of the automobile expands, there is also an increased demand for instruments which keep an accurate and permanent record of the ground covered and act as a check on the vehicle's performance. For these reasons a detailed study of instruments for indicating and recording speed will probably be found of interest at the present moment. Such instruments are known as speed indicators, tachometers, speedometers or plainly speedmeters; while the devices which measure distance, and which form usually a part of every speed indicator, are known as odometers. Instruments which make a permanent record are spoken of as recorders.

Speed measuring instruments may be roughly divided into three classes, according to the principle of their action, viz., direct reading speed indicators, on which the speed in miles per hour may at any moment be read off on a graduated scale or dial; timers, or watches which enable the speed to be determined from the time taken to cover a certain distance (from one kilometer stone to the next, for instance), and which are applicable only where there are such distance marks along the roads; gauges, which enable the speed to be evaluated by comparison with some constant known speed. The first class, that of direct reading instruments, will be considered first.

There are several quite distinct principles on which the construction of the different instruments is based, which may be briefly enumerated as follows: Centrifugal weights, centrifugal liquids, slipback devices (either liquid or mechanical); air, liquid or magnetic drag; frictional, pneumatic, dynamometric and electrical. These different types will be taken up practically in the order named. Beginning with the devices whose action depends upon centrifugal weights, we may divide them into instruments with fly ball governor action, with the balls or weights acting either in the plane of the shaft or at right angles thereto; with ring governor action and bar governor action.

JONES SPEEDOMETER.

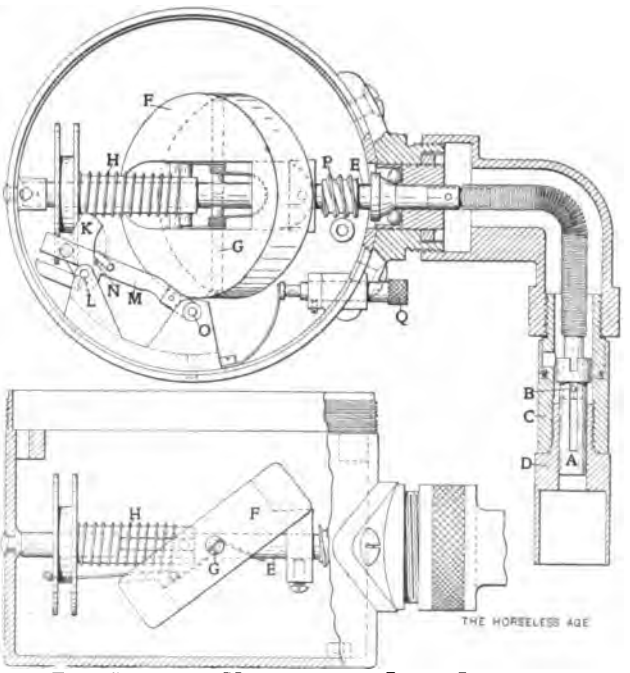
Among speed indicators comprising a ring governor may be mentioned the Jones speedometer, the McGiehan and the Lea. Referring to the line cut of the Jones speedometer, the odometer (trip and total) indications and the speed are all read from one dial, the speed graduations being uniform over the whole range. The instrument is driven by means of a special cable consisting of four sets of three wires each



Eccentric Pin, Pawl and Ratchet for Driving Jones Odometer.

wound in opposite directions and covered by two concentric flexible tubes. This flexible driving shaft receives its motion from the front wheel by means of a small and large spur gear. The shaft of the small gear runs on ball bearings, and is provided with a swivel, so that this gear separates from the other if any obstacle comes between the two, but is instantly returned by a spring in the joint. The flexible shaft is packed with cosmoline and graphite when assembled, and it is claimed that it does not need any further lubrication, yet a small oil hole is provided at the upper end near the instrument in case an operator should desire to oil it. This packing works down and lubricates the ball bearing shaft, and even after the cosmoline disappears the graphite remaining will insure lubrication of this shaft. It will be noticed that the driving shaft makes a right angle just as it enters the case. At this place, instead of using bevel gears or worm and wheel, the power is transmitted by a special coil of rectangular section wire in a gradual curve, as shown in the drawing. The makers claim that this is a most satisfactory device, as it shows practically no wear and needs no lubrication. It is covered by the elbow fitting shown in the section. Piece A, which is slotted to act as a spline, slips over its end, and the pin B acts as a key. The lower end of A is pinned rigidly to a terminal brazed to the flexible cable; piece C screws into the elbow, and D, which is fastened to the casing over the flexible shaft, screws into it.

The action of the instrument is based on the well known principle that a ring pivoted on a shaft and held by a spring so that its plane is oblique to the axis of the shaft, owing to the centrifugal force acting on it when rotated, tends to assume a position in a plane perpendicular to the shaft. The main shaft E on which the governor ring F is mounted runs in ball bearings at the right hand end and on a hardened conical pivot at the other end. The ring F is pivotally mounted on the cross pin G fast to the shaft, and is held in the position shown by a small coiled spring. The sleeve H slides freely on the main shaft, but is constrained to rotate with the shaft by means of a pin through the shaft which works in a slot in the sleeve, as shown in the side view. The left end of sleeve H carries two discs, a pin is passed through the governor ring and a wire connected to this is fastened to these discs, so that discs and sleeve must move lengthwise of the shaft every time the ring changes its angularity with respect to the shaft. This motion is communicated to a cam K pivoted at L, by means of a pin on the under side of it. This pin has a knob at its lower end which fits between the two discs and is moved by them, thereby moving the cam. The arm M, connected to the vertical shaft O of the indicating hand, carries a small pin on its under side at N, which rubs against the edge of the cam, thus communicating its motion to the shaft O and the indicating needle. A light spring coiled around the back of shaft O returns the needle to zero. As the scales on the dials are all alike and the divisions are equally spaced, it becomes necessary to shape the profile of the cam of each instrument separarately. This is done by running the instrument at known speeds on a special testing machine. When the speed has been adjusted to any given value, the indicating hand of the instrument being calibrated, is moved by hand to the corresponding mark on the dial and a mark is made on the cam blank (which has the form shown in the cut by a dotted line), by means of a fine awl inserted through the hole at N. The profile of the cam is then cut out along the line formed by the series of spots obtained, which gives it about the form shown in full lines. The two



Two Sectional Views of the Jones Speedometer.

lugs, one at each side of the case, support the odometer mechanism (not shown), which is run by a vertical shaft with an integral worm wheel which meshes with the worm P on the main shaft. The upper end of the worm wheel shaft carries an eccentrically located pin with a pawl attached so that no matter which way the shaft is rotated the pawl pushes in the same direction, so that the record is accumulative whether running forward or backward. A unique feature of this odometer is that to set the trip register to zero it is not necessary to turn it backward, but simply to push a button Q, which releases all the figured discs, which are then instantly spring-returned to zero.



McGIEHAN SPEEDMETER.

M'GIEHAN SPEED INDICATOR.

The McGiehan speed indicator is also designed on the ring governor principle, and has combined with it a trip and total odometer. A feature of the instrument is the large dial and long scale with equal divisions over its entire range. The flexible driving shaft from the front wheel is attached to the right side. Just above it in the outside view is shown the thumb button for setting the trip back to zero.

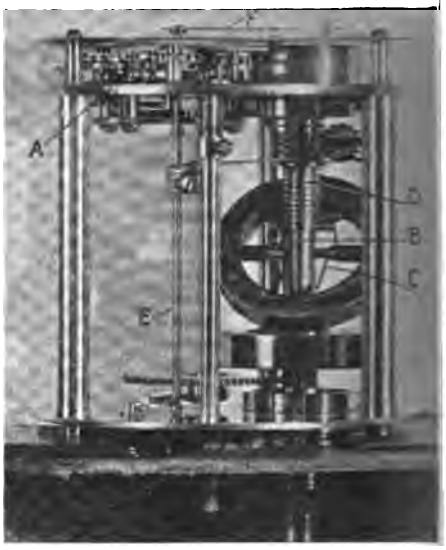
Referring to the photograph of the mechanism, the framework consists of two triangular side plates of brass, between which at the top is seen the odometer, and below it the speed indicator mechanism. In the rear is a vertical shaft driven by the flexible cable. The upper end of this shaft carries a worm, which, by means of a worm wheel, drives the odometer through the train of gears shown on the outside. No stamped gears are used, all gears being cut from Tobin bronze. This main vertical shaft also carries a bevel gear A, which meshes with a bevel gear B on the governor shaft, which it drives. The bronze governor ring is clearly shown pivotally mounted on this shaft, and above it can be seen the disc which acts as a flywheel. The governor shaft runs on hardened steel bearings, the lower one being of the pivot type. The usual arrangement of the spring to resist the movement of the governor ring is used, but this spring does not come into action until a speed of ten miles per hour is attained, and therefore does not return the hand to zero. For this purpose the sleeve C and its integral flanges are made heavy, and for speeds between zero and ten miles the action of the centrifugal ring is opposed only by gravity. The weight of this sleeve also returns the pointer to zero when the instrument is at rest. Above 10 miles the spring on the governor comes into action, and at about 30 miles the spring wound around the sleeve C. Otherwise, the action of the governor in changing its plane and raising the sleeve C is similar to that previously described. It is claimed that the arrangement by which the counter springs become active only at definite speeds makes the instrument more accurate in recording the lower speeds. On the back of the dial the indicating hand is connected to a very fine spur gear which meshes with a larger one, on which is a pin eccentrically located; the end of this pin comes between the flanges of sleeve C, and thus the motion of the sleeve is communicated to the wheel. The scale is exceptionally long and the divisions are equal. The makers claim that this instrument will register speeds of 1 to 2 miles per hour as accurately as those of 40 or 50 miles.

LEA SPEEDISTIMETER.

Another ring governor device is the Lea Speedistimeter, a view of which is here shown. It includes a speed recording instrument, a trip and total odometer and an eight day clock, all enclosed in one brass case, approximately 6 by 8 inches, and is driven in the usual manner. The Chelsea auto clock movement is used, and has a face of 2¼ inches diameter. The driving



McGIEHAN SPEED INDICATOR MECHANISM.



MECHANISM OF LEA SPEEDISTIMETER.

pinion is on a ball bearing shaft fitted to the steering knuckle, and is provided with a ball joint in such a way that the pinion can separate from the large driving gear in case of an obstruction coming between the teeth.

The accompanying photograph shows the speedometer and odometer part of the mechanism; the gears of the odometer at the top are mounted on a horizontal plate A, and each train is protected from improper meshing or jamming by means of special roller cams. One part of the odometer is driven by the worm and worm wheel at the top of the main shaft B, which is vertical and runs on all bearings at both ends, and the other part by the small and large spur gears at the bottom. The button for the reset is also shown at the bottom. Upon the main shaft is pivotally mounted a ring as shown, which forms the governor, and just below it is a comparatively heavy weight which acts as a flywheel. The motion of the governor ring is opposed by the spring C, and is communicated to the sleeve D by a connecting link behind the shaft and fastened to the upper cross pin of the governor ring. On the outside of sleeve D a light spring is wound which resists its motion, which is transmitted to the vertical spindle E by suitable linkage. The upper end of the spindle carries the indicating needle F, which is returned to zero by the hairspring seen at the bottom. The dial is rather broad and the divisions are not equal, but are somewhat smaller at the lowest and highest speeds.

WILLIS' AUTO-LOG.

Still another instrument which contains a ring governor is the new Auto-Log handled by E. J. Willis, of New York. Photographs of the interior of this instrument are herewith shown. The trip and total odometers are at the top, and the speed mechanism is below. The instrument is driven by a special flexible shaft formed of units, any one of which can be taken out or put in by hand, which makes

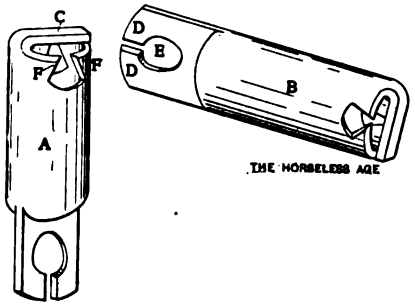
ıe shaft adjustable in length. The outside ısing also comes in different lengths and put together by couplings, so that the ıaft can be made any desired length with-ıt the use of tools. Near the instrument ıe shaft makes a right angle turn, and at ıis place a coiled spring wire is used as ıown. This is covered by an elbow which :rews into the case. At the lower end is ıother turn at which hardened bevel gears ıd a ball bearing shaft are employed. The racket is universal, and for variations in ıe size of car wheels the large gear is ıanged instead of the pinion.

The frame of the instrument consists of vo flat plates of brass, separated by two ıpports, one at each side, which carry the ivot bearing and the ball bearing on which ıe main shaft runs. In one of the photos an be seen a governor ring mounted in the sual manner, and the sleeve A, which has hardened steel disc at one end and is



THE AUTO-LOG.

brass bushed at the other, so that it bears on the shaft at its ends only, to reduce friction. Only one spring is used to resist the motion of the ring, and that is very long and rather heavy, as shown. The ring, sleeve and spring all rotate with the shaft; the motion of the ring is communicated to the sleeve, and thence to the indicating needle as follows: At one side the ring



LINK OF AUTO-LOG FLEXIBLE SHAFT.

has an opening in it and a pin is set into the ring across this opening; the end of this pin is shown at B. Against this pin bears another one, C, which is fast to the sleeve, and as the ring moves its pin C pushes the sleeve along the shaft against another pin D, which bears against the disc at the end of the sleeve. This pin D is rigidly connected to a curved arm or sector E, which is pivoted at F, and has teeth at its other extremity which mesh with a small pinion G. This pinion is fast to the spindle to which the balanced indicating needle is attached. Sector E is brought back and the hand returned to zero by the spring H. One of the photos also shows at the left the worm on the main shaft. This is arranged so that it can be shifted slightly to regulate the tension of the spring and then set-screwed in position. The odometer mechanism is driven through this worm, and a vertical shaft and worm at the top. By one turn of the thumb button K the trip odometer is set back to zero. This is accomplished by means of bevel gears which operate a vertical shaft at the top of which is a gear meshing with the gears L of the dials. Each of these gears has three teeth cut out, and when they are rotated by the central gear whenever the button is turned, they move until the blank teeth are reached, when they stop in such a position that the zero of each shows on the face of the instrument.

The new flexible shaft used on the Auto Log has just been put on the market and is called by its designer, M. C. Hopkins, a separable unit flexible shaft, for the reason that each unit can be taken out or put in separately by the fingers, so that a shaft of any length can be quickly assembled. Two individual units of this shaft are herewith shown; they are made from single piece steel stampings. Unit A is joined to B by slipping the top cross piece C between the jaws DD into the opening E, and then moving B so that its axis is a continuation of that of A; in this position, as will be seen, the torque is transmitted from one to the other by the ends D bearing against the points F, so that the drive is at the periphery, which is claimed to be one of the advantages. The covering of this shaft also comes in short lengths, which can be united by couplings.

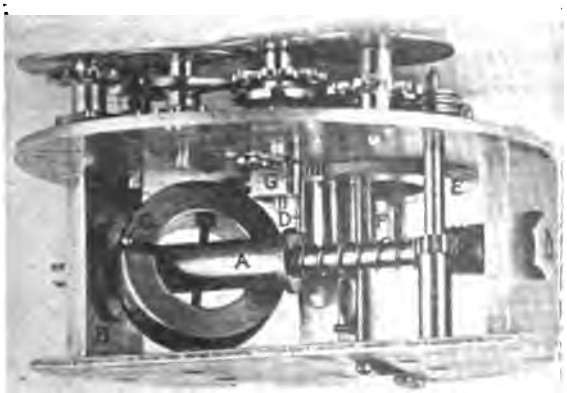
HICKS SPEED INDICATOR.

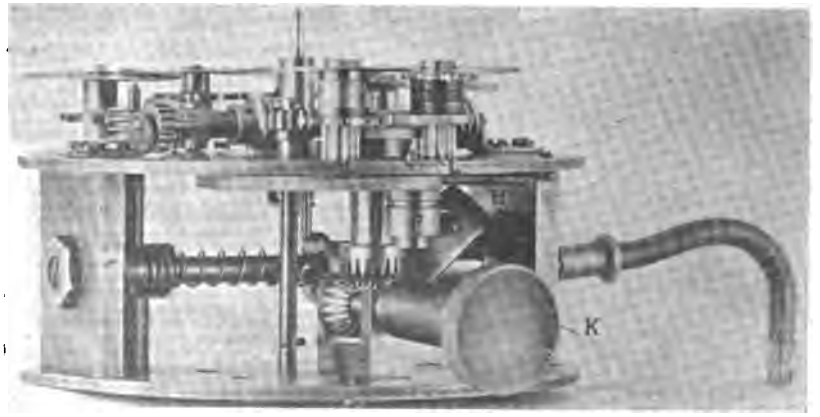
A typical example of indicators with fly ball governor action is the Hicks speed in-



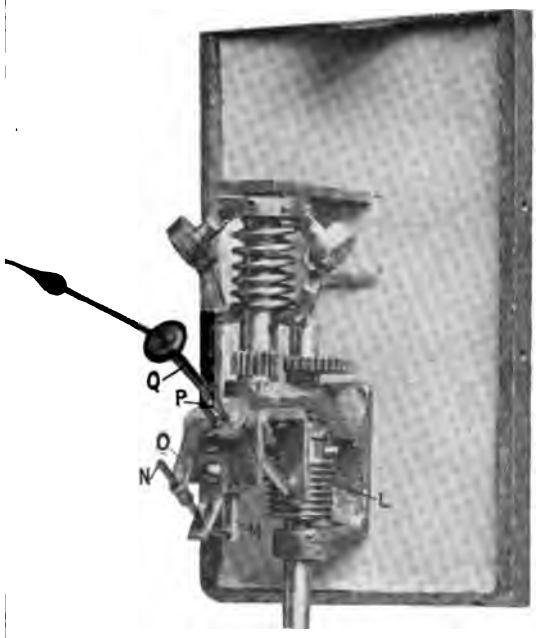
HICKS SPEEDMETER.

dicator, shown complete in the photo: The instrument includes a trip and total odometer. The graduations of the speed indicator dial are practically equal above 10 miles. The second photograph is that of the instrument with the case removed showing the dials for the trip odometer at the top, and the thumb button A, by a quarter of a turn of which this odometer



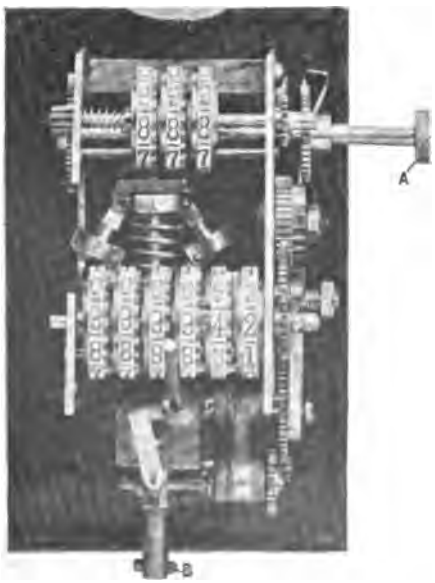


TWO VIEWS OF THE MECHANISM OF THE AUTO-LOG.



HICKS SPEED INDICATOR MECHANISM.

can be reset to zero. Just below are the governor weights and the six dials for the total or season odometer. A flexible shaft driven by gears from the front wheel is attached to the lower end of the central shaft of the instrument at B, and the motion is transmitted to the odometer trains by means of the gears on the outside, which are driven by a short horizontal shaft C, the inner end of which carries a worm wheel meshing with the worm L on the main shaft, as shown in the photo, in which the odometers have been removed. In this photo is clearly shown the speed indicating mechanism, which consists of the two governor balls and their connecting links, which at speed fly outward and raise the cross link, which works in the slot in the shaft, against the action of the spring. This cross link is connected through the inside of the hollow vertical shaft to the rod M, which it raises, carrying with it the curved piece N and the arm O. Piece N moves between guides provided for the purpose. The arm O is connected to a pin P on a disc integral with the spindle Q, at the upper end of which is the indicating needle, and when raised this arm rotates the spindle and needle in proportion to the speed of the governor balls and, therefore, of the car.



HICKS ODOMETER MECHANISM.

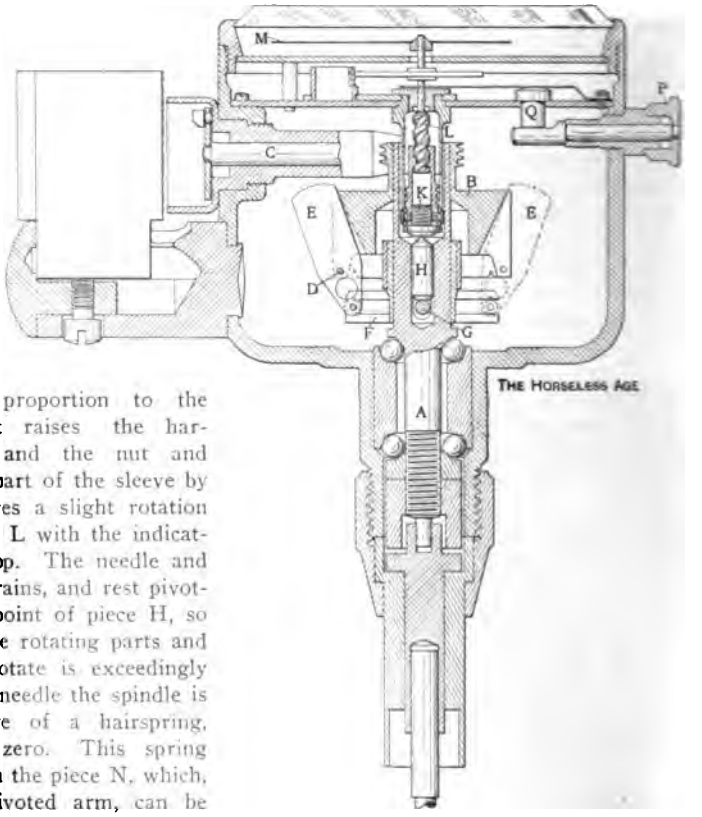
The instrument is 3¼ inches wide by 4½ inches high, and is provided at the top with a small oil cup which lubricates the bearings through small tubes. The makers claim that there is no oscillation of the index hand in use.

LORING SPEED GAUGE.

Another device of the fly ball governor type is the Loring speed gauge, a cut of which is shown. The speed in miles per hour is shown directly by a needle on a graduated dial. The cylindrical case carries the speed measuring mechanism, and to the side is secured an odometer of standard make which registers the trip and total mileage. The instrument is secured to the dash, overhanging the right edge in such a position that the short flexible driving cable has practically no bends in it, but runs direct to the driving pinion and slightly bevel driving gear attached to the front wheel hub. The absence of bends greatly reduces the friction and wear. The illustration shows a cross section of the instrument. At the centre of the casing the shaft A, driven by the flexible cable, runs on ball bearings, and carries with it the weight B, the upper part of which forms a worm which drives a worm wheel at the end of the shaft C to operate the odometer. On a central weight which acts as a flywheel are pivoted at D the governor weights E which carry at their lower ends hardened steel rollers which work in the slotted collar F. This collar is constrained by pin G to rotate with the shaft A, but is free to slide on it longitudinally. As it moves upward with the outward motion of the weights in proportion to the speed of rotation, it raises the hardened steel pin H and the nut and sleeve K. The upper part of the sleeve by its upward motion gives a slight rotation to the threaded spindle L with the indicating needle M as its top. The needle and spindle weigh but 10 grains, and rest pivotally on the hardened point of piece H, so the friction between the rotating parts and those which do not rotate is exceedingly small. Just below the needle the spindle is fastened to the centre of a hairspring, which returns it to zero. This spring passes through a slot in the piece N, which, being carried on a pivoted arm, can be moved around the centre, so that a greater or smaller number of coils of the spring are operative, thus weakening or strengthening its action. A turn of the thumb button P rotates a flat ended shaft and raises plug Q, which pushes upward on a flat spring and locks the indicating hand in whatever position it may be, thus preserving the reading, although the instrument is still running. It is claimed for this instrument that the needle does not vibrate and that no change of position or jar can affect the reading. This object has been attained by balancing the weights E. By reference to the cut it will be seen that when these weights move outward they also move downward, and the rollers at their ends raise parts F, G, H and K, which are so proportioned that they exactly balance the weights E in any position. A shock tending to throw the weights downward will also tend to do the same with the balancing parts, with the result that there is no motion.



LORING SPEEDMETER.



SECTION OF LORING SPEED GAUGE.

The Production and Properties of Gasoline.

By T. H. Reardon.

In the long list of natural products that are important factors in our modern civilization, whether regarded as a necessity, a general utility or a luxury, there is no one article that is entitled to higher rank than the petroleum distillate known as petroleum ether, comprising cymogene, rhigolene and gasoline. The only essential difference in these three products is the volatility and density as shown by the Baumé hydrometer. Cymogene has a Baumé density of 108°, a specific gravity of .590 and boils at 32° Fahr. Rhigolene has a Baumé density of 94—92°, a specific gravity of .625—.631, and boils at 65° Fahr. Both products are so volatile that pressure and cooling are generally employed in bringing about their condensation; both are principally used in surgery as local anesthetics, and, as their treatment is not strictly pertinent to the subject, they will not be dealt with extensively.

Gasoline is comprised between 74°—90°, Baumé scale, and specific gravities of .6889—.6363, the gradation between the different products being arbitrary to a certain extent, their separation being effected by a commercial process known as fractional distillation.

EARLY HISTORY OF GASOLINE.

The refining of crude petroleum first attained commercial importance about 1855, when the differences in volatility, density and other properties were noted and observed in a scientific way. Methods for separating the volatile from the less volatile constituents were devised and tested, the whole aim being to expel the lighter products (without any regard for the value of such products) and to obtain a good quality of illuminating oil free from such volatile products as would tend toward the production of an explosive vapor in lamps. The residue left in the stills after the kerosene was driven off was considered of but little value; in fact, the crude petroleum was worked solely for the kerosene it would yield—the light products and the heavier products being something that went to the "dump" by the shortest natural route.

The first shipment of kerosene arrived in New York in 1857; the oil had a dark brown color and an offensive odor; the lamp wicks crusted and the light was very poor; in spite of these objections, on account of scarcity, kerosene oil commanded $2 per gallon. About the year 1885, gasoline, which up to this time had been regarded as a by product of little value, commenced to attract the attention of refiners; from that time its use has steadily increased and it has gradually won popular favor until to-day all other products of petroleum sink into insignificance when compared with gasoline.

DISTILLATION PROCESSES.

A certain quantity of the crude oil, as it comes from the well, is pumped into a large iron still, not unlike a large steam boiler, the fires in the furnaces are lighted and the distillation is commenced. The different products will distill over in the order of volatility, the lightest passing over first.

Different refiners have different methods, but it is considered good practice to continue the distillation until all gasoline has passed over, and then to redistill for the separation of the highly volatile products, and for the different grades of gasoline. By pursuing this course the gradation between a certain product and the next product of a higher density is more sharply defined, as there is always more or less tendency on the part of a heavy product to pass over with the light product. The Baumé density of the condensed distillate is frequently observed, and when a certain density is reached the delivery pipe is shifted to a different receiving tank, the heat is increased and the further distillation of the crude oil is conducted for the production of illuminating oil.

PURIFICATION OF GASOLINE.

The purification at present generally takes place before the final distillations for the separation of particular grades. The process in brief is as follows: About 4 pounds sulphuric acid of 66° Baumé density are added for each barrel of gasoline undergoing treatment; the whole volume is agitated by means of an air blast for fifteen minutes, and allowed to settle for an hour. The acid and impurities settle to the bottom as sludge and are drawn off; the gasoline next receives a caustic soda treatment carried out in exactly the same manner as the acid treatment. This removes impurities of a different character, and removes any acidity that has resulted from the first treatment.

DISTILLATION FOR SPECIFIC PRODUCTS.

After the gasoline has been freed from impurities it is subjected to redistillation in a still for the separation of grades that do not differ more than two degrees in density and volatility. Steam heat is used in this process and, owing to the even temperature that can be maintained, and also to the excellence of the condensing apparatus, very close fractionation is possible.

USES OF GASOLINE.

At present gasoline is probably more important as a source of power in gasoline engines than on account of any other single application. Users of power are keenly on the alert for the appearance of a prime mover that can convert the thermal energy in fuel into mechanical power, and minimize, if not wholly eliminate, the thermo-dynamic waste that is inseparable from the steam engine. In addition to the high operative efficiency, the gasoline engine has one other very desirable feature, viz., immediate availability. For instance, power is wanted for an hour for some particular purpose; the engine can be started in a minute, fuel is consumed only while the engine is actually doing work, and as soon as the engine is stopped expense ceases. With steam at least half an hour and a lot of fuel are wasted getting ready, and when power is no longer needed a hot fire is still burning, which represents still further waste.

Where power is used in moderate amount and intermittently, the gasoline engine will be found highly efficient. In regard to the advantage of the gasoline engine over the steam engine in automobile service, a number of motorists were interviewed, and it seems to be the general consensus of opinion that where the gasoline is used as fuel to generate steam about twice the quantity must be used for a given amount of mechanical effect.

USE OF GASOLINE FOR HEATING.

Gasoline has a very extensive use in the household as a fuel in gasoline stoves; it is at present more used in rural than in thickly populated districts, the city gas service being more convenient and not any more expensive where such service exists. It is also used in brazing and also in plumbing work. It yields a very intense heat and is really indispensable in certain classes of work in which portability is the most important requirement.

GASOLINE AS A CLEANSING AGENT.

Gasoline is so generally used for this purpose and its merits are so universally known that it needs but brief mention. It has no active chemical properties, but it is an ideal solvent for oils and greases, and when applied to a fabric or a light colored kid glove containing such spots the oil or grease is at once dissolved, and may be completely washed out by the gasoline. As it is colorless and leaves no residue on evaporation it may be used in nearly every instance for such work. As it is highly inflammable it should never be used in proximity to an open flame or near a fire. Many articles of clothing and attire that would be ruined by any laundry process can be washed in gasoline without undergoing discoloration or shrinkage.

AS AN ILLUMINATING AGENT.

Gasoline is used extensively for producing a gas that is used for illuminating purposes. The gas is formed by pumping air into a vessel containing gasoline, the proper pressure for the character of service desired is obtained in this way, and the gas is a simple mixture of gasoline vapor and air. The air not being present in sufficient quantity for combustion, the gas derives the additional oxygen necessary for combustion from the atmosphere in burning, the same as other gases do. The gas produced in this way is sometimes used in the ordinary open flame jet; frequently it is used, and to better advantage, in connection with Welsbach mantles, and used in this way it gives the incandescent gas light.

There are special apparatuses on the market for the production of gas of this kind, the apparatus being automatically regulated so that the proper pressure is always maintained in the generator. A supply of gasoline, sufficient for, say, six months or

a year, being placed in the generator, and the small automatic air pump for maintaining the proper pressure being set in operation, the apparatus needs no further attention until the supply of gasoline is exhausted. A plant of this kind is generally placed in a location exterior to buildings as a matter of convenience, but also to eliminate the fire risk, which is paramount to every other consideration in the use of gasoline.

USE IN THE LABORATORY.

In the chemical laboratory the application of heat is a matter of greatest importance. Every precipitate obtained in gravimetric analysis must be subjected to heat of a certain degree, cooled in a desiccator and weighed on the balance, as final operations in executing a quantitative analysis. The heat required varies with the nature of the substance undergoing treatment; in certain cases drying to constant weight at 212° Fahr. is the correct thing; in other cases the heat of the Bunsen flame is necessary, while in the determination of calcium as oxide and magnesium as pyrophosphate a stiff, white heat is necessary as long as this treatment will cause the precipitate to decrease in weight.

Ordinary illuminating gas is largely used, on account of its general convenience, but there are many instances where no gas is available in a laboratory. In the analysis of compounds for the estimation of sulphur present it is much better to use gasoline as a source of heat, as coal gas frequently contains sulphur, and if the precipitate in the crucible absorbs sulphur from the coal gas used for heating, a fictitious value will be given to the results of the analysis.

Gasoline will give any degree of heat that is required in regular laboratory work; it can be employed many miles away from the city and gas plant, and while everything is in its favor, a single objection to its use cannot be presented. The solvent action of gasoline on fats and oils, so commonly made use of in cleansing operations, is utilized in a far more elaborate way in the laboratory. An example will best illustrate its use. In the analysis of butter a weighed sample is heated at 212° Fahr. as long as it decreases in weight; the loss in weight represents water driven off by evaporation; the residue in the dish is now digested with gasoline and filtered; every trace of fat will be dissolved and will pass through the filter, while the curd, casein, salt and mineral salts, being insoluble in gasoline, remain on the filter.

It is now only necessary to evaporate the gasoline, distill it off, at moderate temperature, and the fat, separated from everything else, will be left as a residue in a convenient form to be weighed.

ENERGY IN GASOLINE.

The composition of gasoline as shown by its formula C_6H_{14} is carbon $\frac{72}{86}$, or 83.71%; hydrogen $\frac{14}{86}$, or 16.28%. Taking the thermal value of carbon at 14,500 heat units per pound and the corresponding value of hydrogen at 6,250 heat units per pound, calculation gives for 1 pound of gasoline: $14500 \times 1831 + 62500 \times .1628 = 22313$ heat units.

Converting pounds (74° Baumé) to gallons, $22313 \times 5.72 = 127630$ heat units; multiplying heat units to obtain equivalent in foot pounds thus: $127630 \times 778 = 99296140$ foot pounds. Reducing foot pounds to horse power hours thus: $\frac{99296140}{1980000} = 49.89$ horse power hours as the energy in one gallon of gasoline, and which would be obtained if we had a gas engine of 100 per cent. efficiency.

Of course, 100 per cent. efficiency in anything is only an idle dream, but the gas engine is doing good work, and will in the near future do better work. It will not drive the steam engine to the wall, nor relegate it to the scrap heap, but it will continue to be what it is already—a very formidable rival.

Book Review.

Three Men in a Motor Car. By Winthrop E. Scarritt. Published by E. P. Dutton & Co., 31 West Twenty-third street, New York. Price, $1.25.

With two other members of the Automobile Club of America, W. E. Scarritt, a former president of that body, during the summer of 1905 made an automobile pleasure trip through France and Switzerland, and his experiences and observations during this trip, related in an interesting manner, form the major portion of the present volume. The book contains an introduction by C. N. and A. M. Williamson, the authors of a popular work of automobile fiction, and is dedicated to the Automobile Club of America. Mr. Scarritt leads off with a review of his early automobile experiences (or, rather, automobile buying experiences), introduces the personnel of his party and then turns to an account of the automobile trip, which began at Plymouth, England, on July 29 and ended at Paris about a month later.

In the account of the trip constant reference is made to the many notable buildings and other things worth seeing along the route covered, and many useful hints are offered as to how an automobile tour in Europe may be made with the least annoyance.

The latter portion of the book is devoted to a discussion of a number of timely automobile subjects, including "Commercial Automobiles and Newspaper Delivery," "The Fuel of the Future," "Automobile Legislation," "Good Roads," "Practical Suggestions," etc.

Motor Wagons for the Portuguese Government.

An English firm (Thornycroft) has recently delivered a light steam truck and a 5 ton steam ambulance to the Portuguese Government in connection with a military expedition in Portuguese possessions in West Africa. The mechanical transport equipment consists of four 5 ton steam wagons with eight 3 ton trailers, and a 1½ ton steam van, specially fitted for the use of staff officers. The 5 ton wagons have platform bodies, and are of the Thornycroft colonial type, with vertical central fired water tube boilers, adapted to burn wood if desired, and compound 45 horse power engines. The wagons are of specially strong construction to enable them to be used satisfactorily in rough country, and the transmission gear is entirely enclosed. Two of the wagons have interchangeable ambulance bodies, which carry twelve men each, there being eight stretcher beds in each ambulance. Owing to the rough country to be traversed, patent automatic weight-adjusting, spring supporting gear for the stretchers was fitted. These are thought to be the biggest ambulances that have yet been built.

The special light steam van is comfortably fitted up for use by day or night. The wheels are fitted with solid rubber tires, and the wagon is capable of a speed of about 15 miles an hour on the level.

The boiler is of the vertical water tube type, and the engine is a compound, developing about 25 horse power. The transmission is by Renold chain to differential on back axle.

British Automobile Trade.

Some authorities have it that last year the imports of automobiles into the United Kingdom exceeded the home production, but careful inquiries seem to negative this. So far as can be ascertained, we made about 16,000 cars of all grades during 1905, worth about $20,000,000. With parts and motor cycles added, the total value is brought up to $25,000,000. During the same period we imported $17,234,830 worth, and re-exported $1,719,180. Our own exports touched $2,720,140. The total value of the home market for last year was thus about $39,000,000, of which the foreigners took nearly half.

The imports last year increased $5,000,000 over 1904, and were nearly twice as great as in 1903. Foreigners seem to be doing a good business in the United Kingdom in the sale of motor cars. Last year the United Kingdom exported $2,700,000 worth of motor cars, and for January and February of this year $560,000 worth were exported, which was an advance of nearly 100 per cent. over the figures for the same period last year. But roughly speaking, the United Kingdom is exporting in motor cars only one-sixth in value of what it is importing, but whereas the average value of each imported car is about $2,100, the cars which are exported are valued at only about $1,500. That difference is attributed largely to the motor omnibuses which are imported in large numbers for use in London. It is estimated that the home market will be worth $50,000,000 this year in motor cars, and that something like 22,000 cars of all grades will be disposed of.—*The Times, London.*

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Governed Motors for Commercial Cars.

Gasoline vehicle motors equipped with throttling speed governors, although they are applied to the pleasure cars of some of the leading manufacturers, have never become the rule in this country. When the governor has been used upon pleasure vehicles it has generally been for the purpose of automatically maintaining a nearly constant car speed independent of road conditions, and thus minimizing the amount of manual control required, for the purpose of preventing the racing of the motor when the clutch is disengaged, or, in the case of air cooled cars, for reducing the motor speed to a safe minimum when running idly. In a large proportion of the cars employing governed motors an accelerator pedal is provided, by means of which the governor is thrown out at will and the full engine speed realized.

Apparently a large proportion of automobile drivers are willing to dispense with the service rendered by a governor and to perform the increased manual regulation required in order to effect speed control as well as to take the necessary precautions against the racing of the motor.

It is, however, not unlikely that the governed motor of a certain type may find a special sphere of usefulness in the commercial vehicle field, owing to peculiar conditions which there prevail.

The pleasure car is designed and constructed essentially as a speed vehicle, and is usually operated by its owner, or, at least, in his presence. Thus the chances of its being destructively overdriven, except at the will of its owner, are not very great. On the other hand, the commercial car is generally designed and built to handle heavy loads at low speeds, often over very rough pavements and other arduous road conditions. It is generally quite highly powered, and despite the fact that it is customarily rather low geared is still capable of speeds over level streets which are likely to prove rapidly destructive and at which it was not desired or intended that it should be operated. A commercial car returning light after having delivered its load may be sadly overdriven as regards speed.

Furthermore, the business wagon is almost always driven by an operator who is not the owner, and the latter is hardly ever present during the road use of the vehicle. Despite all instructions and good intentions, an operator who has no pecuniary interest in a motor car which he is driving will, as a rule, use it less considerately than will the owner himself. This is frail human nature. Moreover, the teamster class, from which commercial car operators are and will be largely recruited, is not noted for its gentle consideration for things mechanical. If the motor of a commercial car is fitted with a governor, say of the fuel throttling, centrifugal type, so safeguarded that the operator cannot tamper with it, it would seem that its use might be made to automatically result in a certain measure of protection of the vehicle from the results of overdriving. Such a governor should be arranged as an engine speed limiting device, preventing a predetermined rate of engine rotation, and hence of car speed, from being exceeded. Such an engine would do its full work in hill climbing or in hauling very heavy loads, but could not be forced into driving the car at an undue speed. Manual speed regulation would not be interfered with up to the limit fixed. The only conditions under which a vehicle so equipped could be made to exceed the predetermined speed would be when running downhill with the engine disengaged.

Alloy Steel for Moderate Priced Cars.

There has of late been so much mention (particularly in advertisements) of the use of alloy steels in automobile construction that the layman might well form an idea that a good car cannot be built without the use of such steels—that carbon steels are entirely unsuitable as materials of construction for motor cars. It cannot be denied that nickel and nickel-chrome steel possess properties which for many purposes render them superior to carbon steel, but it must be remembered that these materials are very much more expensive than the ordinary machinery steel, and promise to remain so indefinitely. The salesman exploiting a car built in part of alloy steel will generally lay stress upon the expensive nature of these materials, and argue that, as the safety of the occupants is involved, no expense should be spared to secure as good material as possible.

Now, this argument may sound very plausible, but it is yet open to criticism. There have undoubtedly been some serious automobile accidents due to insufficient strength in certain parts, but the majority of sensational accidents have occurred with cars justly noted for the fine quality of materials embodied in them. There is not so much danger involved in the use of ordinary grades of steel in motor car construction as in the possibility of excessive speed, the demand for which has been the chief cause of the extensive introduction of alloy steels. It is generally known that the stresses imposed on the structural parts increase enormously at high speeds, and in order to enable these parts to withstand the shocks to which they are subjected when the car is being driven to its limit they must be made of the strongest material available; and some makers go so far as to cut heavily loaded parts out of big blocks of material, so that only the more tenacious core may be used. The same special materials must also be used in the power plant, in order that it may be as light as possible, and thus permit of the highest possible speed being attained. In short, in a car designed primarily with a view to high speed special steels must be largely used—first, to make high speed possible, and, second, to make it fairly safe.

The manufacturer of the moderate priced car—and by this term we include the great majority of all American automobile makers—cannot pattern their product after vehicles turned out by firms catering almost exclusively to the millionaire, and must solve their problems of design for themselves. With them the question whether ordinary carbon or an alloy steel should be used in any given part is as much a question of economy as of safety. A car can be made safe with carbon steel alone—if not for a mile a minute gait at least for a legal rate of speed—but alloy steels will admit of reducing the weight, which conduces to a saving in power and in tire wear; and, besides, in certain parts, such as sliding gears, the use of alloy steel insures greater durability. The question, therefore, will be, Will these advantages outweigh the higher price of alloy steel? Is the public willing to pay the difference in cost necessary to secure these advantages? Perhaps the greatest advantage of alloy steel, from the standpoint of many users, is that it allows of a higher speed with comparative safety, and the economic value of this increased speed would be another factor in the problem. The sum total of all these advantages must be balanced against the disadvantage of the greater first cost of the material and the higher cost of its working. The problem is a somewhat difficult one, and its solution can only be furnished by a close observation of both the results obtained with the special steels and of the public's appreciation of these results. As yet alloy steels are used only very sparingly, but it is quite probable that such parts as crank shafts, sliding gears and live axles will eventually be made of alloy steel in all but the very cheapest cars.

Charging Vehicle Batteries from Alternating Mains.

The usefulness and widespread adoption of the electric vehicle are vitally dependent upon the provision of convenient and universally accessible charging facilities. From time to time attention has been called to new apparatus intended to facilitate charging, and, on the whole, progress in this direction has been quite marked during the last year or two.

The idea held by a large body of the general public that an electric vehicle can be charged wherever it may be "hitched" to an "electric wire" is still very far from realization. Alternating currents being more and more generally adopted for electrical distribution, as time goes on the necessity for the provision of rectifying devices has increased at least as rapidly as such apparatus has been supplied.

The conception of an electric vehicle adapted to be charged without external rectifying device from any alternating current service connection is, indeed, a very attractive one. Its realization would immeasurably widen the field of the electromobile and even open to its users the pleasures of touring, since only the remotest parts of the country are now devoid of electrical supply systems. A proposal has lately been made which may ultimately lead to the production of electric vehicles actually capable of being charged, without the use of external apparatus, wherever either alternating or direct current can be obtained. This proposition is no other than that of so arranging matters that the motor of the car shall become the rectifying or converting device, taking alternate current from the supply service and changing it into direct current, which can be supplied to the battery.

In order to attain the required conditions it is proposed to connect the motor armature winding to collector rings upon its shaft, as well as to its regular commutator. A vehicle motor so arranged, if supplied from its battery, would deliver single phase alternating current from the collector rings before mentioned. Conversely, if proper precautions were adopted the motor, if supplied with single phase alternating current, through the collector rings, could conceivably be made to run as an alternating current converter, delivering direct current from its commutator for the charging of its battery. Converters operating upon this principle are in general use in stationary practice.

Means would have to be provided to allow of the disconnection of the vehicle motor from the driving wheels while it was acting its part as a converter; a charging rheostat would have to be carried upon the car to regulate the direct current supplied the battery, and also an adjustable auto-transformer to adjust the voltage of the alternating current supplied. A special sectional winding would be needed in the motor fields and suitable means for changing the connections of these sections from the parallel relation, required in the regular operation of the car, to the series relation, required in the separate shunt excitation of the motor during the charging operation. The carrying of this accessory apparatus would not be specially burdensome. When charging was to be ef-

:cted the motor field sections would be put i series relation and excited in shunt from ie battery; the motor would be mechani- ılly disconnected from the wheels, start- ł from the battery and brought up to the roper speed; alternate current of approxi- ıately correct voltage would then be ap- lied to the collector rings and matters ɔ adjusted that energy would enter the attery, the motor the while running on lternating current.

While objections of an electrical nature ɾould probably preclude the general use ɨf this method for ordinary daily charg- ng, the provision of the necessary appa- atus required to render it possible might ɪrove very advantageous in an emergency ɯhen direct current was absolutely unob- ainable. The proposition is certainly not ɔeyond the possibility of realization from ı technical standpoint, and if it can be em- ɔodied in practicable form might tend ma- ɪerially toward widening the sphere of the electric vehicle.

Electric Trucks in Hilly Cities.

The report on the commercial vehicle situation in Minneapolis and St. Paul, published in our issue of May 2, brings out the unfitness of the electric truck for use in hilly cities, like St. Paul, Cincinnati, Kansas City, etc. The ordinary electric truck is not equipped with motors of sufficient power to carry it up the steepest grades in these places loaded, and though it would not be a difficult matter to fit motors large enough to surmount the grades with suitable gearing, the heavy drain on the storage battery in hill climbing makes this type of vehicle unsuitable for such work. The mileage on one charge of the batteries of a vehicle that travels now empty, now loaded, over a very uneven roadbed is most uncertain, and it therefore very frequently happens that a truck is found unable to surmount a hill, the battery having become nearly exhausted. Such mishaps, which delay deliveries and require a relief wagon to be sent after the disabled one to tow it to the garage, are most aggravating to a business house, and if they occur frequently the most likely result is that the vehicle is retired from service after a time. Aside from this feature of unreliability the heavy demand for current in hill climbing has a very destructive effect on the battery, thus further reducing the already short life of this part, and, consequently, the cost of maintenance is soon found excessive.

It is to be hoped that the failures in St. Paul will serve as a lesson, and that in future business men in cities of similar topography, when considering the adoption of motor trucks, will realize the importance of choosing vehicles so equipped as to enable them to mount heavy grades without overstraining the power equipment.

Magnetic Spark Plugs.

A few years ago considerable interest was aroused by the placing upon the market of a system of ignition which involved the use of vibrating magnetic plugs operated from a battery and arranged to automatically rapidly interrupt the primary circuit and produce a succession of contact sparks within the cylinder, when the circuit was closed by means of a timer of the ordinary type. Such a system might be thought to possess important advantages, as it might be expected to combine, in a degree, the advantages of the usual methods of high and low tension ignition, and to be free from some of their disadvantages. The hot, quick acting touch spark would seemingly be obtained without the very considerable mechanical complications which its customary method of application involves.

As a matter of fact, very little has been heard, of late, of this apparently quite promising ignition system, and it may be inferred that, in the particular form which it was applied, at least, it did not fulfil expectations. No doubt technical difficulties were encountered in the practical operation of the somewhat delicate vibrating mechanism, which caused the make and break, exposed as it must necessarily be to a high temperature. It must also have drawn heavily upon the batteries. Nevertheless, the principle upon which the system is based may be found to possess merit, and, at the present time, when the superiority of the contact spark is being so generally discussed, it is perhaps worthy of attention. Doing away with the multiplicity of cams, push rods, springs, tripping devices and movable electrodes piercing the combustion chamber walls of low tension ignited engines and allowing the ignition current to interrupt itself and cause the contact spark by means of a simple mechanism compactly contained in a readily removable plug is a rather attractive idea. The magnetic plug has been modified by a well-known American automobile manufacturer and brought out in a "single break" type, apparently much improved over the rather crude vibrating plugs previously referred to. Quite recently a foreign concern has produced a form of magnetic plug, contact spark ignition, of sufficient novelty to arouse renewed interest in the general qualities of this method of spark production. The system in question comprises a magneto as a source of current, and thus the rate of consumption of electrical energy becomes a factor of rather secondary importance. A solenoid actuated, single break plug is used, and it would seem that the chances of the successful operation at high temperatures of so simple a device as this might be very fair. The magneto is of the geared, alternating current type, designed to furnish current on or near the crests of the inductive impulses, and carries integral with it the distributing contact-closing device. A special feature of the arrangement lies in the short-circuiting of the magneto armature by the timing device during the period of its inductive motion just preceding the moment when the spark is required. This should result in a strong magnetic "building up" of the armature core, so that, when the current is sent to the plug, the solenoid attraction, depended upon to cause the single break, should be very strong and the current ruptured very powerful, resulting in a very hot spark.

In the present state of the art, all ignition systems should be of interest and not regarded as finally discarded until they have received full development.

Our Garage Number.

The preparation of matter for our Garage Number, to be issued May 30, is now well in hand, and we have reason to believe that this special issue will be fully up to the standard of our former specials. The range of subjects covered will include garage buildings and equipment, methods of cleaning and looking after cars, systems of checking and charging for service, repair department equipment and methods, etc. Readers experienced in the garage business or in any subject of interest to garage men, who feel competent to write on these subjects, are requested to send [illegible] tions for this number. Arti[illegible] received at our office on Fr[illegible] the very latest, in order t[illegible] properly classified.

Results of the Two Gallon Efficiency Contest Analyzed.

The Two Gallon Efficiency Contest committee in the announcement of the event expressed the hope that the results of this year's contest would allow of fixing much closer handicaps for next year's contest, and it is therefore interesting to analyze the results of the recent competition. The system of handicapping employed this year does not seem to have met universal approval in the industry, and particularly the provision of crediting cars with one and two cylinder motors with only a percentage of their weight seems to have aroused the spirits of one well known manufacturer who makes these types of cars only. Unfortunately, as there were only three two cylinder and five single cylinder gasoline cars entered in the contest, the results hardly justify any conclusion as to the fairness of the handicap placed on these types of cars, owing to the fact that the data are too limited. But as there were forty-one four cylinder gasoline cars that completed the contest the results ought to give some fairly weighty indication of the variation of fuel efficiency with vehicle weight.

The officials of the contest state that, of course, a vehicle weighing one-half as much as another cannot be expected to go twice as far as that other vehicle. This is in accordance with the general view of the matter, but the results show it to be erroneous. One reason that occurs to one why a big car might be expected to have a higher fuel efficiency is that a big motor, when run at full load, is known to be more efficient than a small motor under the same conditions. But the heaviest car has not always the biggest motor, and, besides, the fuel efficiency of the car depends on the transmission efficiency, and the average transmission efficiency may well be greater in the lightweight car, for the reason that the high gear may be used a greater portion of the time. The fuel efficiency of a car, reduced to ton-miles per gallon, depends upon so many factors entirely independent of each other that (in our opinion) it is entirely impossible to prove by any sort of a priori reasoning that the big car should have a higher fuel efficiency than the small car (within the limits of commercial sizes). The results of the contest enable us, however, to determine whether there was any general variation in the fuel efficiency with weight, whether the efficiency increased directly or inversely with the weight, and in what proportion. In order to eliminate any disturbing influence on the calculations due to variation in cylinder number, we will consider only the records of the forty-one four cylinder cars.

According to the contest committee the fuel consumption is not proportional to the weight of the vehicle into the distance run, but to the product of the sum of the weight and a constant into the distance; thus

$$F \sim (W+X)\ D,$$

where F = fuel consumption; $\sim$ = varies as; W = vehicle weight; X = an addendum which the committee assumed to be 800 pounds; D = distance in miles. If the fuel consumption is fixed, as in the late contest, F is a constant, and we may write:

$$(W+X)\ D = C,$$

or,

$$WD + XD = C.$$

By substituting in this equation the values of W and D for the forty-one four cylinder cars we obtain forty-one "observation equations," of which the first three are as follows:

$1{,}500 \times 87 + 87\ X = C$ (Franklin).
$3{,}270 \times 47.9 + 47.9X = C$ (Frayer-Miller).
$3{,}110 \times 40.2 + 40.2X = C$ (Darracq).

The most rational values of X and C can be determined by means of the method of least squares. From each observation equation are obtained two normal equations by multiplying the observation equation by the coefficients of X and C respectively. As the coefficient of C in all the observation equations is unity, the observation equations themselves are the normal equations for C. The first of the normal equations for X are

$11{,}353{,}500 + 7{,}569X = 87C$ (Franklin).
$7{,}507{,}309 + 2{,}295X = 47.9C$ (Frayer-Miller).

These calculations have been carried through for all of the forty-one cars, and the two sets of equations were then each added, which gave

$$4{,}489{,}290 + 1{,}358X = 41C,$$

and

$$153{,}822{,}000 + 54{,}003X = 1{,}358C.$$

Solving for X and C we find

$$X = -570 \text{ pounds},$$
$$C = 90{,}760 \text{ pounds} = \text{miles}.$$

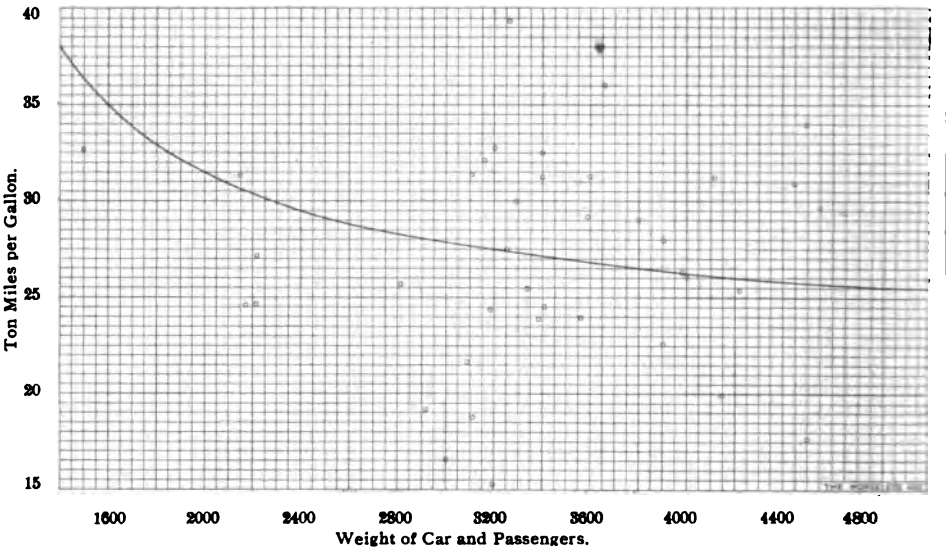
It will thus be seen that the addendum X has a negative value, which proves that the assumption of the contest committee that heavy cars are more economical of fuel than light ones, on a ton-mile basis, is erroneous, and the exact opposite is the case, so far as the four cylinder vehicles entered in the contest are concerned. Instead of adding a constant weight of 800 pounds to the weight of the vehicle, a weight of 570 pounds should have been subtracted, which would have changed the results very materially.

In the diagram herewith the weight of all the four cylinder cars is plotted on the horizontal scale, and the ton-mile efficiency on the vertical scale. A glance at the points thus obtained shows that the efficiency is lower for the heavier weight cars, and the heavy curved line represents the empirical relation found by the above analytical method to exist between the weight and the efficiency. It is, of course, to be understood that the formula

$$(W - 570)\ D = 90{,}760$$

is empirical, expressing the results of the contest.

From the diagram it will be seen that the average weight of the four cylinder cars with passengers is something like 3,400 pounds, and the average fuel consumption for this weight is 1 gallon for 27 ton-miles. The average fuel consumption of the five single cylinder cars which competed was 1 gallon for about 23 ton-miles, and of the three two cylinder cars 1 gallon for each 19.3 ton-miles.



RECORDS OF FOUR CYLINDER CARS IN CONTEST PLOTTED.

In view of the fact that the smaller cars showed actually a greater fuel economy than the larger ones, generally speaking, and the four cylinder cars a higher economy than the single and double cylinder ones, all based on ton-miles produced per gallon consumed, we believe that in next year's contest all handicaps should be abolished and the vehicles be made to compete on a simple ton-mile basis. In this year's contest those classes (that of light cars and that of multi-cylinders) which were given an advantage by the rules would have shown up best even without this advantage.

The two leading cars in the contest, the Franklin and Frayer-Miller, owing to the protests which had been raised with respect to careless distribution of gasoline, were sent over the course again by the contest committee on Tuesday, and both bettered their previous records. The Franklin, driven by Holmes, traveled from New York to 1 mile beyond Wallingford, Conn., a distance of 95 miles, on 2 gallons of gasoline. The time occupied in this run was five hours fifty minutes, progress being slow beyond New Haven because of mud. The second

run of the Frayer-Miller carried it 1 mile beyond Bridgeport, Conn., a distance of 59.8 miles. The Franklin exceeded its first performance by 8 miles, while the Frayer-Miller did better in its second trial by 12 miles. Weights and conditions for the second test were exactly the same as for the first one. The cars were weighed with passengers on the scales at the foot of East Fifty-seventh street, from which point the mileage was figured. The better performances on this day were undoubtedly the result of an improvement in the road conditions and a somewhat higher speed.

The economy records achieved in this contest are still far below records made in France in recent years, but owing to the fact that a very large portion of the route for the A. C. A. contest leads through territory where the 10 mile speed limit is enforced, the conditions are dissimilar and a comparison is unjust to the cars which competed in the American contest.

It may also be of interest to give the ton-miles per gallon produced by the different vehicles. This is shown in the following table:

Car.	Ton Miles Per Gallon.	Actual Weight, With Passengers (Pounds).
Franklin	32.62	1,500
Frayer-Miller	39.25	3,900
Darracq	31.25	3,110
Berliet	35.77	3,660
Mack	39.92	9,325
Cadillac	31.78	2,250
Franklin	31.25	2,140
Stoddard-Dayton	32.60	3,200
Queen	32.18	3,160
Lozier	34.00	4,490
Frayer-Miller	32.30	3,600
Renault	31.12	3,400
Compound	29.36	2,610
Darracq	31.15	3,600
Compound	28.65	2,635
Renault	29.82	3,240
Packard	31.07	4,110
Napier	27.05	2,220
Orient Buckboard	22.97	930
Aerocar	27.45	3,250
Am. Mercedes	30.82	4,440
Frayer-Miller	29.80	4,055
Packard	29.00	3,860
Packard	29.07	3,580
Franklin	28.07	2,720
La Comete	29.50	4,540
Orient Buckboard	21.57	920
Locomobile	29.37	4,640
Duryea	26.96	2,030
S. & M. Simplex	27.92	3,900
Franklin	24.41	2,170
Franklin	24.45	2,220
Franklin	25.71	3,230
Martin	26.57	3,970
Fiat	25.40	3,340
Compound	23.31	2,360
Covert	22.49	1,220
Rochet-Schneider	26.10	4,000
Renault	24.26	3,180
Mercedes	24.41	3,410
Columbia	25.32	4,220
Elmore	23.83	3,380
Darracq	23.88	3,560
Oldsmobile	23.86	1,660
Winton	21.56	3,080
Hotchkiss	22.52	3,900
White Steamer	21.92	3,380
Maxwell	23.76	2,640
Cadillac	21.62	1,780
Columbia	19.18	2,920
White Steamer	18.54	3,225
S. & M. Simplex	18.76	3,110
Bliss	19.67	4,140
White Steamer	19.81	3,370
Wayne	16.50	3,000
Mors	17.65	4,490
Oldsmobile	15.12	1,330
Panhard	15.22	3,190
Northern	17.85	2,760
Buick	16.40	2,280

Jump Spark Versus Make and Break.

By Hugo C. Gibson.

In the general application of low tension ignition very few conductors are required, and these are conveniently short, of heavy gauge and lightly insulated; also, the contacts to the engine frame and throughout the system are simple, heavy and necessarily good. All these points result in very little resistance to the passage of the current. There is a clear path for it all the way, and the timing is definite, with the result that on breaking the circuit a fat, hot spark is produced at the right time in each cylinder. Finally, a magneto generator is usually employed, placed close to the engine, with good, heavy terminals for fixing wires to, and having an armature of low resistance, and therefore capable of giving a heavy discharge without damage. Thus it is seen that the whole ignition apparatus, being of a simple, rugged type, hardly capable of derangement, is eminently suited to be handled by a person who does not wish to delve deeply into the mysteries and shortcomings of electrical apparatus, or who cannot discriminate between the energy required for the adjustment of a three-sixteenths and a one-half inch nut.

Now contrast these conditions with those frequently obtaining when using high tension coil ignition. Most of the apparatus from the battery to the plug is of a delicate nature. There is: (1) A multiplicity of small terminals to keep tight; (2) the absolute necessity for maintaining an efficient primary circuit (rarely obtained), and (3) the delicate adjustment of the trembler on the coil. Also, as a rule, far too much wire is used for connecting up. These bad conditions can and should be improved. Terminals should be of large size and have a fine thread to avoid jarring loose. In the case of storage batteries the lugs on which the terminals are fixed should be of ample size to avoid twisting when tightening the nut, and efficient means must be taken to prevent corrosion due to acid, as this frequently makes a high resistance joint and yet appears good. Use storage batteries whenever possible, as the internal resistance is low and a good, quick, heavy current can be obtained.

The ground or frame connection should never be allowed to occur through the bearing surfaces which carry the contact, or through the frame of the machine; this is a frequent cause of inefficiency. All ground wires should run direct to the cylinder casting and an efficient spring contact should be provided on the centre boss of the contact timer.

The general impression is that the fastest spark is the most efficient, but this is not necessarily so. Tremblers should be adjusted to give the longest spark which will maintain itself apparently continuous while showing a flame color other than blue.

High tension coil ignition is so adaptable and such a long suffering servant that almost any place is considered good enough to locate its essential parts; thus the coil may be under the driver's seat and the batteries in the tonneau. This want of consideration and appreciation is a frequent cause of trouble, and a certain cause of inefficiency, for the reason that an insulated wire has capacity, and this capacity resists any sudden increase or decrease of current in the wire. More especially is this true of the high tension wires, and the faster the trembler vibrates the greater the retardation due to capactiy. Therefore, shorten your wires, both high and low tension, make good, heavy contacts and don't rely on frictional contacts where it is not necessary. Combine engineering with laboratory electrical practice and the high tension coil system is the handiest and most reliable thing imaginable.

Now as to the question of efficiency.

It has been suggested that combustion is not so rapid when the mixture is ignited by means of a jump spark. It is reasonable to suppose that this statement means that the flame propagates itself throughout the compressed mixture at a slower rate when ignited by jump spark than otherwise. If this were so, then by producing a spark in the centre of the mass of mixture, or at what might be looked upon as its centre of gravity, we should obtain more rapid and efficient combustion than with the same type of spark in any other position. It has been proved that any advantage so obtained is inappreciable and that the position of the spark does not affect the time taken to burn the fuel. Therefore, it follows that the propagation of flame is so rapid that quality of spark does not produce any great difference in the time taken to burn the fuel, provided that the spark is capable of igniting the mixture at all, and that it occurs at the right time.

Now, as the time taken to burn the mixture is pretty constant, and we can, if we wish, fire the charge so rapidly (by means of the jump or other spark) as to produce pre-ignition, evidently the explanation of some failures of jump spark does not lie in any inherent defect, but rather lies in its adaptation. Frequently one cylinder of an engine will be firing at a later period than its fellows, and because it is not misfiring the observer thinks it is all right. Perhaps only the trembler requires adjustment, but the result is a low pressure on the top of the piston and consequent inefficiency. This is the fault of the man who installs or adjusts the system, not of the system.

Watching the Car While on the Road.

By Albert L. Clough.

It may be assumed that every owner of a motor vehicle either has his car frequently and thoroughly inspected in the stable or the garage, or else (what is far more satisfactory) looks it over carefully himself at short intervals, and thus forestalls the troubles which might otherwise develop when the car is on the road. Nevertheless, the operator should cultivate a watchfulness of the car's performance while in service and a sensitiveness to the first indications of derangement of any sort, and be willing to improve part of the time allowed him at stops to make a superficial examination of the car's condition. By thus acquiring, as it were, a close "sympathy" with his vehicle, defects may often be detected at their very earliest inception and serious consequences avoided. The careless operator who does not heed the inarticulate signs of distress which sometimes arise from his mechanical charge, but who pushes on until the machine stops, is the man who has to approve the long repair bills.

Hearing and that other sense, whatever it may be (probably some manifestation of the tactile or muscular sense), which makes one sensitive to a change of motion or to vibration are the chief aids which an operator has in watching the performance of an automobile in service.

MISSING EXPLOSIONS.

To the experienced driver of a single or double cylinder car, a single missed explosion is not only instantly recognized, no matter what else he may be thinking about at the time, but the fact is almost painfully forced upon his attention. It is a sort of mechanical "palpitation of the heart." The sound of the exhaust is missed and the regular rhythm of the car movement is interrupted. A four or six cylinder engine, running at good speed and adequately muffled (as they usually are), has so slight a vibratory effect and its exhausts mingle into so continuous a "purr," that a single missed explosion is hardly perceptible even to the trained operator. In fact, such a car may be driven quite a distance, with one cylinder not firing, without the defect being perceptible, unless the reduced power development makes the condition manifest.

If the cylinder having defective ignition misses for a time and then begins to fire regularly, the condition will probably be noticed on account of the changes in motion of the car. If a four cylinder car has a muffler cut-out which may be opened from time to time, missed explosions may be detected when the motor is running at low speed, but when turning at a rapid rate a single ignition failure is hardly to be positively identified by the average operator. A driver should be ever on the watch for faulty ignition in his motor, as it results in reduced power, loss of fuel and some extra stresses on the working parts.

KNOCKING.

Good modern motors, when in condition, operate practically without any clanking or pounding sounds, and thus the operator's ears should be alert for any sounds of knocking proceeding from the engine. When a knock that is evidently not attributable to a too much advanced spark begins to develop, the danger signal which it conveys should be at once heeded. Such a pound will usually make itself apparent when the engine is slowed down, under full throttle, while climbing a hill.

If such sounds develop rather suddenly it is a pretty sure sign that the engine has become hot from lack of oil or of water circulation. If the cause is preignition, due to incandescent carbon deposits in the combustion space, the trouble will probably have been noticed before and will cause no immediate anxiety. The difficulty may be due to a loosening of the connecting rod bearings on the crank pins or to a loosening of some other mechanical fastening about the engine.

KNOCKING DUE TO OVERHEATING.

Knocking due to the engine's overheating and self-igniting its charges is of a peculiarly sharp, almost metallic, clanging nature, and is generally accompanied by considerable smoke arising from the burning off of oil from the outsides of the cylinders. There is usually, too, a very offensive and pungent exhaust produced from the incomplete combustion of the charges, when the motor runs after spark is turned off. A knock produced by mechanical looseness is of a less sharp nature, but louder, and shakes the car more noticeably. If mechanical looseness in the engine is the cause, the engine will stop when the spark is turned off, and will be found to crank easily, but if the cause is overheating of the motor or carbon deposits the engine will run after the switch is opened.

CAUSE OF OVERHEATING.

If the cylinders are found to be more than normally hot and the pistons move with difficulty and squeak when the engine is cranked, the trouble is probably lack of cylinder lubrication, while, if the cylinders are very hot and the radiator is comparatively cool, the difficulty is presumably one of lack of water or of defective circulation. If, when the radiator drain cock is opened, little or no water flows from it, the former cause is to be suspected, otherwise the latter, in which event the pump and piping will require inspection. A loosened connecting rod, if there is the slightest chance that it may free itself from the pin, is a matter which must be immediately rectified, as otherwise it may cause the destruction of the motor. A hot engine, if attended to at once and allowed to cool gradually, will probably not be seriously injured by the experience. The copious feeding of oil to the heated parts and a very cautious supply of cold water to the engine jackets, so long as they are intensely hot, are advisable.

SQUEAKING NOISES.

Very often a squeaking sound proceeding from the engine gives timely warning of a failure of piston lubrication and enables the oil supply to be renewed before the cylinders have become overheated. The driver's ears should be alive to squeaking sounds proceeding from any part of the car, as they are indicative of faulty lubrication. A choked muffler or a slightly loose exhaust pipe gasket may, however, give rise to a wheezing or gasping sound, which sometimes gives the operator a fruitless search for some dry bearing, while in reality none such exists.

GRATING SOUNDS.

An unusual grating or crunching sound arising from any part of the car should immediately lead the operator to stop the vehicle and throw off the spark, in order that the breakage, which may have taken place, shall extend no further than need be. Such a warning may indicate a stripped gear in the change speed device, trouble in the differential, in the drive shaft or the universal joints. Prompt action may limit the destruction as compared to what it might amount to, if the car and engine were not immediately brought to rest. Unusual rattling sounds usually denote that something is loose about the running gear or body of the car, and should be heeded at once. A sudden snap, occurring when traveling rough roads or passing over a "bump," is likely to have been caused by the fracture of a spring leaf. Its cause should be ascertained, and, if a spring has seriously given way, it will be policy to proceed very slowly until a repair shop can be reached. In the case of a chain driven car sudden snapping sounds from the rear of the vehicle may indicate the faulty action of the chains, probably caused by their having worn out of pitch, thus allowing the links to ride the sprocket teeth and suddenly snap into place. A broken chain may be the penalty for a failure to act upon the information thus conveyed.

An unusual humming or grinding sound of definite pitch may be taken as evidence that there are gears which are not receiving their usual supply of lubricant.

SIGHT FEEDS AND CIRCULATION GAUGE.

Every motor car driver should keep a close watch of his lubricator sight feeds. If oil drops can be seen passing he knows that oil is at least leaving the tank and going to some of the bearings, although he cannot be sure, from this indication alone, that all is right in the lubrication system, as there is always a possibility that a delivery tube may be broken or otherwise detached. If, by chance, a water circulation indicator is a part of the dashboard equipment of his car, its indication of pressure will at least be proof that the water is not exhausted and that the pump is active, although it may not be a sure evidence that there is a free circulation of the cooling liquid. If grease cups, capable of being reached from the seat, are depended upon for lubrication of certain bearings, the operator should, at suitable intervals, screw them down sufficiently.

The condition of the tires is a matter

which the operator should frequently
otice. If they are allowed to run flat
ıy considerable distance the results
ove expensive in both lost time and
l money. As a rule, it is not very
›r the driver to see the points of road
t of the rear tires nor of the front tire
st from him. An occasional inquiry
other occupants of the car should
rest the question of the state of the

SIGNS OF DEFLATED TIRES.

:flated rear tire, especially if there be
veight toward the rear of the car, often
ı peculiar "feel" to the steering, as if
· were traveling a greasy road. The
f the car swings about abnormally, as
: were a slight rear skidding tendency.
an operator feels this sensation, when
g on a good dry road, he should im-
ely think of his rear tires. Of course,
ted tire causes unusual sharp jars to
smitted to the portion of the car over
the mud guard and other attachments
vicinity shake and rattle more than
vhen the wheel is running on its rim
re deflated. These signs may, how-
ass unnoticed when a car is proceed-
a moderate pace over perfect roads.
:flated front tire will usually make
nown to the operator by the excess-
which is transmitted to the car body,
the "crankiness" of the steering which
es. The car tends to swerve to the
on which the injured tire is located.
of tire trouble should be instantly
as there is not only the certainty
aging the inner tube and shoe beyond
but the danger of serious loss of
of the car if high speeds are in-
in.

BRAKE TESTS.

y time that either brake is applied
serve the operator as a rough test of
:acy of these all important parts of
In case either brake shows any lack
ing power or fails in any degree to
: its usual effect, there is cause for
stigation and perhaps a readjustment.
ing mountainous districts the oper-
nind should be specially concerned
e condition of his brakes. It seems
unnecessary to remind motor car
rs that the brakes should not be set
ıe car is traveling a level road, but
ter once had a very unhappy ride of
›r so in a car which could just crawl
›n the low gear, while the operator
· abused the motor in picturesque
ıs it labored under full throttle. The
ıke was set, that was all, and it was
ıre to feel the motor whirl the car
'hen the discouraging "drag" was re-
The coasting powers of the car are
the matters which should be noted
wideawake operator in the regular
›n of his car, and, if the vehicle
luggishly, as compared with its wont,
probably some unusual friction act-
some point of the mechanism other
the engine, which is uselessly absorb-
ing power, and perhaps destroying some bearing.

When a car is coasting the motor is usually slowed down by throttle and late spark to its minimum running speed. If it should happen to stop when so controlled this may be taken by the operator as a sign that something is wrong. The ignition may be weak, the carburetor working badly, or an engine bearing may be heating and thus in danger of melting out its babbitt. The latter difficulty will, of course, be suspected if the engine turns hard when it is cranked.

CLUTCH ADJUSTMENT.

As with the brakes, the clutches are also tested as to their holding power whenever they are applied. If the car has a planetary or individual clutch change speed gear, any failure of the car and engine promptly to come to corresponding speeds when a clutch is thrown in indicates a weak clutch adjustment, which should be remedied at the first stop. A too fierce engagement of the leather lined clutch, used with a sliding gear combination, may act as a reminder that the band needs treatment with castor oil.

If a car is provided with a reliable grad-ometer the watching of this instrument during hill climbing may convey interesting evidence to the operator as to whether things are or are not as they should be. An operator very soon comes to know almost exactly how severe a grade the car may be expected to climb upon a certain gear, with a known throttle and spark position—the condition of the road surface and speed of the vehicle being considered. If one finds that grades which have heretofore been easily ascended on the high gear with a certain throttle opening require the expenditure of a much greater amount of gas, or recourse to a lower gear, it is likely that the ignition is weak or has failed in one cylinder; that there is some frictional drag acting on the car or some other defect equally worthy of investigation at the next stop or before.

INSPECTIONS DURING STOPS.

When a stop is being made, the operator usually has a little time at his disposal for making, at least, a cursory inspection of the car. If the motor does not stop promptly when the spark is thrown off, the engine cooling and lubrication systems may well be examined. Among the matters which may warrant the operator's attention are the following: The motor may be cranked over to see that it turns with perfect freedom, so far as friction is concerned, but shows the usual degree of compression in each cylinder. If there is friction, faulty lubrication is doubtless the cause; if lack of compression, the valve action should be closely scrutinized. With the gasoline shut off, the engine may be turned over to see that the vibrator buzzes properly when each cylinder comes to the firing point. It is well to try each wire which connects to the timer, in order to see that it is not wholly or partly broken off through repeated bending. One can usually tell whether a spark plug is broken by slightly twisting the terminal portion, which should be found firm in the metal portion of the plug.

DRIPPING GASOLINE AND WATER.

It is well to take a careful look under the car to see that there is no dripping of gasoline or water. If the carburetor drips when it has not recently been primed there is a presumption that the float or its attachments are in trouble. The draw off plug at the bottom of the carburetor float chamber should be seen to be tight. Many a car has been stalled upon the road on account of a total loss of fuel through the accidental opening of this tap. No dripping of gasoline, from any part of the piping or elsewhere, should be tolerated for a moment, on account of the fire hazard involved. If any unusual escape of water from the radiator, its draw-off cock, the pump or piping is detected, an investigation should follow. A slight water leak may be borne with until a more convenient opportunity presents for stopping it. Many an overheated engine has resulted from the accidental opening of the water draw-off. The oil plugs in the bottom of the crank and gear case should be proven to be tight, as serious damage may result from the escape of the lubricant incident upon the loss of the plugs.

All screw grease cups, which are not operable from the seat, should be screwed down a little when a stop affords one the opportunity. One may well examine the chains, to make sure that they are correct in point of tightness and that the fastenings of the master links are secure. A little grease supplied to the chains conduces to their smoothness of operation and long life. It is of the greatest importance to examine the tires as to their proper degree of inflation and to scrutinize the treads for any sharp objects which might later cause a puncture. No one who has the safety of his passengers and himself at heart will fail to give the steering gear at least a cursory examination when a stop is made, and if there are any nuts in any part of the car which, in the past, have shown an evil tendency to back off, one may well apply the wrench to them.

TESTING FOR FREEDOM OF MOTION.

If the car is stopped on nearly level ground it is no harm to push it backward and forward a few feet by hand, in order to make sure that it moves with its customary freedom. This is a very simple and easy test to make and not seldom proves worth while. It is surprising how often, even at this late date, motor car drivers run out of gasoline through sheer carelessness. Especially when touring through an unfamiliar territory there is no harm in taking on gasoline at stops where it is known that it is obtainable, even though only a few gallons is required to fill the tank. It may be further than one expects to the next fuel supply station, and it is always desirable to keep as full a tank as possible in case of need. It will, furthermore, never be amiss to look to the condition of the water supply when the car is stopped, as by so doing a special stoppage for water may be obviated.

LESSONS of THE ROAD

Three Years With Several Machines.

By E. Paul du Pont.

I have been using automobiles since August, 1903, when I started with a little buckboard. I may say that I got more enjoyment out of it than from any machine I have owned since, but I suppose this was only due to the novelty. I used the buckboard until the following spring, when my brother and I (we owned the machine together) decided it was too small. As for its operation, I can sum up all my troubles under one or two heads: First, we had considerable difficulty with compression. The valves would develop leaks, and so would the cylinder head. We repeatedly found broken piston rings, the renewal of which usually made the engine run like new. The exhaust valve broke from its stem once or twice, which, as may be well imagined, caused much annoyance. I have noticed that light, high speed engines, and especially air cooled ones, require considerable "gas engine knowledge" to operate, and seem to be easily put out of order, although the trouble is often of small moment and is remedied by a little "tinkering."

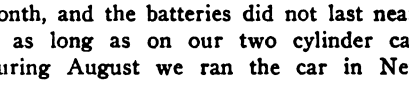
FAULTY OILING ARRANGEMENT.

Another source of annoyance was the lubrication. The engine had a glass oil cup with a hand valve to let the oil run in. This oil cup held enough to lubricate the engine twice. Whenever the engine needed oil it was necessary to stop, because the compression in the crank case would throw the oil out of the top. After supplying the oil it was necessary to wait for the engine to cool, as the danger of pre-ignition prevented immediate starting, even with the compression relieved. On the whole, I may say that the buckboard is a very satisfactory machine for light work.

Our second machine was a small detachable tonneau car, with a double opposed 10 horse power engine under the body. This machine received vary hard usage while we had it, but did excellent work. It had a two speed planetary transmission with bronze pinions. I noticed that these seemed to wear excessively; in fact, when the oil was drained off it reminded one of bronze paint, so much brass was in it. In one year the entire set had to be replaced twice, at a cost of $15, exclusive of work which I did myself. The pins in the differential would sometimes drop out, and, as the brake worked on the differential, this put one in a dangerous position. To obviate this danger we fitted hub brakes, as the machine was used in very hilly country. The differential once broke and allowed the bevel gears to jump out of mesh, with the result that the teeth were ripped off. This and the transmission were the only weak points in the car; the engine was excellent and never needed fixing of any kind. The carburetor and sparking device, however, were very crude. The contact wore out periodically, while the coil needed adjusting two or three times a week. Wires were all the time working loose and causing missing. The carburetor needed adjustment very often and was very sensitive. Every time any of these things needed attention it was necessary to ask all the passengers to get out, then take out the mats and carpets, and remove seat cushion and floor boards.

INACCESSIBILITY.

This soon disgusted us with having the engine under the body, and so the following year we purchased a second hand air cooled car. It had a four cylinder 10 horse power engine with two speeds. The transmission gave no trouble at all, aside from the wearing out of the friction surfaces. The engine did not cool as well as we expected, and used oil excessively. The exhaust valves needed grinding once a month, and the batteries did not last nearly as long as on our two cylinder car. During August we ran the car in New



Faulty Roller Bearings.

Jersey in the neighborhood of Asbury Park and had a very successful month with it. I suppose we averaged 30 miles a day, with no trouble worth mentioning. Once we were puzzled by a missing which we finally located in a broken commutator spring. I suppose good luck should not be bragged about, or it will change. Ours certainly did, that time, anyhow.

LUCK CHANGES.

We were accustomed to take every opportunity to tell of our excellent luck during that summer, and it lasted until three days before we left. Then the driving chain (which is very long) began to run badly and broke several times. Expecting trouble from this source, I purchased a vise, file, hammer and punch, which I added to my repair kit for the return trip. When the day for going home arrived we started at half past seven, with a run of 115 miles to make. Our destination was Wilmington, Del., which we hoped to make that day. We had gone only 7 miles when we discovered that the transmission was getting hot. We spent about an hour taking it apart and oiling the bands, which had started to grip the drums. We made a fresh start as soon as the gear was put together, and this time got only 2 or 3 miles, when we were stopped by a broken sprocket. This looked pretty hopeless, but something had to be done. After considering the best course we telephoned to Philadelphia and ordered a sprocket and then set to work to take the rig apart.

Here we encountered more trouble to the minute than I had ever seen before. The key was twisted and the wheels would not come off. Bolts were entered crooked and plates were bent. We worked all that day and half the next before we could start again. At last we did start, however, and made 60 miles in excellent time. We were saying we might get home before dinner if that kept up, but no! We soon lost all hope.

DEFECT IN ROLLER BEARING.

We were on a level stretch of open road with a grass field on one side and a ditch between it and the road. We were going at top speed, when there was a crash, the machine swerved and landed in the ditch, throwing one passenger nearly 20 feet. One front wheel had left the axle and caused the smash-up. No one was hurt. Right here I want to warn any one who may have roller bearings of similar construction, against a like mishap. The sketch shows a section through the hub, and it will be noticed that the nut is small enough for the wheel to slip over. Some grit caused the rollers to break and there was nothing to hold the wheel on. All such axles are now made with large nuts, and the nuts can be obtained from the factory at a small cost. Large washers put under the old nuts will also make them safe.

EXTRAORDINARY MISHAP.

To return to my narrative, we put the car in storage and went home by train. The car was fixed up and brought home by a repair man whom we sent after it. After this we were very successful with our car until last Christmas. Then a most extraordinary mishap occurred—one of the cylinders cracking off around the flange. It was at night and far from home, and I had to either fix it or stay there. So I set to work. I removed the connecting rod and piston, closed the inlet pipe with waste, and the opening in the crank case with a cuff bolted under the flange, in order to keep the oil in. Then I drove home and had the trouble repaired.

A little later another cylinder blew off. The bonnet was raised and I was cranking when it broke, and it flew off with force enough to break it when it struck the ground.

That was enough of this car for us, and it was sold. A new one has just been purchased. It certainly seems discouraging to have cars last only one year, and it is to be hoped that future improvement will be towards sturdiness and reliability, and not towards lightness. How the new car will do remains to be seen. My experience has taught me one thing, however, and that is that there is some truth in the old saying, "A stitch in time saves nine." Only in the case of an automobile the saving is much greater still.

NEW VEHICLES AND PARTS.

Woods Motor Vehicle Company's 1906 Cars.

The Woods Motor Vehicle Company, of Chicago, are building for 1906 eight electric and two gasoline models. The electric vehicles include most of the well-known types of bodies—open, closed and convertible. The small victoria, which is finished in the natural wood and metal, will serve to illustrate their special rear spring construction and method of supporting the motor. In Fig. 1 is shown a view of this three-quarter platform arrangement. The upper ends of the three-quarter elliptic springs are fastened to the body at two points, and special shackles, as shown, are used for the connection of the cross spring with the forward ends of the side springs. This construction is claimed to keep the dead rear axle parallel with the front axle, though otherwise allowing it free motion. The cross frame is rigidly fastened to the bottom of the body by braces at its middle. The internal expanding brakes for each rear wheel are also shown.

In Fig. 2 are shown the electric motor, brake and countershaft. This combination forms a single unit having its own frame, and is bolted to the under side of the body. The wearing parts are hardened, and the bearing surfaces ground. The jack shaft, which is driven by herringbone gearing, encased and running in oil, is made of chrome-nickel steel and runs on non-adjustable ball bearings; it is fitted with universal joints at each side of its centre and next the outboard bearings. These bearings are pivoted, as illustrated, and are free to swing. The drive is by side chains, and an auxiliary contracting band brake acts directly on a drum fast to the armature. The advantages claimed are, that less power is required to drive, as the front and rear axle remain parallel, the herringbone gears insure quiet running, and the power plant can be quickly and easily removed.

FOUR CYLINDER GASOLINE CAR.

The touring car chassis, which can be fitted with either a detachable limousine or a full Pullman body, carries a four cylinder



FIG. 1.—THE WOODS COMBINATION SPRING.

Rutenber engine, 5x5 inches, rated at 40 horse power. A Hill precision oiler is mounted directly on the engine, and driven by a hardened and ground eccentric from the crank shaft. As usual with this engine, splash lubrication is employed. The water pump consists of two hardened spiral gears to the end of the cam shaft. The circulation is from the top down one side of the jacket and up the other. The ignition is by jump spark from two sets of 6 volt storage batteries, each with a capacity of 100 ampere-hours. The switch and quadruple vibrating coil are located on the curved metal dash and connected to the Lacoste timer and plugs by small diameter French cables. The carburetor is of novel design, and was illustrated and fully described in our issue of February 7 last. Gasoline is carried under the front seat in two separate 12½ gallon tanks, which are connected by a pipe with valve.

The general arrangement of the car is shown in the plan Fig. 3. The frame is of the usual form of pressed steel, narrowed at the front, and the engine and transmission are supported on the sub-frame of channel section. A full universal joint of the company's own design is placed between the engine and the transmission. It is packed in grease, and the back of it is closed by a flat, spring-pressed leather disc, which can be quickly removed for repacking. The power is transmitted through the ordinary three speed and reverse sliding gear, jack shaft and side chains to the solid rear axle. The muffler, which conists of concentric tubes, is hung transversely from the rear of the sub-frame.

CLUTCH.

An aluminum leather-faced cone clutch in the flywheel is fitted with flat springs under the leather to insure gradual engagement. The helical clutch spring is on the inside

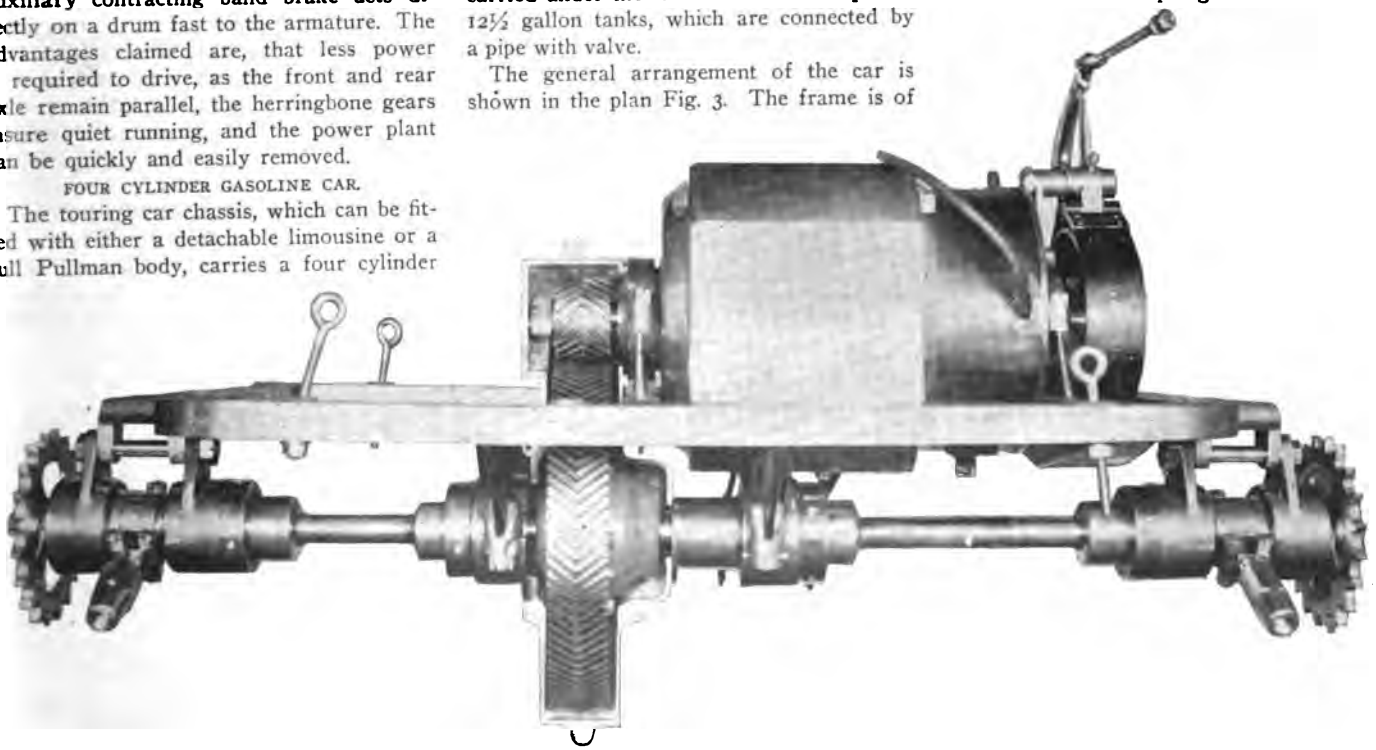


FIG. 2.—WOODS ELECTRIC MOTOR AND REAR AXLE DRIVE.

of a hollow sleeve, as seen in Fig. 4, which it presses inward by reacting against a ball thrust bearing and nut on the end of the prolonged engine shaft. This sleeve carries three integral arms, which are connected to and pull the cone by three connecting bolts. The distance between this

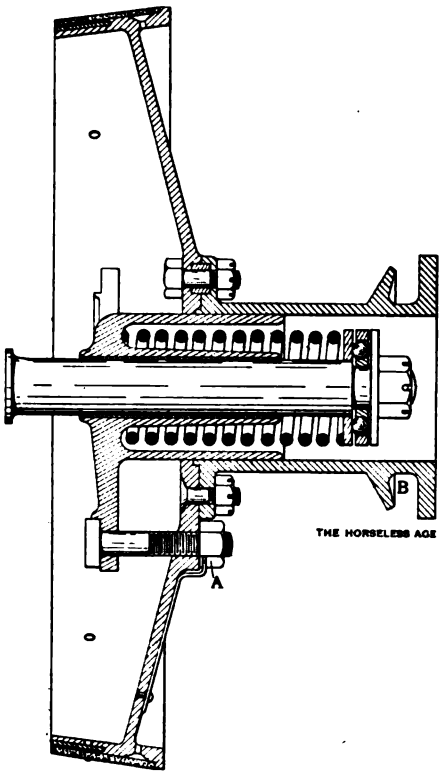


FIG. 4.—WOODS CONE CLUTCH.

sleeve and the cone, and consequently the pressure of the spring, is adjusted by three nuts, A, which are prevented from turning by abutting V notched springs. These nuts are very accessible and make the adjusting of the clutch easy. The outside sleeve is slotted at B to receive the forked arm on the cross shaft, operated by the clutch pedal.

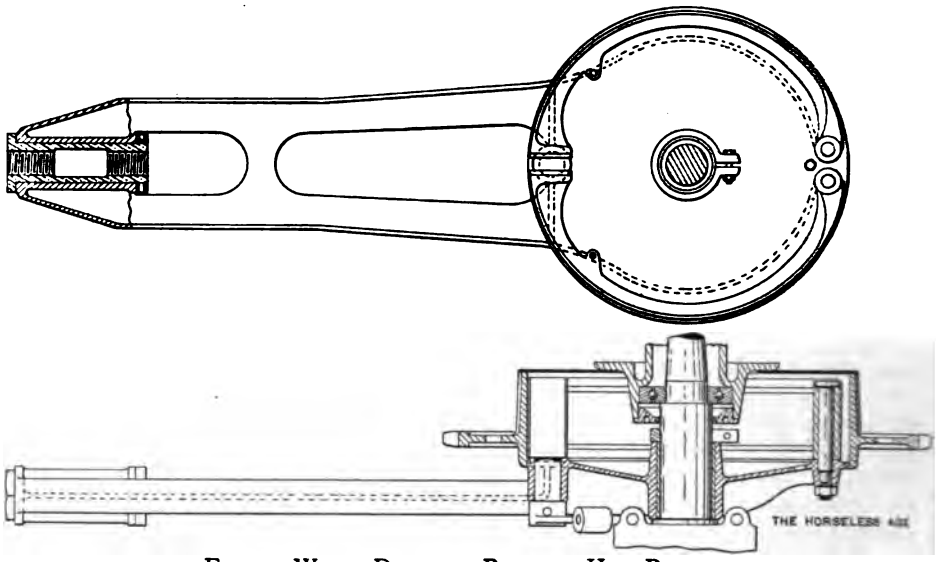


FIG. 5.—WOODS DISTANCE ROD AND HUB BRAKE.

CHANGE GEAR.

The three speed and reverse sliding gear transmission runs on non-adjustable ball bearings. Chrome nickel steel is the material used for the gears and shafts. The high speed is direct and is obtained by a positive clutch, with the lay shaft rotating idly. The shafts are arranged side by side in a horizontally divided aluminum case, with supporting arms on its lower side so that the upper half can be removed, leaving everything in position. The bevel gear differential and the centre jack shaft ball bearings are on the inside of the case. The outer ends of the jack shaft are also carried in non-adjustable ball bearings, supported in special brackets riveted to the frame. The reduced end of the squared shaft has a 4½ inch bearing inside a bronze bushing in the clutch shaft, which is supported at each end of this space by a ball bearing. The shafts carry integral flanges to which the gears are bolted. The speeds are controlled by the usual side lever, which operates on the progressive system.

AXLES AND BRAKES.

Both axles are steel forgings and support the wheels on non-adjustable ball bearings, which are protected from grit and dust by rings containing felt washers. The rear brakes are internal expanding bands with fibre facings acting against drums integral with the rear sprockets. The bands are pivoted and held by studs from the banjo-shaped manganese bronze radius rods, Fig 5, which take all the braking strains. The forward ends of these rods are pivotally connected to the jack shaft hanger. These brakes are interconnected with the clutch and operated by the usual side lever, which acts through steel cables over equalizing pulleys, as shown in the plan. An internal expanding transmission brake, operated by a foot pedal, is located on the jack shaft. It not only disengages the clutch, but at the same time throttles the engine. The connection can be adjusted to give any desired amount of throttling. The connection between the brakes and clutch can also be varied by means of a turnbuckle.

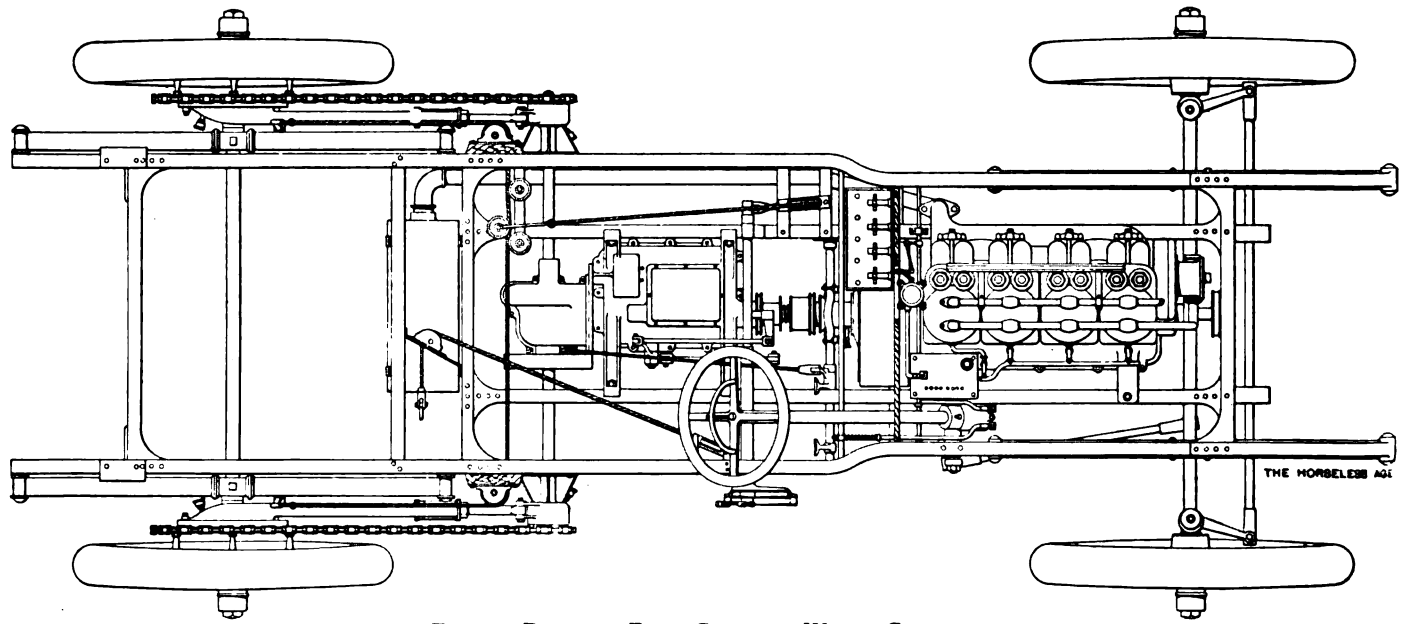
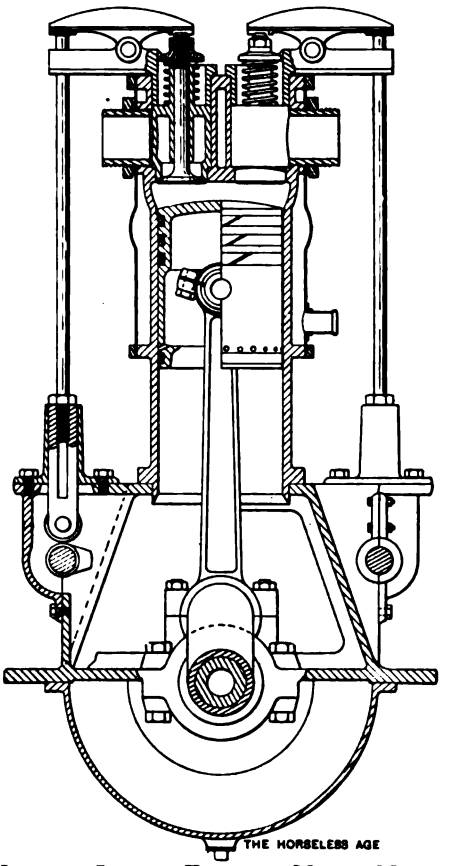


FIG. 3.—PLAN OF FOUR CYLINDER WOODS CHASSIS.

The Miller Motor.

John A. Miller, of Miller Brothers, Tarrytown, N. Y., who has experimented in the automobile line for a number of years past, has designed and about completed a model of a four cylinder gasoline motor which embodies a number of novel points. The model built is of 3¾ inch bore by 4 inch stroke, has four individual, copper-jacketed cylinders and employs high compression. The inlet and exhaust valves are mechanically operated and of the caged type, so that the valve with its spring and seat can be removed as a single piece. The cages are set into the integral cylinder heads, side by side, and are held in place by the base of the brackets carrying the valve rock levers, which are bolted to the cylinder heads directly over the valve cages. The cylinder castings are increased in diameter at the upper end, to enable a larger diameter valve to be used. The cylinders are machined inside and out, which makes the thickness of the wall absolutely uniform and insures uniform expansion due to heating. The cylinder heads are double, providing for a large body of water around the valves. This is one of the advantages claimed for this particular construction. The top plate of the cylinder head and a flange along the length of the cylinder are turned down in the lathe and a spun cylindrical copper shell, with a single corrugation, is then forced over the cylinder. Before this is done the opposing contact surfaces on the cylinder flanges and the copper shell are tinned. Then split rings of cast brass are clamped around the shell over the flanges, and the whole is heated to a temperature higher than the melting point of tin, and the bolts are drawn up tight while the cylinder is hot, with the result that the shell is practically sweated to the cylinder. When the cylinder flanges are turned down the valve outlets are turned down to the same diameter; they are then tapped out and an outside nipple is screwed in each, over which is passed a brass washer, the inner side of which is curved to conform to the circumference of the copper jacket. These washers are then forced against the copper shell by steel nuts screwed over the nipples.

The crank chamber is of aluminum, in two halves, joined horizontally. The upper half carries all five of the crank shaft bearings, the lower half serving only as oil well and dust protector. The upper half is cast with six integral supporting arms and also carries the cam shafts, of which there are two, symmetrically arranged on opposite sides of the engine, one for the inlet and the other for the exhaust valves. The cams are located in pockets, the inner half of which is formed by the crank chamber wall and the other half of which is bolted to the crank chamber, while the top is formed by the cast brass push rod guides, which are held in place by four cap screws. The parts of the cam shaft between cams



VERTICAL SECTION THROUGH MILLER MOTOR.

are exposed. This arrangement admits of quick removal of the shaft in case adjustments or repairs are needed by the cams. The cam shaft is of peculiar construction. The cams are threaded on, the threads being cut right and left handedly, respectively. They are held in place by being screwed up against a flange and are adjusted in the first place by being faced off until they assume the right angular position when screwed up tight against the flange. This method of fastening the cams admits of adjusting them angularly if this should ever be required, but it necessitates making the shaft in two halves, which are joined together (as shown) by overlapping half-sections and screwing a coupling or internally threaded sleeve over these sections. The cam gears are enclosed at the forward end of the engine.

An interesting feature of the engine is the method by which uniform lubrication of the cylinder is insured. Mr. Miller has had some experience with a foreign car of well known make that has the cylinders supplied with lubricant through a small tube entering them on one side. Upon taking this engine apart it was found that the oil had effectively reached only that side of the cylinder and the wear was much greater on the opposite side. In this engine the lubrication is entirely by splash. A sort of trough-shaped groove is cut around the inside of the piston not far from the lower end, which catches much of the oil that is thrown up by the splash in the crank chamber, and this groove communicates with the outer surface of the piston through a series of fine holes all around, through which the oil collected by the groove passes to the surface to be lubricated.

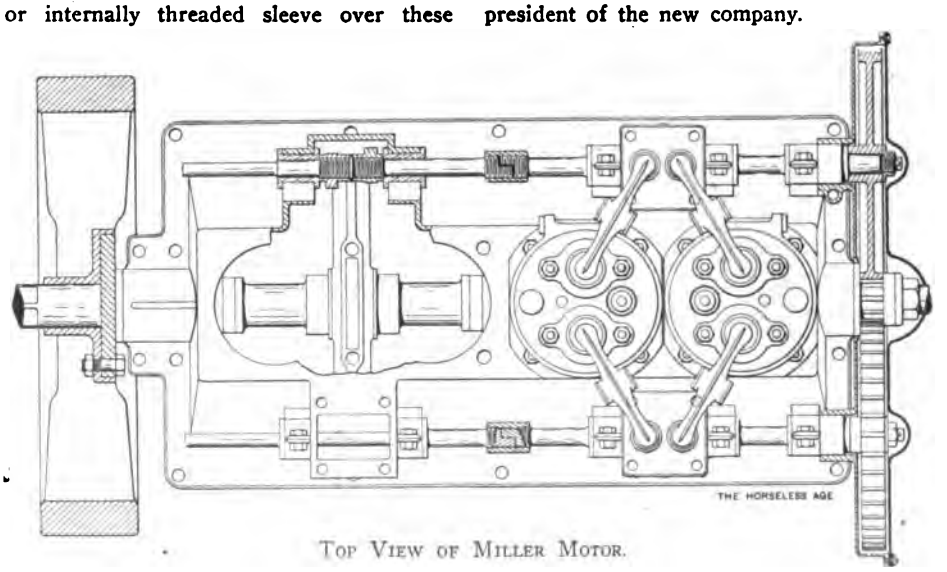
The valves are operated through push rods and rock levers, as shown. The piston is fitted with three packing rings above and one below the hollow piston pin. The flywheel is bolted to an integral flange on the crank shaft.

To Manufacture the Mason Car.

The Mason Motor Car Company, Des Moines, Ia., was recently incorporated under Iowa laws with a capital stock of $25,000, for the manufacture of automobiles. They inform us that they propose to begin making a new type of car the coming summer, and expect to make fifty machines the present year. It will be called the Mason car and will sell for $1,250.

The car and motor were both designed by F. S. Duesenberg, of Des Moines, the motor being a 5x5 double cylinder opposed type, developing from 20 to 24 horse power. It is said to be built along somewhat new lines. The body will be equipped with a detachable tonneau, and will have a seating capacity of five persons.

Edward R. Mason, of Des Moines, is the president of the new company.

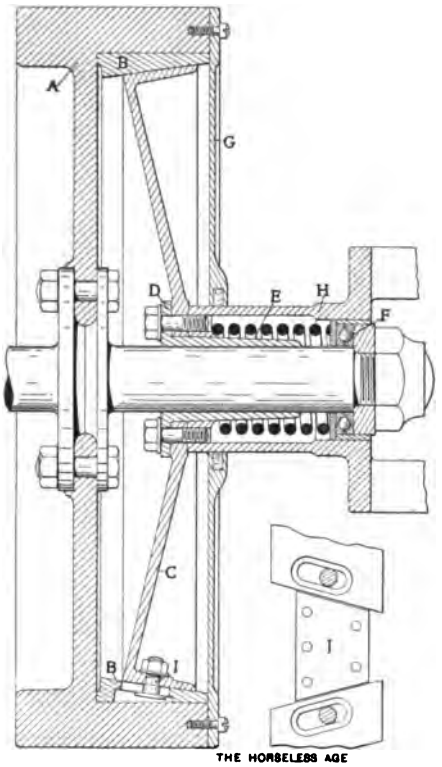


TOP VIEW OF MILLER MOTOR.

The "Standard" Clutch and Brake.

The Standard Brake Company, of 101 West Sixty-sixth street, New York city, have engaged in the manufacture of automobile friction clutches and brakes of a new design, which is patented to them. The principle involved in these devices is a development of that of the conical clutch, but the active friction surfaces are entirely metallic, parallel with the shaft centre line, and flooded with oil, and the surfaces are positively separated when the clutch is thrown out or the brake disengaged, so that no dragging can occur. Both devices are self-adjusting for wear, the same as the ordinary leather faced cone clutch, and are substantially the equal of the latter in point of simplicity of construction, there being no small and delicate parts employed in the operation of the devices.

A sectional view of the clutch is shown in Fig. 1. The flywheel rim, A, is chambered out cylindrically, instead of conically as for the cone clutch, to receive the split phosphor bronze ring B, which is cut with a taper of 8° on its inner surface, and has a wedge-shaped portion cut away at one point of the circumference. Within this split ring B is the aluminum cone C, which is similar to the cone of the ordinary leather faced clutch, except that it is turned to a smaller angle. The cone C is bolted to the hub D, which has a bearing on an extension of the engine shaft, and is urged in the direction of the flywheel by the coiled spring E, the reaction of which is taken up on the thrust bearing F. The clutch chamber is closed by a circular aluminum plate, G, with felt packing around the clutch spring housing H, so that it forms an oil-tight chamber, and the clutch may be operated in oil.



"Standard" Clutch.

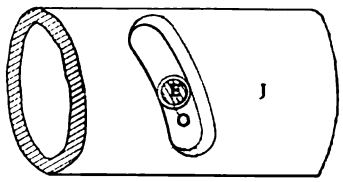
It will be understood that when the clutch slips, in starting the car, etc., the motion is between the interior surface of the flywheel and the bronze split ring B, the latter revolving with the cone C, to which it is held by three retaining bolts, I, one at either side of the cut in the ring and one opposite the cut. These bolts pass through oblong slots in the ring, and the two slots on the two sides of the cut are inclined at the same angle as the edges of the cut, as shown in the detail view. The heads of the retaining bolts rest in countersinks in the bronze ring. The bronze ring is cut with oil grooves on its outer surface.

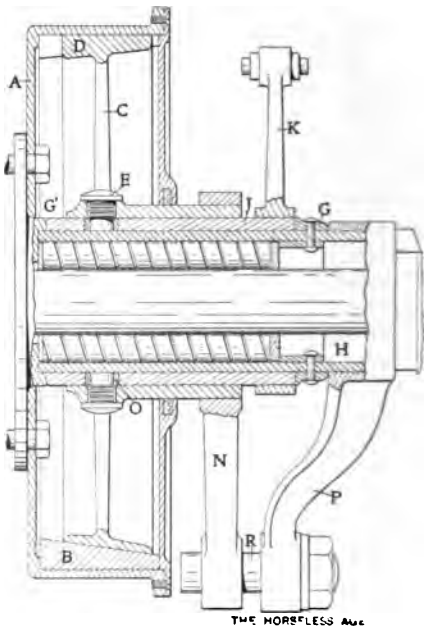
When the clutch is disengaged there is a layer of oil on each of the friction surfaces, and owing to this oil, when the clutch is let in again, the engagement will be very gradual. As the pressure on the clutch pedal is gradually released and the pressure on the clutch surface consequently increases, the layer of oil is forced out between the friction surfaces into the oil grooves cut in the surface of the rings. By varying the number of oil grooves, the rate of action of the clutch can be varied at will, a clutch with many oil grooves requiring less pressure to force out the layer of oil from between the friction surfaces, and thus taking hold more quickly. The expanding action is imparted to the bronze ring, not by the wedge shaped piece J riveted to the cone, but by the cone C itself.

A special feature of this clutch is that it is self-centring and is disengaged absolutely positively. The bronze ring is turned to an internal diameter slightly smaller than the external diameter of the cone, hence it always tends to bind upon the latter, and the retaining bolts I insure that the expanding ring always remains in contact with the cone all around its circumference. Consequently, when the cone is drawn out by means of the clutch pedal, the ring being prevented from lateral motion by the end walls of the clutch chamber, it is contracted and yet kept eccentric with the flywheel, thus insuring a clearance all around and preventing dragging.

When the clutch is new the inner edge of the cone in the position of engagement is about five-eighth inch from the bottom of the clutch chamber, and the clutch is self-adjusting for wear until the cone touches the bottom of the clutch chamber. This lateral distance of five-eighth inch corresponds to about three-thirty-second inch wear all around the clutch ring, which allowance appears to be ample considering that the clutch works in oil.

The brake operates on the same principle as the clutch, but the actuating mechanism is different. In the cut the brake drum A is shown bolted to the hub of the road wheel, and contains the split bronze ring D, carried on the cone C, which is provided with a long hub extending inward from the wheel, and having the arm N secured to its end. The end of arm N can be connected to some stationary part of the frame or axle, which connection must, however, be very substantial, as it must support the reaction of the brake. In the cut it is shown connected by a stud bolt R to a bracket D depending from the axle casing. In this manner the cone C and ring D are held from rotation. In order to expand the ring D the cone C must be forced into it, and this is accomplished by means of a pin E screwed and riveted into the hub of cone C, and extending through a helical slot in the sleeve J, between the hub of the cone C and the axle tube H. That portion of the pin which is within the slot in the sleeve is surrounded by a hardened steel roller O, so there is only rolling motion on the edge of the slot, and consequently little wear. The sleeve J is mounted between two thrust collars G G on the axle sleeve, and is provided with a lever arm K, which is connected by a suitable linkage with the brake actuating hand lever. It will be readily understood that as the lever K is





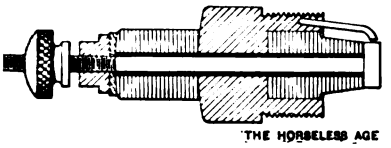
"Standard" Brake.

turned around its axis, owing to the helical groove in the sleeve J, the cone C is forced into the ring D and expands it against the drum A.

The advantages claimed for the brake are the same as those claimed for the clutch. Owing to the film of oil, the brake does not bring the wheels to a sudden stop. When the brake is disengaged there is a clearance all around the circumference between the ring and the drum. The brake is equally effective for either direction of motion, and is self adjusting for wear, except that the lever arm K must be set back on the sleeve J, which can be readily accomplished by means of special provisions made for the purpose. The motion of the lever K in applying the brake is equal to one-eighth revolution.

The "Rich-Spark" Plug.

he Richardson Engineering Company, Hartford, Conn., have brought out a mica-insulated spark plug, for which claimed all the advantages of the so- :d soot-proof plugs in combination with

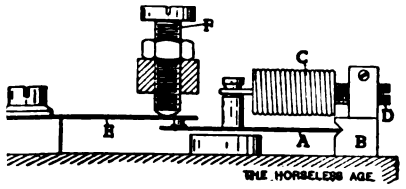


THE "RICH-SPARK" PLUG.

t facility of cleaning. It comprises a l central terminal wrapped with sheet ı insulation and passed through the aded, brass outer shell, into which it lamped by means of an integral head a nut pressing against insulating wash- of mica discs. The head of the central ıinal itself forms one of the spark ts, the other being formed by a wire into the outer shell. Pressure inside cylinder does not tend to loosen the lation. The plug is chambered on the le, yet the insulation extends out from shell far enough to allow of easy ıing. No packing is used in the plug.

ıe J.-G. High Speed Trembler.

ıe drawing herewith shows the trem- used on the Guenet spark coils, han- by Herz & Co., 187 Lafayette street, York. There are two metallic spring es, an iron blade (or armature) A car- g one of the contact points and a steel ıg E carrying the other point. The ıg E has one end rigidly supported on rminal block, and the vibrations of its r free end are limited by the adjust- stop screw F, against which it is rn, when at rest, by the pressure of the : A, derived from the coiled spring C, tension of which can be adjusted by ıs of the screw D. When the pri- r circuit of the coil is completed and core is thereby magnetized it attracts armature A, which is followed for a l distance by the spring blade E, then es away from the latter, thereby break- the circuit. The speed of the vibrator be adjusted by means of the screw F the current consumption of the coil means of the screw D. Ordinarily w F is adjusted until there remains a : of .016 inch between the armature



J.-G. VIBRATOR.

the end of the core. If thus adjust- vhen the armature A is pressed down the finger the spring E will drop it clears the point of the screw F by to .005 inch. Spring C is adjusted the armature A will support a weight 160 grains at its end.

Acetyvone Generator.

A new generator for automobile searchlights has just been put on the market by the Acetyvone Company, 38 Park Row, New York. Although this generator uses calcium carbide, it is entirely different from those previously in use. The material used is a patent composition of calcium carbide and foreign matter, which forms a homogeneous mass and is moulded into sticks approximately 1½ inches in diameter by 4 inches long. The special feature claimed for this composition is that only the definite surface which is automatically placed in contact with the water generates acetylene gas, and that the generation is gradual and in direct proportion to the consumption; and that the generation ceases upon raising the sticks from the surface of the water. This is of great advantage, as it does away with the difficulties of overproduction of gas, and consequent excess pressure experienced with many generators.

In Fig. 1 is shown a sectional view of the generator. It consists of an outside casing R, which is fitted upon the sides and at the bottom with suitable baffle plates to prevent undue motion of the water, which is placed in it to a level slightly above the lowest baffle plate. Lowered inside of this is a bell H, which is open at the bottom, and contains within it two tubes T, the whole being clamped at the top by pivoted thumb screws, so that it can be quickly removed. Fig. 2 shows the parts removed, and two tubes joined together at their lower end, in which are placed four of the prepared sticks of acetyvone, are pushed up inside of the tubes T; the ends of the sticks, by gravity, rest on small gratings in such a position that they are submerged for a small fraction of their length in the water. As they are decomposed the sticks settle down by gravity, and the residue falls to the bottom of the tank. This residue is of such a nature (owing to the foreign matter introduced) that it does not adhere to the metal, thus making it very easy to clean the generator; and it is further claimed, that it also overcomes, to a great extent, the objectionable odor.

Referring again to Fig. 1, at the upper end is shown a lever L, which, in the position shown, allows the inner tubes A with their contained sticks to be in contact with the water, but when swung into a horizontal position it automatically closes the valve leading to the burners, and at the same time raises the tubes and sticks out of contact with the water, and furthermore, the caps at the lower ends of the tubes A are brought into tight contact with the lower ends of the tubes T with a rubber gasket between so that the sticks are absolutely protected from the water and no further generation of gas is possible. One movement of the lever L, which lowers the sticks into the water, at the same time opens the gas valve leading to the burners.

The claims made for this apparatus are, that it is easily taken care of and cleaned,

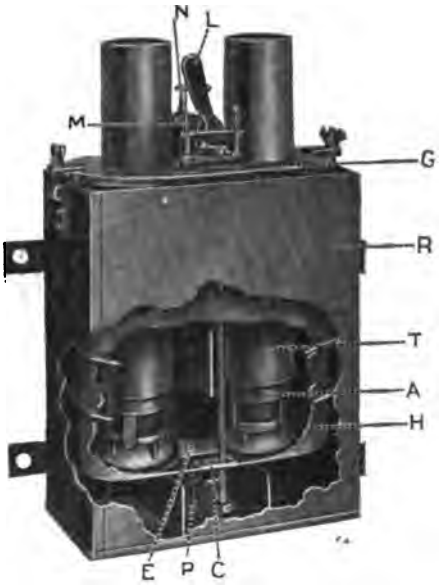


FIG. 1.—ACETYVONE GENERATOR.

is odorless and economical—there being no waste of the sticks when only partially used—and that one charge will give 6 hours' light for two ordinary burners, either continuously or intermittently.

Alloy Steel Balls.

The Standard Roller Bearing Company are placing upon the market special steel balls, known as the "Standard alloy" grade, which are made of alloy steel, and claimed to be much stronger and more durable than any that have previously been made. These balls are guaranteed true both in diameter and sphericity to .0001 inch, and are claimed to have a harder surface than it is possible to secure with ordinary steel. When broken the fracture shows a soft velvet grain, very much finer than in

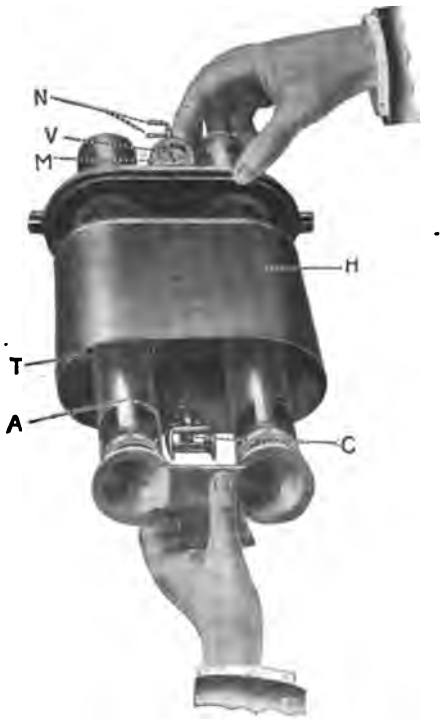
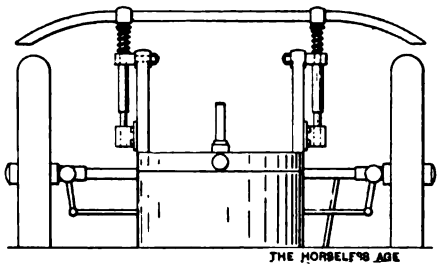


FIG. 2.—PARTS OF GENERATOP

regular crucible steel balls. The manufacturers state that a ½ inch ball of ordinary steel will crush under a pressure of about 25,000 pounds, while "Standard alloy steel balls" require 45,000 to 50,000 pounds. Five-eighth inch balls usually crush at about 39,000; "Standard alloy" at 65,000 to 70,000 pounds. Three-quarter inch balls crush at about 56,000 pounds, "Standard alloy" at 95,000 to 100,000 pounds.

The Harroun Spring Bumper.

R. W. Harroun of 1329 Michigan avenue, Chicago, Ill., is marketing a spring buffer for automobiles, as shown in the accompanying illustration. The bumper proper

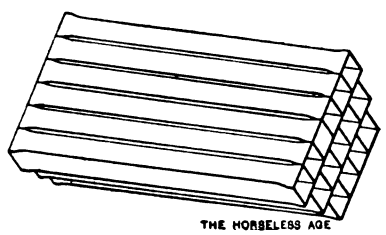


HARROUN SPRING BUMPER.

is made of 1¼ inch Shelby steel tubing, of 3-16 inch wall thickness. It is attached to the frame, its two arms extending back through I bolts and brackets secured to the forward end of the frame side members. The arms are a free fit in the bolts and brackets, and are surrounded by coiled springs, which, when the bumper strikes an obstruction, compress and absorb the shock. The maker states that the device can be attached to any existing machine, and claims that it sets off the front of a car and improves its appearance.

The Fedders Square Tube Radiator.

The Fedders Manufacturing Company, of 1752 Genesee street, Buffalo, N. Y., manufacture a cellular type of radiator composed of square tubes, for which are claimed large cooling surface in proportion to weight, long path for the water to travel, and other advantages. The square tubes used in the construction are of copper and have very thin walls, and their ends are expanded so that when the ends of adjacent tubes are sweated together there remains a water space at the middle of the tube length. The arrangement of the tubes is such that the stream of water passing into the space between two tubes always strikes the middle of the upper surface of the tube immediately below. This causes the stream of water to divide laterally, and it passes down through the spaces on either side until it has completed its course through the cooler. The spaces between the tubes are claimed to be large enough to avoid all danger of clogging, which has been one of the serious objections to the ordinary cellular coolers. As an additional precaution against trouble from this source, the water, which enters from the top of the radiator, is twice strained through brass strainer cloth before entering the cellular portion of the cooler. The jacket or outer casing of this radiator is made of polished brass.

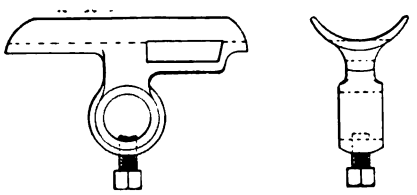


SKETCH OF FEDDERS RADIATOR.

It is claimed that leaks in the radiator may be easily repaired by any tinner, by removing the damaged tube and inserting a new one. In case of damage sustained on the road, it is only necessary to plug the damaged tubes and they may be repaired at leisure later. The cellular portion of this radiator is tested at 25 pounds and the complete radiator at 15 pounds.

Improved Bow Rest.

One of the new styles of automobile bow rests manufactured by the Walter J. Harper Company, 229 Mulberry street, Newark, N. J., is herewith illustrated. It is a brass polished fixture, on which the bows of the automobile top rest when lowered, and is to be attached to a round iron projecting from the body. By means of the set screw it can be adjusted to any angle. It is made with a loop, through which a strap may be run in order to bind the top



HARPER BOW REST.

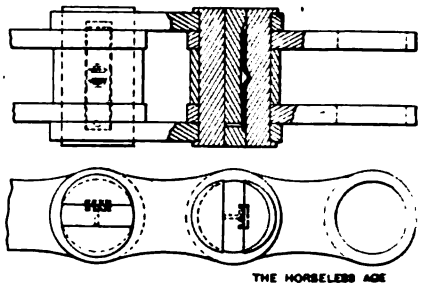
down and prevent it from "jumping" when the car is run over rough roads.

The principal advantage is the length of the bearing (3¾ inches), which greatly lessens the danger of breaking or bending the bows when the top is lowered.

This company manufacture twelve styles of bow rests, also curtain rollers and many other kinds of automobile fixtures.

The Gartland Locking Device.

F. X. Gartland, of 20 Rittenhouse street, Philadelphia, has invented a locking device intended as a substitute for split pins, check nuts, etc. It is here shown as applied to a roller chain. The pin of the chain is made in three parts, as shown. The middle part is cut with a depression on one side, in which a flat spring with a nose is located, the spring being riveted to the part at one end. Both of the outer members of the pin are cut with a notch or depression on their flat surface, opposite the nose of the spring when the three parts are in their proper relative position. The two



GARTLAND LOCKING DEVICE.

outer parts are formed with flanges on their ends, which flanges are so beveled toward their ends that the two outer parts laid together, with their flanges, can be passed through the holes in the chain links. After being placed in their proper position longitudinally they are forced apart and the middle part is pushed between them, the spring being pressed into its slot for the purpose. When the middle part comes into position the nose of the spring engages into the groove on the flat surface of the outer part of the pin and locks the whole pin.

Testing Varnish.

At the last meeting of the Royal Scottish Society of Arts in Edinburgh a communication by Professor Baily and Dr. A. P. Laurie on a method of testing varnishes was read. The object of the method is to reduce to a definite standard the qualities of hardness and toughness. Professor Baily and Dr. Laurie have devised an apparatus which attains this object. The apparatus consists of a blunt steel point ground to a certain radius, upon which pressures can be put by means of a spiral spring. The varnish to be tested is painted on glass, and allowed to dry. The steel point is drawn along the glass, and the pressure increased until it scratches the varnish. As the pressure is known, there is thus available a measure of the toughness and hardness. It is claimed that the apparatus, by providing a definite standard, will be of value to manufacturers.

The Automobile in Buenos Ayres.

The Electromobile Company, of Buenos Ayres, on April 1 last placed in service fifty electric victorias and landaulettes built on the Krieger system and fitted with taxameters. These vehicles are intended for public hire. On this occasion the City Council of Buenos Ayres passed a very stringent ordinance concerning automobile drivers. It is not deemed sufficient to require them to pass an examination in the operation of all kinds of vehicles and furnish a certificate of character; they must also submit to body measurements by the police, finger impressions, etc. These regulations are being severely criticised and for the present generally ignored. The Automobile Club of Argentina during the Easter holidays arranged a competitive run from Buenos Ayres to Rosario-Cordoba.

ring Wheel Trials in Europe.

THE PRADEAU SPRING WHEEL.

ıen the tire and speedometer trials being carried out by the British Autoe Club there was submitted for a mile official trial a set of spring s of a new pattern. The ordinary of artillery spokes are let into the n the regular manner, but extend to- the rim for only half their length. e the chamfering of each spoke ends l collar is shrunk onto the wood, in ıme way that an iron tire is shrunk the felloe of a wheel. Anchored to eel collars are most substantial spiral s, of a length sufficient to extend the collars to almost the extreme ery of the rim. The material in contact with the ground is a strip id rubber; canvas of about half the ess of the rubber is vulcanized), and within this canvas is a steel lat in section, following, of course, ırve of the rubber tire. Equidistant the inside face of the steel rim plates are fixed, of the same diamıs the spiral springs, these plates ıg the anchorage for the springs. ubber tire, canvas, steel rim and ; float within a steel felloe, this lating the portion in the illustration h which the twelve large half round ads pass. The inner face of the felvard the hub has twelve circular steel ; screwed to it, the spiral springs ısly mentioned being contained . the casings extending nearly h the felloe. The action, in theory, ple enough, and the wheel doubtless l all right as a model and upon the experimental wheel, which, it was tood, had been running upon the of a very light car of small horse

ractice matters turned out quite dify, and the wheels were proved to uitable for pleasure cars. The car ch the four wheels were fitted for ficial trial was a 24 horse power nd, as can be seen from the illus- they were more suitable for a 5 ton

The inventor had apparently quite ıked the enormous twisting strains ch the driving wheels of a car are . It can be appreciated that as the revolves the whole of the felloe will stantly on the move backward and d, as if it were a circular see-saw, ition to the vertical movement imby the springs in the casings. On y first day the live axle of the car visted right off. A new axle was t from London to the place where had broken down and was refitted. ıme thing happened a second time e wheels were then withdrawn from als. The axle breakages were not any fault on the part of the Fiat , but were entirely due to the exnary strains set up by the wheels, which no car could possibly be expected to withstand.

FRENCH ELASTIC WHEEL CONTEST.

A contest for spring wheels or elastic wheels was held by the French journal, *L'Auto*, from April 18 to 26, inclusive, over a circular route from Paris to Nice and back. Entries were divided into two classes, the first class being for wheels with elastic tires other than pneumatic, but otherwise rigid; and the second class, for wheels having some elastic medium incorporated between the hub and the felloe. Of ten starters only six completed the first stage, and only four the first half of the contest, at Nice, where a day of rest was enjoyed and the tires were exhibited to the public. The distance from Paris to Nice is 1,076 kilometers (675 miles), and was covered by the car fitted with Garchey spring wheels at an average speed of 24 m. p. h.; by the car with Edmund Levy wheels at the average speed of 18 m. p. h.; by the car fitted with Soleil wheels at an average speed of 15.7 m. p. h., and also by the car fitted with Ducasble tires, for which the speed was not determined. The Renault car to which the Soleil wheels were fitted is shown herewith as it returned to Paris. The Halle wheels, which were submitted to an official trial under the auspices of the A. C. G. B. and I. some months ago, partook in this contest fitted to a Gobron car, driven by Rigolly, but were forced to abandon at Nice, owing to want of a reserve part, it was stated.



PRADEAU SPRING WHEEL.

Only two of the cars carrying sets of competing wheels returned to Paris on April 26, those fitted with Soleil and Levy wheels respectively. For the full distance of 1,350 miles the Levy car took 72 hours 13 minutes, and the Soleil car 91 hours 51 minutes, making the Levy the winner.

In the Soleil wheel the elastic medium is located between the two concentric steel hubs, of which the inner one contains the axle bearing and the outer one receives the spokes. The elastic medium consists of rubber washers, which fill the free space between the hubs and are held by two metal rings, connected by studs, which pass through the holes in the rubber washers. In this manner the inner hub is supported on an elastic mass, which transmits its pressure and torsion to the outer hub. Special means are provided for effectively ventilating the interior of the hub to prevent heating of the rubber washers.



RENAULT CAR WITH SOLEIL ELASTIC WHEEL.



Buying a Motor Car—Another Experience.

Editor HORSELESS AGE:

The following narrative is interesting, because it brings out vividly a certain phase of the freak conditions that are still somewhat too prevalent in connection with the automobile business. Why false notions of economy and business judgment should be permitted to override common sense in buying a motor car is one of the puzzles that dealers and manufacturers are frequently confronted with, and it is a problem that apparently cannot be either satisfactorily solved or overcome.

Except in the omission of names, this story is a faithful narration of facts, and it serves to illustrate the extent to which otherwise intelligent men will go in the direction of deviating from all recognized rules of business when it comes to buying an automobile.

A well-known citizen who has been on the lookout for a light car for his private use enlisted the assistance of a friend, who is in the business, to help him find what was wanted. A few days ago an opportunity presented itself to secure a bargain in a second-hand car, as good as new. Of course that was apparently just what the well-known citizen wanted. The prospective purchaser and his friend, who was supposed to act as expert counsellor, put their heads together and figured, but did not consult the local agent of the manufacturer of the car, from whom it had originally been bought.

In due time they came to a decision, and made an offer which was accepted. The money was paid, the friend got a fee, no doubt, for his good services, and the well-known citizen became the owner of a car, of standard make, but about which he knew practically nothing. However, he had the satisfaction of having closed the deal without danger of being misled by an interested agent who was in a position to give valuable counsel and instruction, which would have saved the purchaser considerable money, as the sequel will show.

The next scene in this farce opened with a personal call by the well-known citizen at the office of the manufacturer's agent for the purpose of securing his services in putting the car in good running order. The new owner had used it satisfactorily for a few hours and had succeeded in driving the car several miles into the country, where it had unaccountably stopped and refused to go again. Under the circumstances there was nothing particularly strange in the fact that the new owner of the car was unable to locate or remedy the trouble; nor could he give an intelligible account of the situation. The essence of his report was that the car had stopped and he could not start it again. Incidentally he remarked that, although he is a big man in excellent physical condition, he had exhausted himself cranking the engine and turning it over the compression, with no signs of an explosion. He had, he said, tried every expedient that suggested itself, to adjust the mechanism of the carburetor and sparker, where he thought the difficulty seemed to lie. Finally he made his way home as best he could, without the machine, and after arranging with a local garage to bring in the car, went to the manufacturer's agent with a request to have the car overhauled and put in proper working condition.

All this had occurred in the evening, and sometime between midnight and two o'clock in the morning the same night a sleepy chauffeur from the garage had gone to the scene of the accident, hitched a towline to the disabled car, and started into the city. Nobody knows precisely what happened, but according to the story told in court later by the chauffeur, the pesky car, instead of following along docilely, took advantage of a bad place in the road to veer around and run into a post or tree and twisted the front axle, besides otherwise damaging the car.

When the manufacturer's agent presented an order for the car at the garage, its surrender was refused until the charge for towing it into the city was paid. The owner objected, as he believed he had a larger counterclaim for damages, in which he was subsequently sustained by the court.

After much delay, annoyance and expense the complications were adjusted, the car was turned over to the manufacturer's agent, and it was found that besides the injuries sustained by the car while it was in charge of the chauffeur who towed it in from the country, the contact points on the sparker had become oxidized from long use and needed cleaning.

The moral of this story is obvious, but there is no reason to believe that the experience of this particular purchaser, or of a multitude of others, will have any effect in inducing "penny wise and pound foolish" buyers of automobiles to seek reliable information from reliable sources, instead of being guided by the opinions and judgment of self-styled experts whose practical experience, often, is chiefly of value only so far as it emphasizes the old adage "A little knowledge is a dangerous thing."

S. E.

Unjust Treatment by Mt. Vernon Police Alleged.

Editor HORSELESS AGE:

I desire to call your attention and the attention of your readers to an act of injustice on the part of the police of the city of Mt. Vernon. On Sunday, April 22, I entered the city of Mt. Vernon, having been warned by several motorists that the police were exceedingly strict. I turned into Prospect street, and, noticing crowds along the sidewalk and many people standing in the roadway, operated my motor car, a 30-35 horse power Rainier, as slowly as it could possibly go. The street being on a slight down grade, from time to time I disconnected the engine from the gear and used the emergency brake, which was half-set almost all the time. The car was practically descending the grade on its own momentum and going so slowly that my chauffeur stated that the car was moving away below the limit and feared lest I should stall the engine.

At the end of the street I was stopped by a police officer, who informed me that I was under arrest, as I had traversed the secretly marked one-sixth of a mile (880 feet) at a speed of forty-seven seconds, as indicated by his stop-watch, and that I should have taken fifty-eight seconds to make this distance, under the State law of 10 miles an hour. Under the observance and testimony of four people in my car and my own experience as a motorist of over a year, my car was moving at about the rate of 7 miles an hour. Unfortunately, my car was not equipped with a speedometer, but such an instrument would have been of no avail as proof, because a friend's car just ahead of mine, equipped with a Jones speedometer, was also held up on the assertion of the same police officer that it had traveled the one-sixth of a mile in forty-eight seconds, although the speedometer recorded the rate of only 7½ miles per hour.

The point I desire to call your attention to and the attention of your readers is that, proceeding with the utmost care and caution through the town of Mt. Vernon at an undoubted speed of not more than 7 miles an hour, I was placed absolutely at the mercy of a police officer with a stop-watch, which he may or may not have operated properly; and, notwithstanding the caution, care and slow speed with which I was proceeding, I was subjected to arrest, the word of this police officer was taken against the testimony of all four witnesses in my car, and I was later fined $20 on his single statement. It can readily be seen that under such weight of evidence the motorist is absolutely at the mercy of the village constable and has no protection.

I hold that under the laws of the State of New York and under the laws of the United States I am entitled to traverse the public highway in a four wheeled vehicle at a reasonable and proper speed, having due care and caution for the safety of pedestrians and other vehicles on the road. I was operating my motor at as slow a speed as was possible without stalling the engine, and in such case the attitude and action of the police in the town of Mt. Vernon was not only unreasonable but oppressive. I had never been arrested before, nor even warned for exceeding the speed limit, and have always severely censured those motor car drivers who have operated at an unreasonable and excessive speed, and in this case I suffered from the wrongdoing of other people.

Is there any association or automobile club that is taking up this question of police oppression? The attitude taken by local town authorities has become a menace to the reasonable and prudent automobilist. The sufferers in such case are generally the reasonable operators of motor cars, and in but few instanecs are flagrant violators of speed limits caught and punished as they deserve.

The sooner the manufacturers, the dealers and the purchasers of motor cars link themselves together in an association to prevent unjust treatment by legislatures and the resulting oppression by local officials the better for the industry and enjoyment of motoring. A Motor Car Speed Political League, if properly organized and administered, would undoubtedly have a happy effect upon ignorant and prejudiced legislators and town authorities. I trust you may be able to furnish me with the names of any associations interested in this point, as a determined effort to exact strict justice for the motorist as well as for the police and town authorities will have a healthful and restraining influence upon the sport.

GEO. AUSTIN MORRISON, JR.

[We know of no organization which can be appealed to except it be the A. C. A.—ED.]

Solid Tires.

Editor HORSELESS AGE:

The writer in the issue of May 9 signing himself "Investigator" is going through the same experience I had three seasons ago, when I solved the problem by placing solid tires on the rear wheels only and increasing their size at the same time from 28x3 to 30x3½, making an easier riding wheel. Being quite skeptical, the manufacturer gave me thirty or more days' trial. These tires I am still using.

I would state here that I am in no way connected with the manufacturers, or the sale of their products, and have even refused to write a testimonial for them.

During the winter of 1903-4, I think, a series of discussions appeared in one of the automobile journals between a Mr. Swinehart and a writer signing himself "C. E. D.," and while, as is usual in such discussions, no conclusion was reached, it seemed to me that the arguments of "C. E. D." against solid tires were far from convincing, his experience having been, he admitted, with a different form of solid tire than those having concave sides, which Mr. Swinehart was championing.

I have observed that the opinions of most automobile trade men are that any given device is good if it happens to be on some well known make of car. They argue that if it were not good it would not be there, and if it is not there it is not good. Therefore, they reason, as all standard makes of autos have pneumatic tires, the solid ones are not good. One has only to watch the annual changes in autos to see how fallacious such reasoning is.

There are many different ways of driving an automobile. If "Investigator" is sportively inclined and wishes always to go at a mile a minute rate, or as fast as his engine will drive him, irrespective of the condition of the road, I should advise him to keep away from solid tires. But if he be content to keep within the legal speed limits, and regulate his speed to the condition of the road he is traveling, he will not find solid tires objectionable but very satisfactory, and will enjoy his car fully without anxiety and apprehension of puncture or blowouts.

I make runs of 75 to 80 miles in five hours' running time, thus averaging 15 to 16 miles per hour. As this speed must be reduced in going through villages my rate in the open country is somewhat greater. On a good road I have gone 5 miles in ten minutes, or at the rate of 30 miles per hour, and that without the slightest unpleasant jolting of the car.

As it is the rear tires that give the most trouble, it might be well for "Investigator" to equip his car with solid tires on the rear wheels only at first. I have never had trouble with front tires, and as the engine in my car is located in front under the hood pneumatic tires seem best on the front wheels.

After thoroughly tightening all nuts and putting on jam nuts, I have had no difficulty with any parts jarring loose.

There are several kinds of solid tires, but those with concave sides are most resilient. My car is of the vintage of 1903, and if this machine of the cold rolled steel period will stand the strain surely there can be no doubt about the 1906 product, if sanely used. MECHANICAL ENGINEER.

The "Kicker" Discussion.

Editor HORSELESS AGE:

I wish to fire a shot in this interesting "Kicker" conflict, and will first direct my blunderbuss to the arch inspiritor himself; but lest my aim should chance to be good, I will take the precaution of offering my hearty salute to this "foeman worthy of my steel," for, indeed, I am interested, gratified and instructed by the controversy brought about and nurtured by Mr. "Kicker," and now also by his friendly advocate, Mr. Pembroke; and I feel like thanking these gentlemen, and all concerned, on both sides, for the entertainment and information I have received in this battle of opinions.

I like a fight; I like a cause. I, too, have opinions and tastes; I, too, have had experience and sweated by the roadside, as did "Kicker's" lieutenant, but I like it; I like to be accomplishing something; bettering the condition of a good thing; and I don't fancy that the climax of all that is desirable is to "whizz" over the roads on an eight-day clock. Nevertheless, I want to be able to "whizz" if I so desire, or creep, or wallow, or climb, to feel that my resources are not limited to a shop-ratioed winch on the "tumbling rod." But enough! My object is not to belittle; I would rather praise. The explosion motor vehicle is a great thing, and bespeaks great credit to those who have conceived and persistently clung to it, developed it, made it what it is—the most popular road machine in the world.

But I am jealous in behalf of the steamer, for what would it not have been ere this had it had a similar enthusiastic interest, fostering care and solicitude? True, a great many steamers were made in the beginning of this later auto era, but, strange to say, the bulk of them were little better than morbid jokes on their race, and, besides loosening up some capital, did little else than to create a few hearts like "Kicker's." A maze of every known trinket and device, woven into an inextricable mass, moistened and set on a bonfire—a perdition in summer and a wreck in winter! Think of building a one-seated vehicle, with a 6 horse power duplex engine as light and perfect as skill and thought can create, and combining it with a thing like a soap kettle, called a "boiler," weighing 200 pounds, carrying 50 pounds of water and having but 15 square feet of heating surface, 12 of which are in a bunch of puny little water coils, set in a way to hint at circulation! This is one thing, but, alas! not all, that makes us sad, and makes "Kickers." Surely the steam auto's worst enemy is the steam auto maker.

But I digress. I was going to combat "Kicker," and, verily, I believe I have boosted his cause. What I intended to say was this: In regard to his observations about the utilization and waste of heat, as in the explosion piston method and the water vaporizing one, as in a steamer, he has hit upon the vital point to which all steam designers should look for results, for the sin of steamers is waste of heat, and their salvation its more complete utilization. A steam engine can be run on what a gas engine throws away. Water will respond to a degree of heat not noticeable to air, and the power derived from explosion is due to the sudden expansion of air. This is the basis of our confidence in steam engines, the machines which employ fire and water to give them life.

All motors depend on expansion and contraction in some form, and there is no expanding medium so cheap and efficient as water. Air will not compare with it; in fact, air is about the most reluctant of all common mediums, so much so, that it is considered the best non-conductor of heat for practical purposes. Note the quantity of air passing through an auto's cooler to take up the heat contained in such a comparatively small quantity of water, a thin layer of which, encasing the cylinders, is sufficient to effectually prevent overheating. So is it not reasonable to expect the best results from the method which employs the best means?

I take issue with our explosion champions in the matter of multiplicity of parts in a good rational steamer, as, for instance, a certain renowned make which is in its vitals a barren wilderness compared with

the jungle-like interior of an ordinary four cylinder explosion car.

As to wear and tear, there is no machine that has stood so much abuse as the steam engine, and that has such a long record of durability.

Let us not despise the steamer, for to do so is foolish; it is holding its own in the conflict—another improvement or two and it will be in the lead.

MAURICE R. WILLIAMS.

[We cannot entirely agree with some of our correspondent's reasoning. As to the relative cheapness of the two expanding mediums, as he calls them, air and water, we don't think there is much choice between them. The heat conducting power of the medium does not seem to be a factor of much importance in the process of power generation. What counts is rather the proportion of energy that can be obtained from the medium to that which must be put in.—ED.]

Charming the New Jersey Farmers.

Editor HORSELESS AGE:

Ex-Governor Voorhees, of New Jersey, and Frank Bergen, Jr., an undergraduate of Pingry, who has been running automobiles for half his lifetime, made a trip through Union, Somerset, Hunterdon and Morris counties last week. Their route lay entirely across the territory inhabited by Senator Frelinghuysen's constituents. The ex-Governor, popular and famous for his good humor and good nature, is commonly called "Uncle" by his intimate juniors—a title that goes only to the beloved of statesmen. A bright, alert boy proudly running an automobile needs no description.

When the tourists met a farmer on the road in the backwoods region they would beam upon him graciously and stop the auto, and the engine, too, if the farmer's horses were nervous. This pleased the countrymen immensely. Sometimes they would urge their horses to smell of the auto, which they think is a cure for auto-fright, and in every case they thanked the ex-Governor and his chauffeur for their considerate kindness. Several farmers said, "If all owners of devil wagons were as obliging as you are we would not kick at all."

While stopping for a day or two at the ex-Governor's country seat near High Bridge in Hunterdon County the neighboring farmers were taken out for short trips, and were highly pleased. Two of them, bearded like the late Horace Greeley, rode with the ex-Governor on his way home as far as Morristown, shouting gleefully to their friends as they passed by. On their return it is said that they pronounced the automobile a godsend to the country.

AUTOPHILE.

Automobile Tests.

Editor HORSELESS AGE:

In the current number of THE HORSELESS AGE I note comment upon the need of automobile testing, and desire to call your attention to some work which is now being done along that line. I am sending the following in the hope that it may be of interest to your readers.

A senior in the mechanical engineering department of the University of Pennsylvania is carrying out a complete set of tests to investigate the efficiencies of the entire mechanism from the motor shaft to the wheels. The conditions under which the tests are being made are, as far as possible, those of road operation.

These tests are being made at several different loads for each gear ratio. A still more interesting feature of this investigation is the determination and location of the losses at each point in the car.

Obviously this sort of test is of the greatest importance to the motor car manufacturer. In fact it is no less important to him than the careful keeping of his business accounts. The one will show him any improper conditions in the running of his business, while the other brings to light any defects in the design of his car.

R. C.

Reducing the Gear of Cars.

Editor HORSELESS AGE:

In continuation of my note re valve timing, I may as well give the sequel. The manufacturer claimed that a set of experimental cams had been put in the engine by error, and paid about half my bill for having proper ones fitted in a local shop. The 5x5 opposed engine was put in a 10 horse power chassis with a good deal of difficulty, as the chassis frame was narrow for so large an engine. It was necessary to put a drop in the middle of the frame and the engine on the left side had to be placed over it. A new Ball transmission was put in also, and the sprocket on it was reduced from a ten tooth to a nine. This reduced the gearing ratio from 3.2 to 3.55 to 1. For a hilly country like this a low gearing is a great advantage. I should have preferred 4 to 1, but could not manage it. The wheel base was lengthened 10 inches and a hood put in front, under which were put the water and gasoline tanks. The work was very well done by a local firm of machinists and was well worth doing.

The car goes almost anywhere on the high gear, the low only being used to start with and to go slow over a very bad place. I had a run of 22 miles out and back the other day. There is a rise of 1,000 feet in the 22 miles and the road is built on the hillside, with many curves and bad, rough grades. The car took them all on the high. It was possible to start at the foot of a hill at a walking pace and be going at a 20 mile gait before reaching the top. In fact, the driving was quite a new experience for me. I would not want more power or a better car.

The low powered cars that are still being turned out would be immensely improved by a lower gearing for such roads as ours. The 4 inch cylinders taken out of my car are now mounted in a runabout of about 1,300 pounds. The same firm of mechanics fitted this with a reducing gear of about 5½ to 1. This was done by driving to a fixed jack shaft, on which were fitted, bolted together, two sprockets of unequal size. The first drive was to the larger one, and then from the small one to the rear axle. The position of differential and sprocket allowed this arrangement to line up. With some cars this might perhaps be done by turning the differential round. The lower gear allows the engine to run much faster without killing it on the hills. A run of 18 miles over a rough, hilly road was made in one hour, and the low gear was not touched. Of course, more cooling surface for the water is needed. In this run the engines, with a gearing of 3.2 to 1, would have been driven in the low a dozen times. I commend this plan as a cheap and efficient one to owners of low powered cars.

W. DEARDEN.

Ignition Query.

Editor HORSELESS AGE:

I have a two-cylinder horizontal automobile, and I am told that if I put another spark plug in each engine I will greatly improve my power. It could be easily inserted by putting it through the cap over the exhaust valve. Would it be necessary to have a separate vibrator? Would it cause the engine to heat any more? My object would be to only make use of it on hills, as I have ample power elsewhere.

J. A. BOLARD.

[We cannot see how an additional spark plug could possibly add to the power of your engine.—ED.]

Protest Against Treatment of Motorists.

Editor HORSELESS AGE:

The New York *Herald* of May 8 published the following under the caption, "Time to Check the Craze for Speed":

> There is only one way to stop it—a good long term of jail; not a fine, for the convicted chauffeur, with a perpetual revocation of his license and a good round money penalty, say the value of the car, for the owner.
>
> Then it will be safe for other people to venture on the streets and roads.

Do we scent hysteria, or is it the revengeful spirit of a motorless pen driver that underlies the above lines?

Who would advocate mulcting the owner of a carriage and pair of horses of their value in money because the coachman was exceeding the speed limit for a short distance? Imagine the hue and cry if that coachman, for merely driving fast, never having caused an accident, were not allowed to drive again and was imprisoned for a long time! Think of the injustice to his family—of the difficulty that a "jail bird" always experiences in finding employment.

Is speeding where a clear space presents itself such a heinous offence? If so, why are trolleys permitted to rush through a

cleared space at top speed? Rather is it considered desirable for the common people to make the most of each opportunity to make up time lost in going slowly through crowded places. Why cannot the well-to-do receive the same concessions from the lawmakers that are accorded the live-centers?

For seven years I have been an enthusiastic motorist. All my life I have owned valuable horses. And each narrow escape that I have experienced on the road has been due to parents permitting their children to use the driveway as a playground, to ignorance of the rules of the road on the part of drivers and to the use of powerful searchlights on motor cars.

If the police would spend less time looking at their watches in hope of catching the owner of an automobile indulging in harmless pleasure and devote their energy to stopping the using of public highways for day nurseries; to compelling the drivers of horses, also chauffeurs, to keep well to the right of the road at all times save when passing a vehicle from the rear, and to preventing pedestrians from walking more than two abreast on the driveways, hundreds of accidents would be avoided.

The use of searchlights should be prohibited, as they blind all who approach them.

Very recently, while out in an automobile, as we attempted to pass a stage full of school children from the rear, the driver, causelessly, save for slovenly driving, turned directly in front of our car. We managed, by almost demolishing the machine, to avoid a collision, which would have meant great headlines in the newspapers telling of the wanton, wholesale destruction of innocent children by a heartless juggernaut.

Is the marvelous work of God-given brains to be rendered valueless because no attention is paid by the authorities to that class of pedestrians and drivers who glory in defying their more fortunate brethren to enjoy the results of the world's progress?

Give us a more liberal speed limit and policemen who will compel *all* traffic to obey sensible, possible laws.

License drivers as well as chauffeurs and teach children in the public schools that the roads are not playgrounds.

Let us reserve severe legal penalties for those who *cause accidents.* Men are not hanged who wear murderous expressions. Why should those who look as though they might cause an accident have their lives blasted forever?

Arrest, fine or reprimand all drivers and chauffeurs who are not on the right side of the road, all pedestrians who walk more than two abreast or in the middle of the road, all users of powerful, blinding searchlights on moving vehicles; build "thank-you-maams" at a given distance each side of schoolhouses and trolley crossings in the country and erect signs notifying travelers of their existence; abolish grade railroad crossings in all populated districts; erect signs indicating dangerous curves; in fact, do everything possible to encourage speed and progression.

Clearing the roads of the long existing public nuisances in the interest of motorists is a progressive step that is well worth trying, for all traffic will also benefit thereby, else it were wiser to immediately prohibit the manufacture of automobiles, instead of ruining the lives of those who try to earn an honest living as careful chauffeurs for merely executing an absurd, almost impossible speed limit. S.

Buckboards' and Tricar's Record in the Two Gallon Contest.

Owing to an oversight in our report last week the records of the two Orient buckboards and of the Indian tricar were omitted from the results. The Orient buckboards covered a greater distance on a supply of 2 gallons than any other vehicle competing for prizes. One of them had an actual weight of 930 pounds, a contest weight of 1,451 pounds, and covered 98.8 miles, which gave it a score of 143,358 and placed it 19 in the general classing; the other had an actual weight of 920, a contest weight of 1,444 pounds, and covered 93.8 miles, which gave it a score of 135,447 and placed it 27 in the general classing. The Indian tricar, with two passengers, weighed 500 pounds, had a contest weight of 1,150 pounds, and covered on 1 gallon 99.8 miles. The score of this vehicle, figured for 2 gallons on the basis of the performance on 1 gallon, would have been 229,540, higher than that of any other car which participated in the run, but the tricar was entered for a certificate only.

Exhibitors at Open Air Show.

The following is the list of exhibitors at the open air automobile show at the Empire track, May 24, 25, 26:

Motor Cars—Smith & Mabley, White Sewing Machine Company, Cryder & Co., Covell & Crosby Motor Company, Oldsmobile Company of New York, New York Motor Car Company, Darracq Automobile Company, E. T. Kimball & Co., Ardsley Motor Car Company, Aerocar Company, A. G. Spalding Brothers, Majestic Auto Company, Wayne Automobile Company, Rainier Company, Matheson Company, Reo Motor Car Company, Peter Fogarty, Nielson Motor Car Company, Maxwell-Briscoe Motor Car Company, Winton Motor Carriage Company, New Amsterdam Motor Company, Auto Import Company, Theo. Schultz, Cadillac Company of New York, Advance Motor Company, H. J. Koehler Company, Frayer-Miller Company, C, A. Duerr Company, Welch Motor Car Company, P. A. Fogarty, Homan & Schultz, Geo. J. Scott Motor Company.

Accessories—Raimes & Co., Eastern Carbon Works, Conn. Telephone and Electric Company, Penn. Rubber Company, R. & P. Traction Tread Tire Company, E. T. Kimball Company, Allen Bag and Specialty Company, Duplex Ignition Company, Diezemann Shock Absorber Company, Hartford Suspension Company, Gaither-Owen Carburetor Company, Jacob Veith, Michelin Products Selling Company, Newcomb Carburetor Company, Mutual Accessories Company of America, Havemeyer Oil Company, Voorhees Rubber Manufacturing Company, Vacuum Oil Company, Acme Autometer Company.

New Ohio Law Badly Bungled.

COLUMBUS, Ohio.—The Sawicki automobile bill enacted by the Legislature which recently adjourned appears to be a dead letter. Attorney General Ellis has advised the Secretary of State not to attempt to enforce it.

Representative Henry T. Hunt, of Cincinnati, discovered that the new law provided for the payment of a license and registration fee "by every person who shall *hereafter* acquire a motor vehicle." As the law goes into effect June 1 this clause is interpreted to mean that only those acquiring possession of motor cars after that date will have to pay the license fee. The Attorney General was of the opinion that the law was not of uniform operation, and therefore unconstitutional. The Legislature intended, of course, that all owners should pay a license, but failed to say so.

The concluding paragraph of the Attorney General's letter is significant:

It is quite doubtful whether the State has a right to require municipal corporations to maintain streets and regulate the use thereof as to all other classes of transportation, and as to one class grant exclusive rights and privileges removed from municipal control or regulation. I, therefore, advise that you neither incur any further liabilities nor take any further official action under this statute until a construction of it is secured or the question of its validity is determined by some court of competent jurisdiction.

The following section evidently contains blunders:

The Secretary of State shall send to the auditor of the county in which such vehicle is owned, copy of the statement filed with such Secretary of State, together with the registration number as provided in Section 4, of this act. And the auditor of the county shall keep a record book of such statements and numbers, said record book to be furnished by the Secretary of State, and $3 in addition for each additional 10 horse power.

The proposition, as it reads, instructs the Secretary of State to send out $3 to every county auditor in the State, either with the record book or every time an additional 10 horse power is recorded from the particular county. What it intended to say was that $5 was to be charged for a vehicle of 30 horse power, or less, and $3 for each additional horse power; then the provision in regard to record books. In some way the provision for additional charge for additional horse power got in the wrong part of the bill.

The Sawicki bill was supposed to have been almost an exact copy of the New York automobile law, but evidently was bungled somewhere.

Maumee Cars.

The Maumee Motor Car Works have been incorporated under Michigan laws with a capital stock of $100,000, and will manufacture automobiles for 1907 at the plant of the old Wolverine Automobile Company, Dundee, Mich. The main office will be at Toledo, Ohio. J. G. Swindeman, of Toledo, is president, and W. K. Terry, of the same place, secretary and treasurer. Frank Blair is the mechanical engineer. Their car will be called the Maumee, and a model will be ready early in the summer.

The Wilkes-Barre Hill Climb.

The Wilkes-Barre hill climbing contest, May 10, one of the festivities connected with the centennial celebration of the city's corporate existence, attracted fully 20,000 people, who stood in a chill, drizzling rain, cheered only by occasional gleams of sunshine, and watched the cars make the difficult ascent. The crowd surged over the course at the start and finish to such an extent as to handicap the contestants, and it seemed almost miraculous that accidents were avoided.

The climb was a little more than a mile and a quarter up Wilkes-Barre Mountain, dubbed Giant Despair by a New York motorist who had struggled with the difficulties of the road. It is a portion of what is known as Northampton street, a highway stretching from the Susquehanna to the Delaware River, a distance of 108 miles.

A more difficult piece of road than that selected can hardly be imagined. Its steep surface is broken by rocks and hollows, and jagged stones and roots of trees project in many places. To add to these difficulties the rain had made the road greasy and treacherous.

Extravagant statements have been published by the daily newspapers in regard to the grades, estimating them from 16 per cent. to as high as 27 per cent. The absurdity of such estimates must be apparent to one familiar with road profiles. As a matter of fact, no one seems to know what these grades are with any degree of accuracy. THE HORSELESS AGE representative failed to find any profile of the road. If there is one, it is probably buried in some former county surveyor's office. That some of the grades are exceedingly steep the eye can perceive, and any one who has traveled over the Lehigh Valley Railroad from Wilkes-Barre to New York will remember the height of the mountain and the difficulty of the railroad ascent.



LOOKING UP THE GRADE.

The grades were not the only difficulty of the course, but the sharp curves added to the obstacles. The Devil's Elbow is the name of a U-shaped curve where a steep grade is encountered, and a little way beyond is a reverse, or S-shaped curve. From this latter curve the road appears to stretch in a straight line up to the clouds. On reaching the summit a 200-yard dash brings one to the finish of the course. A climb up this road is, indeed, a practical test.

Long before the time set for the event the course was lined by thousands of people watching the chauffeurs trying out their machines. Many of the drivers had made trial trips during the night. Telephone wires had been stretched to the top of the mountain to give instant communication between the starter and the timers stationed at the finish. W. J. Morgan, of New York, who managed the Mt. Washington climb, was in charge.

It was just 9:15 when Sidney S. Gorham, of the A. A. A., announced that everything was ready, and the clerk of the course, D. H. Lewis, of the A. C. of Buffalo, called the entrants for event number 7 for stock cars valued at less than $8,000. The cars were given a flying start of 200 yards and as they crossed the tape the starter, Fred. J. Wagner, of the A. C. of Chicago, fired a pistol, the report of which over the telephone wires notified the timers, C. J. Diegers, Alexander Schwalbach and A. J. Batchelder, of New York.

The Matheson 60 horse power car made the first trip over the course, R. Mongini driving. Being a Wilkes-Barre product, the car was greeted with a burst of enthusiasm. Unfortunately, it got out of order 200 yards from the finish.

The English Daimler 45 horse power car was entered, and, though it was catalogued a $9,000 car, the other contestants agreed to allow it to participate. When Chauffeur Harding crossed the tape he was going at high speed. As he disappeared from sight up around the first curve Manager Morgan said he would wager better than 2:30 for the car, barring accidents. The time was announced as 2:11 1-5, the best time made for the day.

It was truly a bold dash up the steep incline. At the first bump the rear wheels left terra firma a distance of about 3 feet.

S. B. Stevens and his 80 horse power Darracq, in which Hemery won the Vanderbilt cup, arrived on the scene of action



STARTING POINT OF THE WILKES-BARRE HILL CLIMBING CONTEST.

luring the races. J. Campbell was driving t, but its road journey had played havoc vith its gear, and it was not started.

Of the American cars the six cylinder, o motor power Stevens-Duryea made the est showing for the mile, in 2 minutes 27 econds. S. H. Hancock was driving, and he first time it crossed the starting line n the event for stock cars costing $5,000 nd under its time was not taken officially, owing to the crowd of people hampering he movements of the officials. It was reorted that it went the mile in 2 minutes 7 seconds, but its speeding qualities were stablished in an unofficial performance. This car, too, declined the issue of the ree for all, so that the Daimler laurels were not in jeopardy.

SUMMARIES.

Cars Costing Under $8,000, 45 Horse Power—English Daimler, H. P. Harding, driver, first; time, 2:11 1-5. 35 horse power Pope-Toledo, S. A. Elliott, driver second; time, 3:16 2-5. 40 horse power Matheson, C. R. Ceuter, driver, third; time, 3:31 1-5. 50 horse power Thomas, E. P. Kelly, driver, and 60 horse power Matheson, R. Mongini, driver, did not finish.

Cars Costing $1,000 and Under—First, 22 horse power Buick, H. J. Koehler, driver; time, 3:10 2-5. 10 horse power Maxwell, C. W. Kelsey, driver, did not finish.

Cars Costing Under $1,500—22 horse power Buick, H. J. Koehler, driver, first; time, 3:00 4-5. 20 horse power Jackson, E. E. Scheuffler, driver, second; time, 4:49 1-5. 20 horse power Maxwell, C. W. Kelsey, driver, third; time, 5:25. 16 horse power Reo, R. M. Owen, driver, did not finish.

Cars Under $2,500—24 horse power Pope-Toledo, Edward W. Werrand, driver, first; time, 2:56 4-5. 16 horse power Rambler, William Bittner, driver, and 22 horse power Buick, H. J. Koehler, driver, tied for second place; time, 3:21 1-5. 30 horse power Stoddard, Dayton, R. E. Pardee, driver, third; time, 4:31 2-5. 18 horse power White, steam, E. C. Johnson, driver, fourth; time, 5:06 2-5. 16 horse power Maxwell, J. Maxwell, driver, fifth; time, 5:14. 16 horse power Reo, R. M. Owen, driver, and 20 horse power, Orient, E. P. Chalfonte, did not finish.

Cars Costing Under $3,500—35 horse power Rambler, H. Bitner, driver, first; time, 3:18 1-5. 35 horse power Pope-Toledo, S. A. Elliott, driver, second; time, 3:25 2-5. 36 horse power Maxwell, C. W. Kelsey, driver, third; time, 3:25 1-5. 24 horse power Matheson, Frank Lescault, driver, fourth; time, 4:24 1-5.

Free-for-all—45 horse power English Daimler, H. N. Harding, driver, first; time, 2:16 1-5. 36 horse power Maxwell, C. W. Kelsey, driver, second; time, 3:04 2-5. 8 horse power Stanley steamer, W. Gill, driver, did not finish.

Cars Costing Under $5,000—50 horse power Stevens, S. H. Hancock, driver, first; time, 2:27. 45 horse power Pope-Toledo, V. Bliss, driver, second; time, 3:12. 35 horse power Pope-Toledo, S. A. Elliott, driver, third; time, 3:51 4-5. 24 horse power Matheson, Frank Lescault, driver, fourth; time, 4:05 1-5. 18 horse power White steamer, E. C. Johnson, driver, fifth; time, 5:51 3-5. 22 horse power Buick, H. J. Koehler, driver, and 40 horse power Matheson, C. R. Greutter, driver, did not finish.

Speed Over Different Pavements.

At the instance of a prominent engineering firm of Chicago, the E. R. Thomas Motor Company recently conducted a series of road tests near their Buffalo plant, to supply data for the purpose of assisting the engineers in determining the best material for highway construction. Comfort and speed were two of the points on which information was asked particularly.

A brick pavement was selected as the standard, and a car was geared low enough to be capable of making just a mile a minute on the selected course. It was run over this measured brick pavement distance to prove that this speed was uniform and then was taken over a measured mile of asphalt. Next a dirt road was tried and then a stretch of macadam. As a result, the speed of these various road materials with one mile in one minute over a brick pavement as the standard was shown to be as follows:

Brick pavement	1:00
Asphalt pavement	1:02
Dirt road	1:05
Macadam road	:58 2-5

For speed it was shown that the macadam was faster than the other three, but for dust the brick pavement was preferable. Observations show that the macadam, unless oiled or sprinkled, is dustier for all classes of travel than the brick.

The report was therefore made to the Chicago engineers that while macadam is the best for speed, and, under ideal conditions, for comfort, too, it is less desirable than brick under everyday conditions.

The Syracuse A. C.

The Syracuse A. C. at a recent meeting decided to bring a test case involving the question whether or not payment of toll can be enforced over some of the toll roads in that section, which are almost impassable. The toll road from Syracuse to Manlius, which tourists pass going from Albany to Buffalo, is cut up with ruts, and the company seem to make no attempt to put it in repair.

The club voted to put up danger signs throughout the county, also mileage signs as far west as Canastota, east to Auburn, south to Cortland, and north to Oswego and Pulaski.

The lack of observation of the ordinary rules of the road within the city limits was another matter brought to the attention of the club. The club voted to co-operate with the police department in compelling all drivers to keep on the proper side of the street. It was also voted to ask the general manager of the Syracuse Rapid Transit Company to instruct motormen to signal with their gongs when approaching curves.

Award of Prizes in Two Gallon Efficiency Contest.

The committee have made the following awards of prizes for the Two Gallon Efficiency Contest held by the Automobile Club of America on Saturday, May 5, First prize, $500 punch bowl—to 12 horse power Franklin Model E, four cylinder runabout, weighing 1,500 pounds, carrying two passengers and covering a distance of 87 miles, entered by the Decauville Automobile Company. Second prize, $100 cup—to 24 horse power Frayer-Miller four cylinder touring car, weighing 3,270 pounds, carrying five passengers and covering a distance of 47.9 miles, entered by the Frayer-Miller Motor Car Company. Third prize, silver medal—to 15-20 horse power Darracq four cylinder touring car, weighing 3,110 pounds, carrying five passengers and covering a distance of 46.44 miles, entered by S. B. Stevens. Sixty-two cars in all finished the contest, to whom certificates of performance will be furnished. The presentation of the prizes was made on Monday evening, May 14, at the rooms of the Automobile Club of America, 753 Fifth avenue, New York.



SCENE ALONG THE ROUTE OF THE CONTEST.

COMMERCIAL APPLICATIONS

Elizabeth and Rahway Motor Bus Line.

The recently incorporated East Jersey Motor and Transportation Company will begin operating motor buses between Elizabeth and Roosevelt, N. J. (formerly Carteret), by way of Linden and Rahway, and from Linden to Tremley Point, as soon as gasoline cars can be purchased. There is an increasing demand for passenger service between these towns, and it is the company's desire to begin operations by June 1, if possible.

Considerable difficulty has been experienced, however, in finding factories that could make immediate deliveries of the type and size of vehicles desired. The officers have about decided to buy two open cars of a smaller carrying capacity than at first intended. Three more cars will be bought as soon as the factories can turn them out.

The conditions which make motor bus lines desirable between the towns mentioned are due to the refusal, five times repeated, by the Elizabeth city council to grant permission to the Public Service Corporation of New Jersey to lay trolley tracks on Rahway avenue. This is a broad macadam thoroughfare, and the abutting property owners have always opposed laying railroad tracks on it.

The distance from Elizabeth to Rahway is 5 miles, through Linden Township, and from Rahway to Roosevelt the same, the roads being macadamized the entire distance and no heavy grades. At the present time the Pennsylvania Railroad offers the only transportation facilities between Rahway, Linden and Elizabeth, and this service is not arranged to suit local traffic.

The motor bus service will be made as cheap as the patronage warrants. It is hoped that it will be possible to make the fare from Elizabeth to Linden 5 cents, to Rahway 10 cents, and to Roosevelt 20 cents. Buses will run every half hour at first.

The route decided on is as follows: From the Pennsylvania and Jersey Central Railroad stations, Broad and Grand streets, Elizabeth, to Cherry street, to Rahway avenue, to city line; to St. George avenue, Rahway, to Milton avenue, to Pennsylvania station, to Main street, to Rahway avenue, which will be the thoroughfare used to the centre of the borough of Roosevelt.

Rahway avenue, Elizabeth, and St. George avenue, Rahway, are identical, and run along the boundary line between Linden Township and the boroughs of Roselle and Cranford, from which localities many people will be accommodated by the proposed service.

The branch line to Tremley Point will connect with the main line buses at the intersection of St. George and Wood avenues in Linden Township, and run through Linden Borough to the Linden cemeteries, to the manufacturing plants at Tremley and Tremley Point, to which places at the present time there is no kind of public transportation.



RAMBLER 1,000-1,200 POUND DELIVERY WAGON.

The company is incorporated with a capital stock of $100,000, divided into 4,000 shares at $25 per share, of which stock $30,000 is to be issued immediately. The incorporators are R. T. Potts and E. M. Wood, Elizabeth; A. F. Kirstein, Sidney Harris, Herman Gries and Aaron Gries, Rahway; John P. Winans, Clarence Winans, Geo. W. Bauer and Geo. W. Bauer, Jr., Linden.

The following officers have been elected: President, George W. Bauer; first vice president, R. T. Potts; second vice president, J. P. Winans; third vice president, Sidney Harris; secretary, Geo. W. Bauer, Jr.; treasurer, Herman Gries.

Watertown Motor Bus Line.

Chauncey W. Gray inaugurated his motor bus line on Washington street, Watertown, N. Y., May 8, and will start the Factory street line the latter part of the month. He has a Packard car, with a special body built by the H. H. Babcock Wagon Company, of Watertown. A second car is nearly completed.

He is running the Washington street car on a twenty-minute schedule, and charging 5 cents fare. Books containing twenty-five tickets sell for $1.00.

Rambler Delivery Wagon.

The new Rambler delivery wagon manufactured by Thomas B. Jeffery & Co., Kenosha, Wis., is illustrated herewith. It is built on their Type II chassis, with specially heavy springs and steering knckles, and is geared lower than the touring cars. It has a carrying capacity of from 1,000 to 1,200 pounds, and weighs 2,200 pounds. It is driven by an 18 to 20 horse power motor. The inside body dimensions are 4 feet long by 4 feet wide by 5 feet high. The length may be increased to 5 feet.

Good Word for Electric Delivery Wagons.

W. R. Kuhn & Co., caterers, 6202 Penn avenue, East End, Pittsburg, Pa., inform us that they are using three half-ton electric delivery wagons, one of which has been in use twenty-eight months and the other two sixteen months. They are all in constant use seven days of the week, and are in good running order at the present time, showing little wear except on the tires.

The total expense of operation of the three wagons up to the present time has been $527.27, or $8.78 per month for each wagon. This does not include the cost of charging the batteries, which was done at their own electric plant, and would, therefore, be a very small item. They regard the above as a creditable showing, and are satisfied with the saving over horse power.

They find a point in favor of the electric vehicles in that any careful man can operate them. An experienced chauffeur is not required.

New Commercial Truck Company.

A new commercial motor vehicle company, with a capital stock of $200,000, has been organized at Milwaukee by A. F. Meiselbach, Byron R. Godfrey and Charles Rohde. They will soon begin the manufacture of a friction drive car at the new factory at North Milwaukee. It is the intention of the company to make a wagon designed for foundries, department stores, grocers and express companies. The carrying capacity of the truck will be from 1 to 3 tons.

Commercial Vehicle Notes.

A motor bus line is planned between Bryan and College, Tex.

A motor bus line is planned for Coffeyville, Kan. C. B. Gardiner is president of the company.

Residents of the Sewickley Valley suburb of Pittsburg want motor bus service instead of trolley cars.

Lorenzo Robinson is operating a gasoline motor bus between Genoa and Sycamore, Ill. It will seat eight passengers.

Six 30 horse power motor buses are to carry passengers from Jacksonville, Cal., to the Yosemite Valley the coming summer.

A motor bus line from Beverly to Manchester, Mass., along the water front, is planned for early this summer. The fare will be 20 cents.

The California Auto-Despatch Company, Los Angeles, Cal., who operated sight seeing coaches and motor trucks, suspended business early in the month.

H. C. Hull, carrier of R. F. D. mail route No. 5 from Union City, Mich., has bought an Oldsmobile to use on his route. Postmaster Tower says that motor cars will soon be used on all five R. F. D. routes from that post office.

The State Courier Service has been established at San Francisco through the instrumentality of Mr. Costigan, of the Pacific Motor Car Company, the service being under the supervision of the Governor and his staff. Further information is lacking, but we presume that the project relates to a plan for the use of automobiles in the city while other means of communication and transportation are inoperative.

Sightseeing Automobile as Hearse and Funeral Coach.

During the recent hearse and coach drivers' strike in New York city it became necessary to press automobiles into service in order to bury the dead. On May 12 F. Simons, an undertaker of 378 Tenth avenue, Manhattan, who had engaged to direct the funeral of Mrs. Minnie Robinson, but found himself unable to secure conveyance of the usual kind to transport the casket to the cemetery, chartered one of the big automobiles used for sightseeing purposes, with which he transported the whole "funeral procession," casket and mourners, to the Lutheran Cemetery at Middle Village, Long Island. The family of the deceased woman consented.

MINOR MENTION

It is reported that the Harrison Wagon Works, Grand Rapids, Mich., are to build an automobile factory.

The Auto Equipment Company, of Detroit, have begun the manufacture of auto tops at 260 Jefferson street.

Thomas B. Jeffery & Co. will erect a modern three story building at 207 and 209 North Broad street, Philadelphia.

An automobile exchange to cost $500,000 is planned for a site on North Broad street, Philadelphia, between Arch and Callowhill streets.

The new warehouse of the Detroit branch of the Fisk Rubber Company, Detroit, will contain 12,800 square feet of floor space. The San Francisco branch will be rebuilt.

The Auto Livery Company has been established in Philadelphia, with headquarters at the Hotel Bellevue-Stratford, Thirty horse power 1906 Autocars are being used.

Robert H. Hopper, of the Germantown (Pa.) A. C., has been appointed chairman of the committee on highways of the A. A. A. in place of W. H. Hotchkiss, of the Buffalo A. C., who was unable to serve.

The Rutherford (N. J.) Motor Club has been organized with the following officers: President, William Barkley; secretary and treasurer, A. C. Donaldson; committee on rules and bylaws, S. H. Rhodes, F. A. Curtiss and W. E. Waller.

The Massachusetts A. A., through its counsel, Francis Hurtubis, Jr., recently issued a letter to managers of electric light, telephone and telegraph managers, requesting that their linemen be instructed not to throw glass insulators, bits of wire and old carbons in the highways.

The Malden (Mass.) A. C. has elected the following officers: President, A. E. Bliss; vice president, E. B. Beaudry; secretary, H. K. Frost, and treasurer, C. T. Small; board of directors, Dr. F. W. Plummer, R. C. Guptill, Dr. T. J. Springall, F. N. Joslin and Herbert Damon.

It is reported that the Maumee Valley Automobile Company, Toledo, Ohio, have leased the former Kirk automobile plant on Oakwood avenue, and will manufacture the De Luxe cars for 1907. F. W. Keating, formerly a salesman for the Pope Motor Car Company, and George M. Verity, of Middletown, Ohio, are said to be behind the enterprise.

The Rochester (N. Y.) A. C. has elected the following officers: President, Harry S. Woodworth; vice president, H. C. Strong; secretary and treasurer, H. S. Bentley; attorney, J. A. Barhite; consulting engineer, A. J. Rockwell; board of governors, J. S. Bingeman, W. C. Barry, Jr., F. C. Mason, Rudolph Schmidt, A. F. Crittenden, H. H. Foster, F. H. Bettys, Leo Richmond, Griff D. Palmer.

The Hamilton (Ont.) A. C. has elected the following officers: President, C. E. Hemp; vice president, George P. Sohngen; treasurer, F. W. Whittaker; secretary, Mark Sohngen.

Motorists driving their cars to Philadelphia or other points in Pennsylvania should be particular to have the Pennsylvania license numbers on their machines. The police in many towns are on the lookout for careless drivers, because they can pocket part of the fine. The Bristol police have been particularly active.

Massachusetts Auto Rules Null and Void.

BOSTON.—A decision of importance to Massachusetts motorists was given by Judge Sullivan in the Municipal Criminal Court recently, when the case against Walter Clapp, Jr., was dismissed. He had been summoned to court for an alleged violation of the rules and regulations of the Massachusetts highway commission in operating an automobile on Boylston street with only one number, the front number plate being missing.

Hurtubis, Keen & Thibodeau, counsel for the defendant, required that the government prove that the highway commissioners had passed a regulation requiring that number plates shall be carried at both ends of an automobile.

The only evidence which the secretary of the Massachusetts highway commissioners could introduce from the records of the commission was that on August 20, 1903, it was voted that a "form or certificate" be approved, and the government tried to show that this vote included the rules and regulations printed thereon, but the court sustained the contention of the defendant's attorneys that to approve a form of certificate is not passing rules and regulations, and incidentally it developed at the trial that as matters now stand the Massachusetts highway commissioners' regulations, as printed upon the various certificates of registration, are null and void.

The (British) Society of Motor Manufacturers and Traders has decided to adopt a standard size of flat tongue lamp bracket, as employed for both side and tail lamps. The tongue which they have determined to adopt is to be 3 inches high and 1⅜ inches by one-quarter inch at the base, tapering to 1¼ inches to one-sixteenth inch at the top.

According to a report from Paris, dated May 14, the automobile factories in the vicinity of the capital have decided to resume work, owing to a desire expressed by a majority of their striking employees to return to their places.

Garage Notes.

C. E. Mayers will open a garage at Red Lion, Pa.

S. H. P. Hall is building a garage at Ballston Spa, N. Y.

Thomas Fulton, Washingtonville, N. Y., is building a garage.

Fifield Brothers, Augusta, Me., will erect a garage the coming summer.

S. W. Kent Miller will open a garage and repair shop at Martinsburg, Md.

The Waterville Market Company, Waterville, N. Y., have opened a garage on White street.

J. H. Godden has opened a garage and repair shop at 481 North Union street, Savannah, Ga.

The Schenectady Automobile Exchange have opened their garage at 18 Lafayette street, Schenectady, N. Y.

The Carlson Auto Company, of Brooklyn, N. Y., have plans for a new garage. They handle the Winton cars.

The Wilkinsburg Automobile Garage Company have opened their new garage at Hay and Ross streets, Wilkinsburg, Pa.

The recently incorporated Berwin Automobile Company, Allentown, Pa., will build a garage at 128-132 North Eighth street.

Wm. Dominick & Co. have removed their garage and repair shop from 243 Michigan avenue to 544 Wabash avenue, Chicago.

The new garage of the Colonial Automobile Company, 5518 Walnut street, Pittsburg, Pa., will be completed some time next month.

Apperson Brothers will occupy the first floor of the new garage being built by Avon Von Glahn at 1238 and 1240 Michigan avenue, Chicago.

Robert Nelms is building a garage and repair shop on West Adams street, Jacksonville, Fla. R. L. Atkinson will be associated in business with him.

The Waterville Motor Company, Waterville, Me., of which J. J. Hennings and I. L. Belyea are the proprietors, have opened a garage and repair shop.

Miller Brothers, Glens Falls, N. Y., have purchased land at 12 Maple street for the erection of a new garage, the one they built last fall proving too small.

A garage is to be erected this summer by the Auto Express Delivery Company, Erie Court, S. E. Cleveland, Ohio, who conduct a light delivery business.

The Stuyvesant Heights Automobile Company have opened a garage and repair shop at 449 Madison street, Brooklyn, N. Y. Raine Ewell is president and treasurer of the company.

We are informed that the Tarrant Motor and Engineering Company, who have a new garage at 102-112 Russell street, Melbourne, Australia, would be interested in catalogues and trade literature from American manufacturers.

W. C. Jaynes has disposed of his interest in the Jaynes Automobile Company, Buffalo, N. Y., to C. B. Penny, secretary and manager. It is understood the company will have the Buffalo agency for the Packard cars, until recently in the hands of F. S. Alliger.

New Incorporations.

Berwin Automobile Company, Allentown, Pa.—Capital, $10,000.

The Sandusky Automobile Company, Sandusky, Ohio, have reduced their capital stock from $150,000 to $15,000. J. J. Hinch is the president.

Buick Automobile Company, Kansas City, Mo.—Capital, $2,000, all paid. Incorporators, W. S. Hathaway, H. G. Kirkland and W. F. Schreiber, Kansas City.

The Direct Drive Axle Company, Columbus, Ohio.—Capital, $150,000; to manufacture automobile axles. Incorporators, J. R. Fassig, C. O. Haines, Carl Phillips and Irwin M. Pleukharp.

Vandegrift Automobile Company, No. 5 Exchange Place, Jersey City, N. J.—Capital, $100,000; to manufacture automobiles, carriages; mechanical and electrical engineers; express, transfer and forwarding. Incorporators, Henry G. Morris, Pedro G. Salom, F. Rogers Donahue, all as above.

Chester Automobile Company, Chester, Pa.—Capital stock, $10,000.

The Diamond Manufacturing Company, Detroit, makers of automobile parts, have increased their capital from $100,000 to $300,000.

O'Neill-Ollier Company, Chicago.—Capital, $10,000; to manufacture automobile equipment. Incorporators, Charles C. O'Neill, L. F. Ollier, S. E. Willard.

Automobile Rental Company, Denver, Col.—Capital, $50,000. Incorporators, B. B. Bloom, E. Owens, A. P. Smith, S. H. Hammond, O. O. Dohme, of Denver.

Notice has been filed at Indianapolis, Ind., that the name of the Windsor Automobile Company, a South Dakota corporation, has been changed to the Evansville Automobile Company.

The Aerocar Company, Cleveland, Ohio.—Capital, $10,000; to manufacture parts. Incorporators, D. C. Westenhower, W. J. Rudolph, James C. Brooks, F. C. Howe and Al Welch.

DeLong Motor Company, Syracuse, N. Y.—Capital, $25,000; to manufacture automobiles and motor boats. Incorporators, M. E. Coe, G. E. DeLong and A. M. Clark, all of Syracuse.

Columbus Sight Seeing Company, Columbus, Ohio.—Capital, $10,000; to operate sight seeing cars. Incorporators, Ben Williams, Bert Smith, J. B. Foster, Henry Bechtold and T. J. Farrell.

Angier Automobile Supply Company, Boston, Mass.—Capital, $20,000. President, Herbert M. Butler, 10 Kenmore street, Boston; treasurer, Oscar M. Angier, 24 Gleason street, Dorchester.

Willink Garage Company, Brooklyn, N. Y.—Capital, $10,000; to deal and rent automobiles. Incorporators, Herbert O. Hyatt, Edward H. Bancker, of Brooklyn, and George E. Austin, of Manhattan.

Boston Auto Livery Company, Boston, Mass.—Capital, $15,000; automobile livery business. President, Antonio Leverone, 8 Sherman street, Roxbury; treasurer, Royal A. Waiteling, 320 Newbury street, Boston.

North Shore Auto Passenger Company, Beverly, Mass.—Capital, $50,000; common carriers of persons and property. President, S. Harvey Dow, 46 Cabot street, Beverly; treasurer, Ulysses G. Haskell, 66 Cabot street, Beverly.

Ultra Motor Company, New Haven, Conn.—Capital, $25,000; to manufacture motors, motor cars, motor cycles and motor boats. Incorporators, Joseph Schaeffer and John H. Connell, New Haven; Otto S. Jung, New York.

Vehicle Top and Supply Company, St. Louis.—Capital, $17,100, all paid. Incorporators, George Haubert, of Logan, Ia., twenty-one shares; William E. Clark, William H. Daughters, John Mueller and Allan H. Clark, of St. Louis.

Lexington and Concord Sight Seeing Company, Lexington.—Capital, $10,000; to deal in automobiles and transport passengers by means of them. President, George W. Taylor, Lexington; treasurer, Henry F. Knight, 50 State st., Boston.

Memphis Automobile Company, Memphis, Tenn.—Capital, $10,000; to deal in and rent automobiles; also to convey passengers and freight. Incorporators, E. B. Meyer, A. L. Cross, E. L. Menager, William Floyd and F. Zimmermann.

The Slama Tire Guard Company, Humboldt, Neb.—Capital stock, $90,000; to manufacture detachable non-skid tire protectors. Incorporators and officers: President, O. A. Cooper; vice president, Lewis Slama; secretary, C. K. Cooper; treasurer, C. M. Linn.

Matthews Motor Company, Northeast Corner Fifth and Erie Streets, Camden, N. J.—Capital, $75,000; to deal in automobiles. Incorporators, Louis I. Matthews, Clinton Apartments, Philadelphia, Pa.; J. Morris, 5427 Wayne avenue, Germantown, Pa.; Craig Herberton, 2018 Walnut street, Philadelphia.

The New York Car and Truck Company, Jersey City, N. J.—Capital stock, $2,500,000; to manufacture railway and street cars, carriages, automobiles, omnibuses and other vehicles. Incorporators, John H. Turner, Harry S. Rossell and Thomas S. Strong, Jr., all of 15 Exchange place, Jersey City, the registered office of the company.

Rochelle Motor Company, New Rochelle, N. Y.—Capital, $150,000; to manufacture automobiles. Incorporators, E. T. Birdsall, E. S. Winslow and G. W. Vaughn, George Moore and Edgar K. Bourne.

New Agencies.

Aurora, Ill.—W. J. Reid, Buick cars.

Boston, Mass.—E. S. Breed, Buffum cars.

Galva, Ill.—Fred E. Dack, Compound cars.

Allentown, Pa.—Homer Adams, Corbin cars.

Aurora, Ill.—Andrew Welch, Studebaker cars.

San Pedro, Cal.—Marine Supply Company, Reo cars.

Bainbridge, Ga.—Charles A. Caldwell, Compound cars.

Boston, Mass.—Adams-Dutton Motor Car Company, Elmore cars.

Pueblo, Col.—The Pueblo Automobile Company, Pope-Waverley cars.

Boston, Mass.—The Boston Mechanical Company, Motor Mart, Moon cars.

Baltimore, Md.—Charles L. Wiegand, 840 North Fulton avenue, Reo cars.

Allentown, Pa.—Nadig Brothers, Queen, St. Louis and Stoddard-Dayton cars.

Pittsburg, Pa.—Colonial Automobile Company, 5518 Walnut street, Cleveland cars and Aerocars.

Schenectady, N. Y.—The Schenectady Automobile Exchange, 18 Lafayette street, Maxwell and Mitchell cars.

Oakland, Cal.—The George P. Moore Company, Inc., spark coils of the Connecticut Telephone and Electric Company.

Los Angeles, Cal.—The George P. Moore Company, Inc., spark coils of the Connecticut Telephone and Electric Company.

Trade Literature Received.

Davis W. Shuler & Son, Amsterdam, N. Y.—Booklet, "About Motor Vehicle Springs."

Charles E. Miller, 97-101 Reade street, New York.—1906 price list of automobile supplies.

The Morawitz Company, 343-345 Broadway, Milwaukee, Wis.—Catalogue of Mora auto furs.

Clark Ellis, Medina, N. Y.—Booklet, "The King Method of Road Work in New York." Copies sent for 3 cents in stamps.

The Auto Supply Company, 1662 Broadway, New York.—Sixth annual catalogue of automobile supplies, apparel and tools.

Catalogue of the assets of the Vehicle Equipment Company, bankrupt, to be sold at public auction at Long Island City May 16.

The Gilbert Manufacturing Company, New Haven, Conn.—Supplement to catalogue showing the case, leggings and tire holding irons.

Saks & Co., Herald Square, New York.—Catalogue, "Distinctive Automobile Garments and Requisites for Spring and Summer Service."

Trade Personals.

H. N. Dunlap, formerly assistant sales manager of the Ford Motor Company, has resigned to take a position with the Aerocar Company.

John L. Poole, foreign representative of the Olds Motor Works, returned to New York on the Hamburg-American steamship Amerika May 5.

George C. Hood, who has been with the Baltimore Motor Carriage Company since its organization, is now with the Motor Car Company, of Baltimore.

The Evansville Battery Company will be represented in Chicago and the State of Illinois by Frank S. Hanchett, with an office at 1303 Michigan avenue.

Charles D. Smith, formerly of the Winton Company's New York branch, has been appointed Eastern supervisor of the Winton Company, with headquarters at Boston.

Louis C. Block, former special representative of the Ford Motor Company, has been appointed manager at Buffalo, N. Y., succeeding A. M. Robbins, who has gone with the Babcock Electric Carriage Company as salesman.

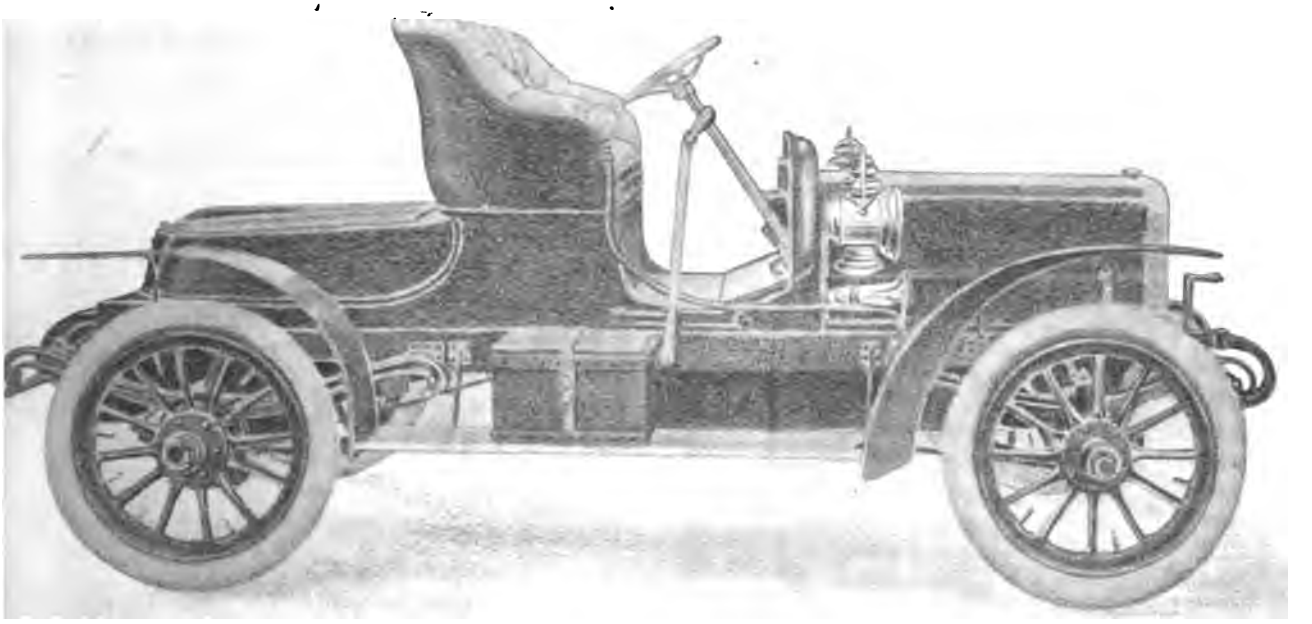
...THE...

Horseless Age

VOLUME 17 MAY 23, 1906 NUMBER 21

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WINTON MODEL-K



This $2,500 Winton Model K Runabout is faster on level and incline than the $2,500 Winton Model K because it carries no rear seats. Otherwise it is exactly the same as the Winton Model K, the most thoroughly tested and proved car on the 1906 market. More than 900 of them in daily use and all giving satisfaction.

For details get "The Motor Car Dissected" from

***The* WINTON MOTOR CARRIAGE CO.**

Licensed under Selden Patent. **CLEVELAND, OHIO, U. S. A.**

Winton Branch Houses in New York, Boston, Philadelphia, Pittsburg, Chicago and London. Winton Sales Agencies in all important places.

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LOOK FOR GARAGE NUMBER MAY 30

Note the Enormous Traction. Remember the Rigid, Non-Elastic Base.



WITH THESE IN MIND, IT'S EASY TO UNDERSTAND WHY

Diamond Wire Mesh Base Construction

WAS RECEIVED AND IS USED WITH DELIGHT IN THE FIELD OF THE COMMERCIAL VEHICLE.

More points in which **Diamond Wire Mesh Base Construction** excels all others:

SIMPLICITY—Base and attaching device are one and the same.
ECONOMY—Phenomenal wear at low cost per ton-mile.
SCIENTIFIC BALANCE—Base and tread proportioned rightly for their work.

QUALITY—DIAMOND.
Applied and removed without any machinery.
Twin and triple types used for tires above 5 inch size.

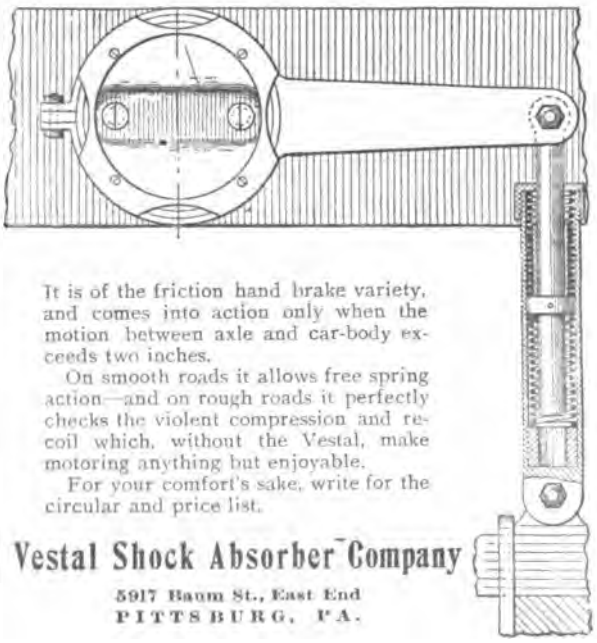
SPECIAL CATALOGUE ON REQUEST.

THE DIAMOND RUBBER COMPANY, Akron, Ohio

NEW YORK—78 Reade St.
BOSTON—174 Columbus Ave.
PHILADELPHIA—304-306 N. Broad St.
BUFFALO—715 Main St.
DETROIT—158 Jefferson Ave.
ST. LOUIS—3966 Olive St.
CHICAGO—1523-1531 Michigan Ave.
CLEVELAND—1514 Euclid Ave.
SAN FRANCISCO—
DENVER—323 Boston Building.
MINNEAPOLIS—503 Second Ave. S.

Every Road Is A Smooth Road

to the man whose car is equipped with the Vestal Shock Absorber.



It is of the friction hand brake variety, and comes into action only when the motion between axle and car-body exceeds two inches.

On smooth roads it allows free spring action—and on rough roads it perfectly checks the violent compression and recoil which, without the Vestal, make motoring anything but enjoyable.

For your comfort's sake, write for the circular and price list.

Vestal Shock Absorber Company

5917 Baum St., East End
PITTSBURG, PA.

Compound MOTOR CAR



Model Six, 16 H. P., $1,400

A doctor can't afford to take any chances. He must ... powerful car that will carry him over all kinds of roads, reg... the weather.

The same chassis is used in this model as in our ligh... cars, which have made notable records in public tests for reliab... and economy, carrying five passengers.

Write for catalogue containing full description of all our mo...

THE E. H. V. CO., Middletown, Conn.

Speed Indicating and Recording Devices—II.

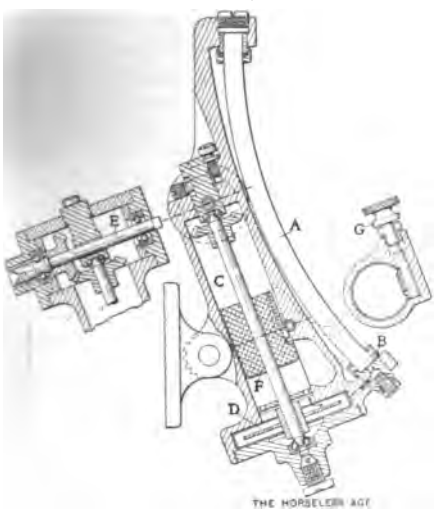
By E. S. Foljambe.

Instruments based upon the pressure producing action of motion in a liquid are less common than those of the centrifugal governor type, there being at present only two instruments of this kind on the market in this country—the Veeder tachodometer and the Chicago Pneumatic Tool Company's speed recorder. The former instrument is illustrated and described herewith, while a description of the latter will appear in an early issue, the manufacturers having placed an instrument at our disposal for this purpose, but it having arrived too late to prepare the illustrations for this installment.

The best-known instrument of this type is the Veeder tachodometer, which is based on what is known as the liquid slip-back principle. Explaining the construction in general terms, a paddle wheel pump is used to set a liquid in motion proportional to the speed of the car, and forces it against its own weight up into a gauge tube to a height corresponding to the pressure produced by the motion. Back of the gauge tube is a scale. In a centrifugal pump there is always a certain leakage past the rotating paddle wheel, and after the tachodometer has adjusted itself to the momentary speed and the speed remains constant, the liquid leaks back by the paddle wheel just as fast as it is urged forward by the same, hence the term "slip-back." The pressure produced by the centrifugal force on the liquid is proportional to the square of the speed and also to the specific gravity of the liquid, but as the counter force also varies directly with the specific gravity, the indications are independent of the latter factor and depend only on the speed.

Referring to the illustration of the tachodometer, the instrument combines a tachometer with an odometer. The Veeder trip odometer is connected to the right side, as shown. The speeds are indicated by a column of colored liquid, either wood alcohol or kerosene, in a tube backed by a curved graduated scale somewhat like a thermometer. The liquid is forced by a paddle wheel pump up into the tube, but continually runs or leaks back, so that the tube is never filled, but the liquid stands at a height corresponding to the speed of the paddle wheel, which is in proportion to the speed of the car. The pump is run by a flexible cable from the car wheel. This cable enters above the level of the liquid, to obviate the necessity of a stuffing box.

In the sectional view of the instrument the curved portion A carries the graduations and the tube into which the liquid enters after passing the throttle valve B. C is the chamber in which the liquid is carried. Through the centre of this chamber runs the main shaft, with the paddle B at its lower end, around which the case fits rather closely. The upper end of the shaft carries a bevel gear meshing with another bevel gear on the short shaft E, shown in the side view, which is driven by the flexible cable. Both shafts are provided with ball bearings at each end. Tightly fitting around the main shaft and to the inside walls of chamber C is a displacement plunger, which is shown in the sectional view to the right; it can be raised or lowered to readjust the liquid level to the zero mark by a thumb nut G. The accompanying photo shows the main shaft, bevel gear, displacement plunger and paddle wheel.

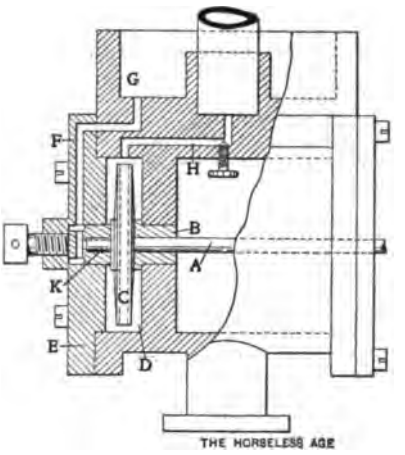


Sectional Views of Veeder Tachodometer.



Revolving Portion of Veeder Tachodometer.

It is claimed that the instrument is quite accurate with even as heavy a substance as mercury, as, although the weight is greater, the centrifugal force set up in it is also greater in proportion, and the difference in viscosity does not materially affect the result.

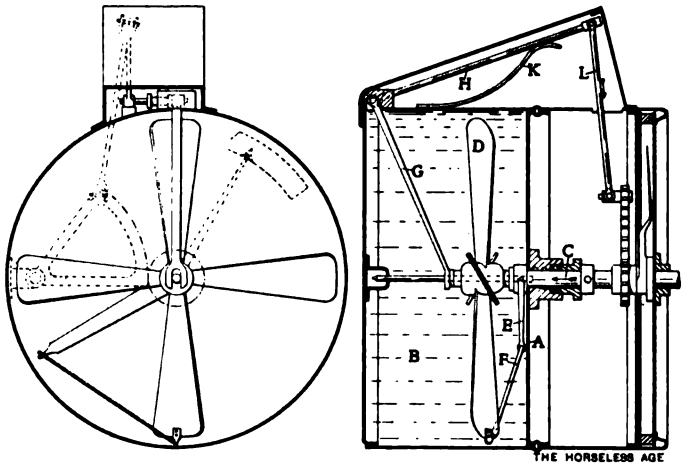


Sketch of Wolf Speed Indicator.

The liquid slip-back speed indicator has been a favorite instrument with inventors, and we illustrate a few of the devices of this kind which have been covered by United States patents, but are not on the market so far as is known. A liquid pressure type of recorder has been patented by F. E. Wolf, of Berlin. The mechanism consists of an outside casing through the centre of which runs the main shaft A, supported on suitable bearings at B and at each end. This shaft has fastened to it a disc C, which is placed in a chamber D. Piece E is a kind of cover plate over this chamber, and has inside it a passage F which communicates at one end with a small reservoir G at the top, in which is carried the liquid, and at the other end with the chamber D. From the top of this chamber a passage H runs to a glass tube. The action of the instrument depends upon the fact that the disc C is drilled with one, two or more radial holes, as shown dotted, which are filled with liquid by means of the communicating passage K, which is drilled in the main shaft. When not in action the level of the liquid is the same in the glass tube as in the reservoir G, but as soon as the disc C is rotated the centrifugal force of the liquid in the radial holes causes a pressure in the chamber and a corresponding rise in the tube from which, by scale indications, the speed is shown.

The advantages claimed are that the hole leading from the chamber D to the indicating tube is never either partly or entirely covered by any rotating part, and that this rotating part, instead of being a tight fit in its case, does not touch the sides and, therefore, does away with friction and consequent wear, which might cause inaccuracy.

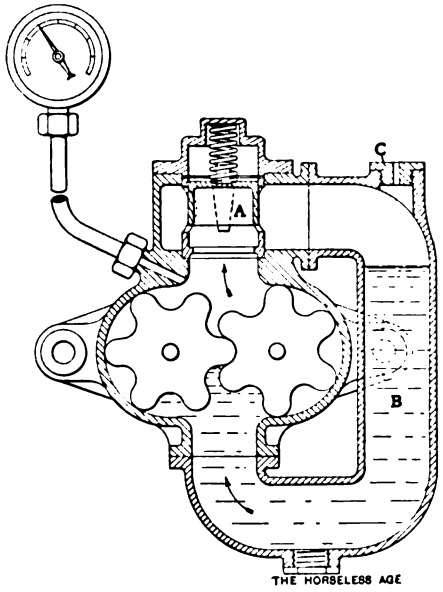
In an instrument patented by Wetzel, of Stuttgart, Germany, the reaction of a revolving propeller in a liquid is made use of. Referring to the sectional view, the cylindrical case is divided by the partition A, and the compartment B is filled with



WETZEL'S SPEED INDICATOR.

either oil or glycerine. On the main shaft C is mounted the propeller D, driven by the linkage EF. As the propeller is revolved the reaction against the liquid causes it to move in the direction indicated by the arrow, carrying with it bell crank lever GH against the spring K, and by means of the connecting link and the rack M rotates a gear to which is affixed the indicating needle. As the propeller is driven in proportion to the speed of the car, the dial under the needle can be graduated to show the speed in miles per hour.

An instrument of the liquid pressure type has also been patented by a Frenchman, Caille. This device consists essentially of a kind of gear pump driven by the usual flexible shaft, which forces liquid into an upper chamber from which a pipe is connected to a gauge suitably graduated to indicate speeds instead of pressure. In the upper part of the delivery chamber is a piston valve A subjected to spring pressure on one side and the pressure of the liquid on the other. This valve when raised uncovers delivery ports which allow the liquid to enter chamber B, which is under atmospheric pressure, through the opening C, from which chamber it again passes through the pump. By correctly proportioning the spring pressure on the valve, the area it exposes to the liquid under pressure and the dimensions and shapes of the delivery ports, the pressure gauge will give indications practically in proportion to the pump speed, and therefore to the speed of the vehicle.



SECTION OF CAILLE SPPEDMETER.

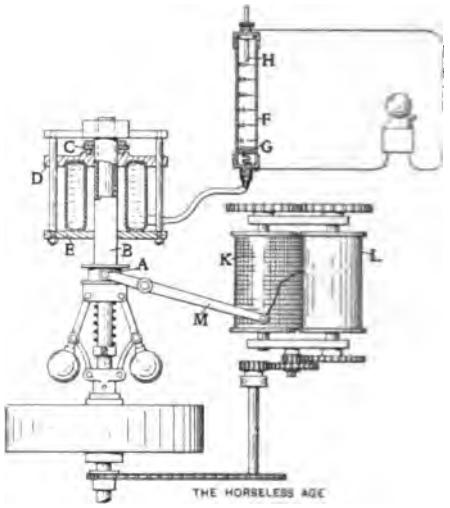
An instrument combining the governor ball and liquid pressure principles has been patented by D. Mason, of New York. By the usual centrifugal action the governor balls assume a position according to the speed of rotation, which is in proportion to the speed of the vehicle. The balls pull downward on a collar A and its integral sleeve B, lowering with it plate D by means of nuts CC threaded at its upper end. Between this plate and the nuts a ball thrust washer is placed. As D lowers it decreases the distance between it and plate E. Plates E and F form end pieces of a frame tied together by rods upon which plate D slides. The upper end of the frame is supported upon the main shaft and the lower end on the sleeve B. As plates D and E move toward each other under the governor action, they compress an elastic bag filled with suitable liquid, in which a pressure is created, which causes the liquid to rise in a transparent tube F located on the dashboard. This tube is graduated to show the speed in miles per hour. On the surface of the liquid inside the tube is a float G which makes electric contact with rod H and rings an alarm bell when any predetermined speed is reached for which the adjustable rod H was set. The recording mechanism consists of a pivoted arm M, one end of which works in the slotted collar A and the other end marks a record on a strip of paper unwound from drum L onto drum K, which drums are turned at a variable rate of revolution necessitated by the increasing diameter as the drum takes the ribbon.

The Arrangement of Levers.

BY N. W. W.

In planetary transmission cars there are probably a dozen different combinations in which the speed changing devices could be arranged, but which way is the most convenient? That is one of the problems the designer has to settle. There are times when a driver is going around and between wagons, street cars and pedestrians on low gear, and he needs both hands to steer with. If the low gear is operated by a side lever, how is he to keep one hand on this lever so that it could be released quickly in case something got in the way and still have both hands on the wheel or on the wheel and spark lever? To settle this question some makers have abandoned the side lever for the low gear and put in a pedal, and put the reverse gear on the side lever. Now one would ask "Why have the reverse on the side lever when it is objectionable to have the low gear there?" In going backward the driver naturally will turn in his seat so as to see where he is going, and he would be liable to push on the low speed pedal by mistake, causing some accident.

Supposing, now, that the reverse is operated by the side lever and the low gear by a pedal; the brake and the high gear must be located. Where only one set of brakes is used this set is best applied by



MASON'S RECORDING APPARATUS.

the use of a pedal, since one can push harder with his foot than his arm, and since the right leg is the stronger, the pedal is put on the right side of the steering post. The natural tendency of the driver is to keep one foot on each side of the steering post, and since a careful driver always keeps his foot on the brake, the low speed pedal should be located on the left side of the steering post.

The high speed gears are operated by the forward movement of the side lever. Of course, some accidents occur because of the operator not being able to stoop over and pull the lever up in time, but the danger varies directly with the distance the driver has to reach. On some cars the movement of the arm alone will bring in all the functions of the side lever, but on others the operator must bend over until his head is about level with the steering wheel before he is able to touch the lever, but these conditions are becoming scarcer, and the danger is not so great as it would be if a pedal be used, since the clutch might stick and the pedal fail to return. A remedy for this would be a strong spring to pull the pedal back, but the tiring effect it would have on the operator on long trips would make it impractical. The side lever is therefore to be preferred for the high speed

Laboratory Tests of Cork Insert Friction Plates.

A series of tests have recently been made by John R. Nichols, under the supervision of Professor Hollis, of Harvard University, to determine the value of cork for increasing the frictional resistance of metallic surfaces in contact. The tests were made on "Compo" friction plates, manufactured by the National Brake and Clutch Company, 16 State street, Boston, and the report on the tests has been communicated to us by the company.

The pieces to be tested consisted of five cast iron and five phosphor-bronze plates 5 inches wide by 10 inches long by three-quarter inch thick. One side of each plate had been planed smooth, and one plate of each metal had, respectively, 0, 11, 14, 17 and 48 holes three-quarter inch in diameter by one-half inch deep drilled in the smooth side. The holes were located symmetrically on the plates and in rows, staggered. They were drilled flat at the botom.

Corks 1 inch in diameter were compressed and placed in the holes wet, allowed to dry, and driven home hard. They were then sandpapered down to one-thirty-second inch projection above the surface of the metal. Before commencing a test, the plate was dragged back and forth several times under a load of about 500 pounds to reduce the corks to a uniform condition and one that would remain uniform throughout the subsequent test. The surface on which the plates were dragged consisted of a cast iron plate with the upper horizontal surface planed smooth. The pull to overcome friction was applied by means of a pianoforte wire, one end of which was attached to the plate and the other hung over a wheel of known resistance.

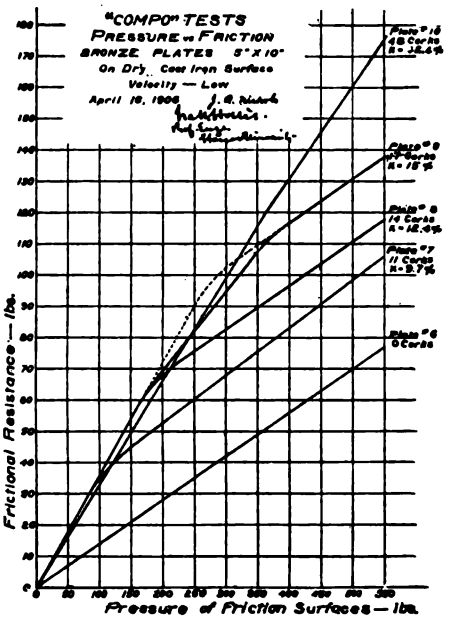
The wheel was calibrated for friction as follows:

Weights on the lower end of the wire were alternately hoisted and lowered by means of a spring balance attached to the horizontal part of the wire, and half the difference of the balance readings, up and down, was taken as the correction for the given weight. Weights were hung on the lower end of the wire to keep the plate moving at uniform velocity when started. The velocity obtained was between one and two feet per minute. It is probable that the coefficient of friction varies somewhat with the velocity, and experiment seems to indicate that the coefficient would be higher for greater velocities. If this is true, the results obtained in these tests show lower values than would be realized in the practical use of "Compo" surfaces for brakes and clutches.

Tests were made on each plate under eleven loads, varying from 50 to 550 pounds, by 50 pound increments. The weights were piled upon the plate, a test being made after every addition of 50 pounds and again after each removal of 50 pounds, as the weights were being taken off. A mean between the two readings for each load, corrected for the resistance of the wheel, was used in plotting the curves. After fair curves had been drawn through the points plotted tables were made out from the curves.

The curves show that the coefficient of friction for plain cast iron on cast iron is about .16. For plain bronze on cast iron the coefficient of friction is .14. The coefficient of friction of the corks on the cast iron is from .33 to .37; .33 being the value for the heavier loads.

It may be noted that at a definite "critical" point the curves of the Compo friction plates become straight lines parallel to the line indicating the resistance of metal on metal without inserted corks. This is due to the fact that at a certain "critical" load the corks have been sufficiently compressed to bring the metallic surfaces into close



contact. In plates No. 4 and No. 9 the premature and partial change of slope may be due to an unevenness of the corks, allowing one side or one corner of the plate to come into metallic contact with the bed plate. The final slopes of these two plates occur when the entire metallic surfaces are forced into contact by the load. The dotted lines shown in connection with the curves for plates No. 4 and No. 9 represent what the curves would have been had the corks been even.

Above the critical point the cork takes no more pressure and the load merely increases the pressure between the metallic surfaces. Below the critical point the frictional resistance increases with the load at a rate measured by the coefficient of friction of cork on metal. Above the critical point the frictional resistance increases with the load at a rate measured by the coefficient of friction of the metals, and the total resistance is the sum of the constant drag of the corks and the frictional resistance of the metals due to the additional pressure, after that carried by the cork is subtracted from the total load.

The curves and tables for loads above the critical point may be expressed in mathematical symbols as follows:

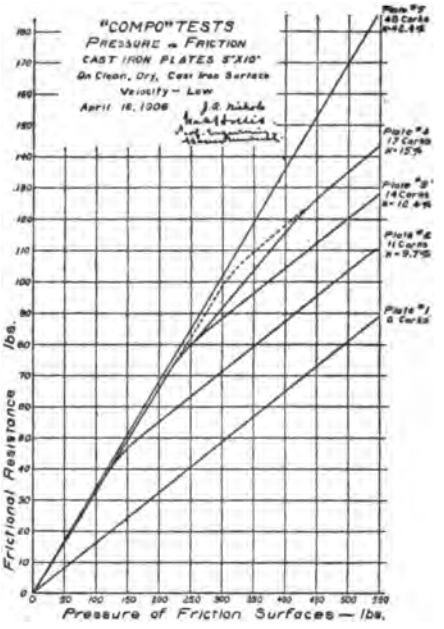
$$R = f W + N A (K - a),$$

where R = resistance to motion of plate; W = total load on plate; f = coefficient of friction of metals; A = total area of plate; K = area of cork in percentage of A; N = a constant depending upon the nature of the materials and the conditions of their use; a = another constant.

If r represents the frictional resistance for each square inch of surface and w the pressure per square inch, this formula may be written

$$r = f w + N (K - a).$$

In order to make this formula practical and useful, it is necessary only to determine the value of the constants from the tests. The equations then read, with close approxi-



mation, for loads above the critical point:

For cast iron "Compo,"

$$R = .16 W + .12 A (K - 6)$$

or

$$r = .16 w + .12 (K - 6).$$

For bronze "Compo,"

$$R = .14 W + .126 A (K - 5.7),$$

or

$$r = .14 w + .126 (K - 5.7).$$

The critical point occurs when, for cast iron,

$$W = .71 A (K - 6),$$

or

$$w = .71 (K - 6).$$

For bronze,

$$W = .66 A (K - 5.7)$$

or

$$w = .66 (K - 5.7).$$

SUMMARY.

For cast iron compo on cast iron.

When W is less than .71 A (K — 6)

$$R = .33 W.$$

When W is more than .71 A (K — 6)

$$R = .16 W + .12 A (K - 6).$$

For bronze compo on cast iron.

When W is less than .66 A (K — 5.7)

$$R = .33 W.$$

When W is more than .66 A (K — 5.7)

$$R = .14 W + .126 A (K - 5.7).$$



MAINTENANCE AND REPAIRS

The Construction of a Repair Pit.

By J. Grant Cramer.

A repair pit is not indispensable. It is, however, such a great convenience that the owner of a car who keeps it on his own premises will never regret the cost of its construction, which need not be heavy. There are many times when it is desirable to get under the car to do some odd jobs or to clean the lower part of the gear box or of the crank case.

It is better not to have the pit in the stable itself, but outside, unless the stable be very large and well lighted. The car should be washed and cleaned outside on a little cement or asphalt floor, so that its dwelling may always be neat and clean, and not sloppy, greasy and generally dirty, as is too often the case.

In order to be able to accommodate all sizes of automobiles, a pit should be of the following dimensions: 9 feet 9 inches long, 2 feet 11 inches wide, and 3 feet 7 inches deep. To the above mentioned length of the pit, properly so called, should be added that of four steps, each step being 8 inches deep and about 5 inches high.

The walls of the pit may be of unhewn stone, rough-walled with Portland cement. The whole pit must then be covered with a layer of the same cement, carefully smoothed down and made perfectly watertight. It is advisable to have the corners rounded, in order to facilitate washing and keeping them clean.

The bottom of the pit should have a gentle slope toward the drain pipe, and the latter should have a trap. The pipe should have stout wire gauze over it to prevent foreign substances from choking it up. A grating resting on a little ledge all around the bottom would enable the repairer to avoid standing in the water, etc., of the pit. This grating might be made in four or five sections. It could then be easily removed to clean the pit or when looking for a small tool or part which had fallen.

Another great convenience would be to have an incandescent lamp. Never get under a car while smoking or with a lighted lamp, candle or matches in your hand. In a niche in one wall you could have a faucet, to which you could connect up hose.

When a car is not over the pit cover the latter with a flooring, so as to prevent anyone from falling in.

The above described construction may, of course, be modified or simplified according to individual ideas or requirements. Brick could be used instead of stone for the walls. The pit could be made deeper. One could dispense with the electric light, the water supply, and even with the drain pipe and grating. One could use the pit buried tank is much to be preferred for the former.

Hints on Detecting Gasoline Engine Troubles.

By William H. Bex.

The trouble with most drivers of motor cars is lack of confidence in locating trifling troubles, for most troubles are, indeed, trifling. If users of cars would observe the few rules which are to follow, their troubles would be reduced to a minimum.

FOULED CONTACTS.

When the motor fails to work properly, inspect the contact points of the vibrator, and usually a very slight turn forward of the contact screw will set things right, but if this fails, see that the commutator contacts are clean. This trouble is generally indicated by explosions in the muffler, which means failure of ignition in the cylinders.

LEAKY VALVES.

Should these things fail to remedy the trouble, look for leaky valves. The symptom is popping back in the intake pipe. The cylinder giving this trouble can be located by short circuiting one plug at a time with the screwdriver. When the proper one is located, the engine will maintain the same speed as previous to the short circuits.

WEAK BATTERIES.

The engine appears to run fairly well until the application of power. It will run a short distance and die down, and considerable adjustment of the carburetor will be necessary before it will start again. The engine will then run a short distance as before, except where considerable headway has been gained, due perhaps to a down grade favoring the motor after the last adjustment, but it fails to pick up again as soon as the speed of the car is slacked down. If dry cells are used, by allowing them to rest they may recuperate so as to allow of restarting, and the driver may perhaps reach his destination. With storage batteries resting will do no good, and the battery must be recharged.

FLOODED CARBURETOR.

Carburetor troubles are of several kinds. If the carburetor is flooded the motor fails to start on continuous cranking. The remedy is to shut off the gasoline, crank the engine with several rapid turns until it starts, and as soon as the speed begins to decrease, turn the gasoline to the usual point for best running.

RICH MIXTURE.

Black smoke comes from the exhaust. There is a lagging action of the engine and fouling of plugs. Turn off the gasoline until the engine has ceased action and there is an absence of black smoke at the exhaust.

RARE MIXTURE.

The symptoms are missing explosions and a knocking sound. If the cylinders are in the intake pipe, the same as with a valve. In this emergency, turn the valve to admit more gasoline. If this not remedy, see paragraph on "Dirty buretors" below.

WATER IN CARBURETOR.

The symptoms are missing explosions irregular running of the motor, sometimes absolute failure to run and at other spasmodic running as in a case of batteries. There may also be a sudden haust. In case of such trouble, take off bottom of the carburetor and drain ing all water to escape. The water in carburetor is due to the roads being wet the weather rainy, which causes water collect in the air passages leading to carburetor. If chamois or a silk handkerchief is used to strain the gasoline filling the tank in the car, these troubles will be eliminated.

DIRTY CARBURETORS.

The action is much the same as water in the carburetor. Remove the and, if possible, the entire carburetor apply pressure of the tire pump and out the obstructions. Instead of force pump after removing the bottom may insert a piece of wire in the passage until you get a free flow of line directly from the hole to the gas

Never experiment with cheap oils best is none too good for a gas engine service which good oil will give will than repay the difference in price.

EXCESS OF OIL.

Oils may sometimes be found to be cause of motor troubles. Excess of in the crank case will cause fouling plugs. Poor oil in small quantities prove the cause of endless trouble tors, especially of the water cooled Lack of a sufficient amount of the quality oil will cause burning of the weak explosions, poor compression sequently great loss of power.

Motor Wagons in the Austrian Army.

Following a series of experiments armored motor cars, the Austrian Office has instituted regular courses struction for officers and men in ing and care of automobiles. The course, which has just been completed attended by five officers, a military and twenty-one men. In addition struction in driving, the class was taught to make such small repairs frequently rendered necessary by accidents. For this purpose the a four cylinder car was completely to pieces, and the pupils were set to rebuild it. The course consisted visits to several automobile factories repeated inspections of the recent bile Show in Vienna. The War Office pects to build up gradually an corps of drivers, and the men are to learn the work, as they will be able to obtain positions as chauffeurs

LESSONS of THE ROAD

Use of an Automobile in the Sale of Mining Machinery.

By Ed Murray.

My business is selling mining machinery and setting it up. Last summer I had occasion to set up three new plants at the same time in a radius of about twenty miles of each other, and I was kept on the road a great deal going to the different points, superintending the work. I started in to drive the rounds with a two horse team, but soon learned that it was impossible for me to do so in the time I had, so I bought a popular two cylinder light touring car, without tonneau, rated at 10 horse power. In place of the tonneau I had a large box made to fit in its place. I made other changes at the very start; one was to put on a ratchet brake instead of the one already on the car, which had no ratchet; and the other was to substitute solid tires for pneumatic, though cautioned against this by friends, for fear of crystallizing the axles. I did it anyway, for my time was limited, and my roads, if they could be called that, were rough and covered with sharp, flinty rocks.

Regarding the power of this car, I was surprised at its taking nearly everything on the high speed. In fact, it took hills on the high that two cars rated at over 20 horse power resorted to their intermediate gears to climb. Of course, I had it geared low, but even at this it would carry two people and quite a lot of luggage at the rate of 22 miles an hour on the level roads of the plains.

PREVIOUS EXPERIENCE.

Before going further I want to say that though I had never owned a car before I had ridden many miles in different ones and had learned to steer and manipulate the gears of seven different kinds. My business among mining men often put me in contact with men who owned cars, and they gladly showed me all they could about them and many times insisted on my running their cars. In this way I learned, to a certain extent, to drive nearly everything from the light single cylinder runabout to the big four cylinder cars.

The knowledge I had obtained in this way induced me to purchase a light two cylinder car. The single cylinder cars appealed to me on account of their simplicity, but on hills they did not show up as well as the two cylinder cars, and they had a great deal more vibration. I could have bought a four cylinder, air cooled machine for almost the same as I paid for my car, but from what experience I had had—whether it was true with other men or not—the four cylinder cars appeared to require more adjustment than the two cylinder kind.

HAD SPECIAL WRENCH MADE.

To commence with my car, I will say that though it had an abundance of power for the use I required of it, I was at first always adjusting some part of it, principally the bearings, which needed constant attention. The two crank shaft bearings especially would hardly run a day without becoming loose. There were two screws to adjust these bearings, one below and the other above, just opposite each other. To tighten these bearings I had a small wrench made to fit the lower screw; until I did this I had to get on my back with a screwdriver. These bearings required so much attention that I did away with the screws and put a three-eighth inch bolt on each side in their places. To do this I had to enlarge the holes on each side of the crank case where the bolts passed through to allow the nuts on the bolts to fit down on the wedge shaped block which tightened the bearings. After this I never had any more trouble with these bearings.

CHANGED TO STORAGE CELLS.

The car carried two sets of dry cells, six in series. Either I had bad luck in getting good batteries or the motor had a way of eating them up very fast. I was out a little over $7 for batteries the first month, and this led me to purchase a storage battery, which caused the car to run with more power and afforded much better satisfaction in every way. The storage battery was 6 volt, 60 ampere hour, and needed charging only twice during the whole season, at a cost of one dollar. Though I kept a set of dry cells I never had occasion to use them. The only trouble the storage battery ever caused me was to test the electrolyte occasionally and add some new. I did not test it one-third as much as I would a set of dry cells.

IMPROVED COMMUTATOR.

The commutator coming with this car was a freak; always breaking springs and out of adjustment. After the first few weeks' use with it I sent East to a company advertised in The Horseless Age and got something for $9 that fitted the shaft and never needed attention afterwards while I owned the car, that I can remember.

The machine had only one coil for the two cylinders, and though of popular make and of the kind much used, it also demanded much care. As I was not well versed on coils or, in fact, any part of the electrical mechanism, I again resorted to the back numbers of The Horseles Age and learned that two coils were considered better than one for a two cylinder car. Again I wrote to one of the companies advertising coils. I told my troubles; gave number of cylinders, size of storage battery, etc., and requested them, if they could supply me with a reliable coil, to send it to me C. O. D. In due time the coil came with full directions how to connect and adjust it. I might also add that the company did not send it C. O. D., but trusted me with the amount. Though I adjusted the new coil a few times during the season, I never regretted having bought it, as it seemed to improve the running qualities of my car.

FIBRE VERSUS RUBBER AIR VALVE.

The carburetor on my car caused me more or less annoyance at first by the air valve sticking, which was made of rubber, and would gather dirt and grit. This would catch sometimes and would not open to its full extent when I thought the throttle wide open. As it did not require rubber or need to be air tight, I made a valve out of fibre; this never gathered dirt. On the late models of the same carburetor I see that the company has discarded the rubber washer for fibre.

The new parts that I added to my car cost me nearly $50. The work I did myself, on Sundays, with the assistance of men about the mine, who were always willing to help me. After making the few changes named, though they may not seem important, no car ever ran with less trouble. I averaged about twenty miles a day, excepting Sunday, for four months with this rig, and during all that time I never had need of a hay motor to pull me to my destination.

SOLID TIRES SATISFACTORY.

Regarding the tires, I never gave them a moment's thought. I never had a chance to use them on cobble stones, but on dirt roads they seemed as easy as pneumatic tires; and when I buy a new car it will have the same kind of tires.

I might also add, though it may be doubted by many, that a friend of mine informed me that these tires carry a car faster and easier through heavy sand than pneumatic. I am positive of one thing, and that is, on hills where there is deep dust the tires hold better than pneumatic, and I have always considered this the reason of my car's climbing two hills on high speed when the two twenty-four horse power cars always resorted to their intermediate.

CHANGES INCREASED POWER.

For the benefit of others who might think a few small changes such as I have mentioned would improve a car to a great extent, I might mention the following incident. After my work was over in the summer I spent a month at a coast resort. There was an automobile agency and garage in this town representing the same make of car as mine. The owner had sold quite a number of cars, among them two from the same manufacturer that I had obtained mine, but rated at several horse power higher and costing several hundred dollars more.

On little runs we had it was soon discovered, to my surprise even, and others, that I could climb hills on high that none of his cars could. This led him to borrow my car to demonstrate with one day when he had a prospective buyer. He had the car nearly all day, and when he returned the manager of the Pacific coast distributing agency of this car was with him. He got out of the machine and looked at it quite

a while, then taking the cigar from his mouth, he turned to me and said, "That is the most powerful car of its make I ever saw, and I have helped to test thousands of them at the factory in the East."

Now, if the few changes I made on the car caused such a vast difference, why is it that the manufacturer does not adopt them? Of course, it would cost more, but the public would willingly pay for it.

Take the commutator, for instance, that came on my car; the whole thing, fibre box and spring complete cost about 75 cents, while the one I substituted for it cost $9. The manufacturer could get these at two-thirds of what I paid for it. The single coil sent out with my car may be bought nearly anywhere for $7.50, while the double coil that I put on in its place cost nearly three times as much. These things the manufacturer could get at much less, in quantities, at least.

Automobile Notes from Sunny Alberta, N. W. T.

By Dr. Charles F. Smith.

For the past ten years I have been using bicycles in my practice, which, owing to the scanty settlement of the country round-about, and the consequent small necessity of driving outside the town, made the keeping of a horse or other conveyance unnecessary. Within the last two years the tide of immigration has set in our direction, and the consequent settlement of the farming districts and expansion of the town has made the acquisition of some other mode of transportation imperative.

Three years ago, while on a summer visit to California, I had my first automobile ride, and was stung severely by the auto bug. Even the spectacle of our chauffeur prying a clincher tire off the rim, and grovelling in the dust of a California road mending a blow-out, with the thermometer at 115 in the shade, was not an effectual antidote. The poison still kept working, when, later on, he had to take the body off the machine to sift some sand into the transmission to get the low speed clutch to hold enough to climb a 10 per cent. grade. Sand was cheap, anyway, and can easily be got in this country.

Last fall, after paying the iceman for his summer's work, I found myself several simoleons ahead of the game, and felt that I could at least afford to send for catalogues, and did so. I also put up 25 cents for the Doctors' Number of The Horseless Age, which was undoubtedly the best investment I ever made, as I got more information for less money than ever before. I read this diligently and with varied results. I would read one man's experience, and it would look as easy as taking candy out of a Christmas stocking. The next page, and my feet would get cold clear up to the knees.

However, about this time I had to make a trip as far as Chicago, and while there rubbered around some of the automobile agencies, and finally had made up my mind to invest in a light tonneau car of well known make. Before finally closing the deal I had a letter from home saying that the bottom had fallen out of a real estate speculation. As the car in question would have set me back about $1,500, I had to pass it up.

On my way home I had to wait over in Minneapolis for a day; while there I wandered down into the auto district, and wound up by buying a demonstrating runabout, double opposed cylinder under the hood, shaft driven. This machine was taken into the shop, cleaned up and painted, and a small detachable tonneau that will hold two children nicely was built.

I reached home about the first of the year, and while the machine was being fixed up in Minneapolis built a garage for it. The car came along, knocked down and crated, about the middle of February. With the help of three or four other seekers after knowledge the machine was set up successfully, and loaded up with gasoline, oil and water. The rear seat was put on, two husky helpers climbed in there, another in the front seat with me, the machine was pushed out into the alley, and, like the Israelites of old, we set out accompanied by a pillar of smoke. In my anxiety to keep my bearings from melting out, I had put in enough oil to run her for two months, and naturally it came out through the exhaust.

One man was told off to do the cranking, and he did not have any time for sleep, as every time we would change the speed we would stall the engine. As it was the first owned here and the second one ever seen in town, we had plenty of spectators.

We drove around for about an hour, and succeeded in breaking a spring leaf, and blowing out a tire, which was in bad shape when the car was bought.

Since that time, with the exception of breaking another spring leaf by dropping into a hole about 2 feet deep, at 15 miles an hour, the breakage and repair account has been nil.

I have driven her about 600 miles, at an average cost of 2½ cents per mile for oil and gasoline. Oil costs about $1.25, and gasoline 40 cents per imperial gallon, buying it in barrel lots. The car will average 18 miles to the gallon, town and country. She has plenty of power, all kinds of speed, and has not as yet laid down with me anywhere. I am fortunate in not having any automobile experts in the town, as the spring repairs necessary have been done by an ordinary blacksmith, and the car is so simple that I cannot see where any ordinarily intelligent machinist could not fix any part in a very short time. Extra parts can be procured at reasonable rates in a couple of days from Minneapolis. My patients now get more attention than ever before, as what was formerly severe labor, in windy weather at least, is now a recreation. I had during my student days a fairly good education in mechanical lines, having spent several years in the pipe organ business, and the automobile is a simple proposition to fix alongside of some of the earlier forms of electric and pneumatic church organs.

A 30 per cent. solution of wood alcohol in the honeycomb radiator successfully resisted frost. A tin can full of the solution left out all night at 30° below zero only froze to the consistency of snow, and would not have done any damage to the radiator if the car had stood out all night.

All joints, universal and steel gear are packed with grease, and protected by leather boots, following out a recent suggestion in this magazine. With a shaft driven machine, this does away with the necessity of a large boot under the car, as the only working parts that are exposed are the push rods and valve stems, which can be protected if necessary with a little asbestos paper or tin.

As far as depreciation is concerned, I have had the car nearly all apart in my spare moments, principally to see how it worked, and apart from tires I would not think the car had depreciated more than 10 per cent. at the most, in spite of having had a good hard season's work.

Finally, it seems to me that if a man has any liking for machinery at all, and a reasonable amount of ordinary sense, and will put in half the time on his machine that he would have to on a horse and buggy, he will get as much satisfaction, do double the work and have a heap more fun, with no more expense.

The Automobile Situation in Manitoba.

Samuel H. Shank, United States consul at Winnipeg, Man., writes us that there are only prairie roads in that province, without gravel of any kind, and many of them not graded. They are not suitable for touring purposes, because the least rain makes them impassable for motor cars.

Winnipeg automobilists have discussed building a road from Winnipeg to Portage la Prairie, 53 miles, but no definite action has been taken.

The reports that have been circulated that a 158 mile road was being built for automobilists in Manitoba, he says, are not true.

He continues as follows:

In the city of Winnipeg automobiling is very pleasant, as the city is practically level, and has many miles of good streets. There are 22¼ miles of asphalt, 18¼ miles of cedar block, 35½ miles of macadam, and 150 miles of gravel streets.

Five concerns handle machines: The Dominion Automobile Company, Ltd., who are constructing a three story garage to cost $60,000; McCulloch & Boswell, Joseph Maw & Co., W. E. Grussey and H. A. McVeety. About 140 motor cars are in use in Winnipeg at present. The prospect for an increased business this year is good.

The motor vehicle for commercial purposes has not been used in this city, except in one instance that an Oldsmobile was converted into a light delivery wagon and gave satisfaction. The severe winters have prevented the use of cars during a great part of the year, and consequently the merchants have not adopted motor vehicles.

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Does the New York Law Discriminate Illegally?

The whole theory of the American Government is that of equality of the citizens, and the Constitution of the United States, which is the fundamental and supreme law of the land, protects the citizens by providing that no State shall deny to any person within its jurisdiction the equal protection of the laws. This constitutional provision prohibits the State legislatures from enacting legislation which without good reason grants certain privileges and immunities to one class of persons which are denied to another class. It prevents favoritism for which there is no logical public necessity. Its purpose is to stamp out partiality in the enactment of laws, and it was incorporated into the Federal Constitution in order that each citizen might enjoy all the privileges and immunities which every other citizen possesses, where there is no logical cause for differentiation.

This constitutional provision may be appealed to by those who are discriminated against unlawfully under automobile legislation, and it is very appropriate to consider in particular whether or not the recent amendment of the New York Motor Vehicle Law is constitutional, in view of the fact that owners of automobiles, by Subdivision 3 of Section 6, are granted the privilege of using a surety company's bond in lieu of other security when arrested for violation of automobile regulations. The law provides that where the owner of a motor vehicle is taken into custody he shall be forthwith taken before an officer, and be entitled to an immediate hearing. If a hearing cannot then be had, it is provided that he shall be released on giving a bond, executed by a fidelity and surety company, or the giving of his personal undertaking secured by a deposit of money, or by leaving the automobile.

It will be seen that this sub-division of the automobile law grants to the owner of a motor vehicle certain privileges which are denied to an operator who does not own the automobile which he is operating. Thus the hired chauffeur and the borrower or hirer of an automobile are denied the privileges of this amendment. No one except the owner of a motor vehicle can claim the special right granted by the Legislature to use a surety company's bond when arrested. Very naturally the question may be asked, Is there not an unjust discrimination in the New York statute? Is there any reason founded upon public necessity why a certain class interested in motoring shall have the right to be taken immediately before an officer for a hearing and a right to use a surety company's bond in bail proceedings, and the same right be denied to another class of citizens engaged in automobiling? If there is a reason for making this discrimination founded upon sound public policy, then the law is constitutional, but if there is no logical basis authorizing the granting of these privileges and immunities to owners and not to others, then the law violates that fundamental and sacred inhibition of the Federal Constitution which makes all men equal before the law.

Gearless Cars.

One of the prominent foreign manufacturers of six cylinder cars is now offering a gearless model as an option. The regular model supplied by this concern is equipped with three forward speeds derived from a sliding gear combination, but in the gearless model the change speed gear is absolutely discarded and nothing intervenes between the engine and the driving mechanism except the clutch, which is of the multiple disc type, designed to withstand considerable slippage during the acceleration of the car. In view of the extensive discussion which has persisted for a number of years as to the practicability of doing away with the change speed gear, any statement bearing upon the realization

of the gearless car in a marketable form is naturally of interest. "Gearlessness" has been one of the ideals which have been very pertinaciously entertained by the automobile public.

The recent increase in the number of cylinders employed in automobile motors, and especially the frequent adoption of six cylinder engines, providing as they do not merely a power impulse each stroke, but impulses actually overlapping one another, has brought "gearlessness" nearer to realization than hitherto. Improvements in constant mixture carburetors, which enable multiple cylinder engines to be run very slowly and at the same time regularly and sweetly, with satisfactory torque development, have also rendered less impracticable the car which shall exhibit all necessary speed variations, even though provided with but a single gear reduction ratio to the rear wheels.

The gearless car problem is, of course, intimately connected with the development of a clutch which shall enable the motor to pick up its load quite gradually. Of course, it goes without saying that the gearless car must necessarily be a vehicle of very high ability. Its motor must be capable not only of keeping the car in motion upon its one fixed gear ratio under the most trying conditions, but, even more, it must be capable of accelerating it under the most arduous circumstances of road surface and grade. Nor should it be forgotten that clutch slippage is at best a very wasteful, if not destructive, process, the difference in speed of the two clutch members, multiplied by the moment of friction acting between them, representing lost energy which is converted into useless heat.

In connection with the question of gearless cars, the two cycle engine, which is still more or less the "dark horse" of the automobile world, may well play a part, on account of the fact that its delivery of useful energy, even in the three cylinder type, is very similar in point of constancy to that realized from the six cylinder four cycle motor. This constancy of motor turning effort, in addition to a very wide range of effective engine speed, high car ability and proper clutch arrangements, seems to be the gist of the requirements which make toward "gearlessness." In point of range of speed control, the two cycle engine, in its present state of development, is generally regarded as inferior to its older rival.

While it is not likely that any general adoption of gearless cars is imminent, it does seem possible that six cylinder gasoline vehicles of large power may generally dispense with any intermediate speeds and rely upon a direct drive for all regular service, although provided with a single low gear for use in starting. However far removed from realization on the commercial scale the gearless car may still be, there is a fascination connected with the question which makes it perennially a subject for conjecture and discussion among those to whom simplicity in motor car construction and operation appears a desideratum.

Solid Tires and Crystallization of Axles.

Our present automobiles, almost without exception, are built to run on pneumatic tires, and if a change is to be made to solid tires, due precautions must be observed or serious accidents may result. The solid tire is inherently less elastic than the pneumatic, and before it is adopted the question should be considered whether the car is sufficiently strong in all its parts to withstand the additional vibration to which it will be subjected. It is safe to say that the average high powered touring car of today would not stand up with solid tires, because the speed of these cars is too high and there is an enormous difference between the cushioning effect of a 5 inch pneumatic and a solid tire of the same carrying capacity. A confirmation of this view was furnished a few days ago when a large 40 horse power touring car of well known make, fitted with solid rubber tires on its front wheels, while running along the street in New York city at a moderate speed, suddenly broke one of its steering knuckles, letting that side of the axle down on the street, and no sooner did it strike the ground than the other knuckle snapped off, too. This car has a maximum speed of perhaps 50 miles per hour, and as the occupants hardly feel any vibration due to reduced resiliency in the front tires, it may well be imagined that the car with its solid front tires had been driven occasionally at a very high speed. That the front axle should crystallize under such conditions should have been expected, and the accident proves that it did.

The front wheels of a high powered car are perhaps the most unfavorable place for solid tires. The dead load of the motor right over the front axle intensifies the strains on the latter due to road vibration, favoring crystallization, and the motor, as the most delicate piece of mechanism on a car, requires more than any other part the shock absorbing action of the pneumatic tire. Solid tires can be mounted with more confidence on the rear wheels of fairly low powered cars, but even there it is usually best to reduce the gear ratio when the change in tires is made, if this can be done without too much inconvenience and expense.

Effect of Violating the Law.

There are two sets of laws which govern the driving of automobiles on the public highways. We have the statutory regulations expressly controlling the operation of motor vehicles, and also the common general statutory law. The automobile enactments prohibit certain rates of speed; the common law, which is the unwritten law, requires autoists to refrain from being negligent or careless, and the general statutory law, in many jurisdictions, provides certain regulations in reference to general traffic on the public avenues of travel. The automobile driver is controlled by all these laws.

A most interesting question is presented where a motor car driver injures a person on the public ways, when the automobile is being driven at a prohibited speed. Does the fact that the speed law was violated necessarily make the automobilist liable for the damage resulting, irrespective of the question of whether he was negligent or the injured party guilty of contributory negligence? It may also be asked whether the chauffeur who has unfortunately caused the death of another person is guilty of manslaughter by reason of the mere fact that at the time the catastrophe happened the speed limit was exceeded?

At the outset, it must not be forgotten that the violation of automobile regulations involves no moral turpitude, and an infraction of a specific automobile requirement is only *mala prohibita*. A penal statute is violated. Something is done which prior to automobile legislation was perfectly lawful, and also morally right.

It is conceded that a party committing an injury while driving an automobile at a speed beyond the legal limit is in the wrong and is subject to the speed law's specific penalty for overspeeding, but he is not necesarily guilty of negligence because he has violated the statutory provision, nor is his responsibility for manslaughter determined by the mere fact that he went one

or two miles above the lawful rate of speed. In order to hold the autoist civilly or criminally liable in such cases, there must be proof of negligence, carelessness and a disregard for the safety of others, and the facts and circumstances surrounding the accident must be considered. Were there many people traveling on the highway at the time of the injury? Were there many vehicles? Was the injured party himself looking out for his own safety? Was he violating the law? What would a driver reasonably be expected to do under the same circumstances? Did he act as any other reasonable man would have acted? All these are questions which would be asked in considering whether the automobile driver was to blame, and the fact that the speed laws were violated is only a circumstance against him. In some jurisdictions proof of a violation of the speed rate might make out a *prima facie* case against the motorist, but it would not be conclusive, and he would have an opportunity to show that under all the circumstances he acted as a reasonable man should.

Crank Chamber Inlet in Two Cycle Engines.

Considerable interest seems to have been taken by our readers in the discussion regarding the relative merits of the poppet valve and piston uncovered port inlet, respectively, to the crank chamber of two cycle engines, which discussion was started in a recent issue by our contributor O. V. H. The results obtained in his experiments are remarkable, because it has been the general opinion that a positively opened crank chamber inlet was an essential feature if the engine was to run at high speed and develop much power. It may be pointed out that besides the piston uncovered port, a number of other arrangements have been used tending to give the same result. In one type of motor the crank chamber inlet port is formed in the end wall of the chamber, and is controlled by a ported piston disc rotating with the crank shaft, while in another the port is formed in the crank shaft bearing and controlled by a hollow ported shaft.

A correspondent in our last issue argues that better results would be expected where the crank chamber inlet remains open during the whole of the upward stroke than where it remains open during only a fraction of that stroke, say, one-third. The inference that a spring returned poppet valve in the inlet to the crank chamber remains open during the whole of the upward stroke is erroneous, however.

The valve will begin to open only when the vacuum in the crank chamber is sufficient to overcome the valve spring, and will begin to close again as soon as the effect of the vacuum on the valve becomes weaker than the spring. Owing to the fact that the proportional change in volume of the crank chamber due to the piston stroke is not very great, there is never a very strong vacuum in the chamber, and the valve will open late and close early, before the chamber is filled with mixture to the atmospheric pressure. Owing to its inertia, a poppet valve cannot open nearly as quickly as a port in the cylinder wall uncovered by the piston, and it seems, therefore, doubtful whether the aggregate time opening would be greater with a poppet valve than with a cylinder port of the ordinary dimensions.

Lack of Practical Value of Local Automobile Trials.

The decline in popular favor of automobile track racing promises to result in the wholesale organization of another kind of automobile event, such as hill climbing contests. There are possible promoters of such events in all parts of the country, and manufacturers will certainly not fail to receive numerous invitations to join in these affairs. They will generally be well advised, however, to refrain from participation, as these contests, in most instances, lack all the elements of a practical competition, are of a decidedly sporting character and local in scope. In local hill climbing contests, for instance, it is the rule that neither organizers, contestants nor spectators ever learn anything about the profile of the grade on which the contest is held, and it is exceptional that the cars are weighed. The mere time of the ascent does not allow of judging the performance; and the figures reproduced in the press are to a certain extent meaningless. They simply show that certain cars went over the course faster or slower than certain others —whether the performance of any particular car was good, bad or indifferent is not obvious to the average reader and can only be judged by parties familiar with the hill.

What is wanted is well organized, practical contests participated in by a majority of the industry, so that success in the event really denotes superior merit in that particular quality on which the contest devolves. The manufacturers should, therefore, give their support to contests organized by clubs or associations of some prestige in the automobile world, and refrain from encouraging local sporting affairs, which, if supported, must unavoidably multiply unreasonably, prove a heavy expense to the industry and disgust the public with automobile competitions. The problem presents about the same aspect as that of local shows, and its solution should be sought along the same lines; that is, manufacturers should leave their agents a free hand in competing in any local competitions at their own expense, but should not participate in them for their own account.

Some Further Thoughts on the Two Gallon Contest.

In our last issue it was shown that in the recent Two Gallon Efficiency Contest the lighter cars actually consumed less fuel per ton-mile than the heavier vehicles, a result contrary to the general view concerning the dependence of fuel efficiency on weight of car. In strange contrast with this result is the fact that the very highest fuel economy on a ton-mile basis was shown by the Mack omnibus, which was by far the heaviest car entered in the contest. Without wishing to detract in any way from the credit which naturally attaches to this performance, we believe we should look for some further cause for this strong deviation from the average results than those general features which ordinarily tend to high fuel economy, such as "excellent construction," "well designed carburetor," etc. The fact that, whereas in general the fuel economy decreased with the weight, this very heavy car showed a higher fuel economy than even the lightest, tends to indicate that it fundamentally differs in some respects from the average competitor. And this it undoubtedly does. The difference is in the gearing. The Mack is a commercial car and consequently geared for a moderate speed, while the heavy touring cars are for the most part geared very high and were forced in the built up district, through which a large portion of the route led, to travel on an inefficient indirect gear, and run their engines on the throttle. The difference in gearing, we believe, explains both of these observations, viz., that generally the heavier touring cars consumed more gasoline per ton-mile than the lighter cars, and that the low

geared commercial car consumed less fuel per ton-mile than any of the high geared pleasure cars. If this explanation is correct, it only tends to prove the very great difficulty of arriving at a satisfactory basis on which vehicles of all classes may compete in a fuel economy test.

There is no doubt that the fuel economy of a given car varies quite rapidly with the speed, at values of the latter which are likely to be maintained in a contest, and this condition makes it advisable, we believe, to hold such a contest where it may be run legally at 20 miles per hour. In spite of every precaution by the contest committee to enforce the observance of the law in the contest, there will be some infractions of the speed rules, and a much greater advantage can obviously be gained by the unscrupulous driver if the legal speed limit is 10 m. p. h. than if it is 20. Holding the contest mainly on country roads has the further advantage that the results are more directly comparable with those obtained in other contests, as the fuel consumption necessarily varies with the road conditions and the speed limit. The several fuel economy contests held in recent years by the A. C. of France had their starting point at Surennes, a suburb of Paris. It would, of course, be somewhat less convenient for most of the contestants and officials to travel to a point outside the city for the start, and not quite as large an attendance could be expected at the starting point, but these drawbacks are of no great importance. The value of the contest to the entrants is not so much dependent on the attendance at the start as upon the reports of the contest in the press.

Some Recent British Novelties.

By V. H.

NOVEL METHOD OF WATER COOLING.

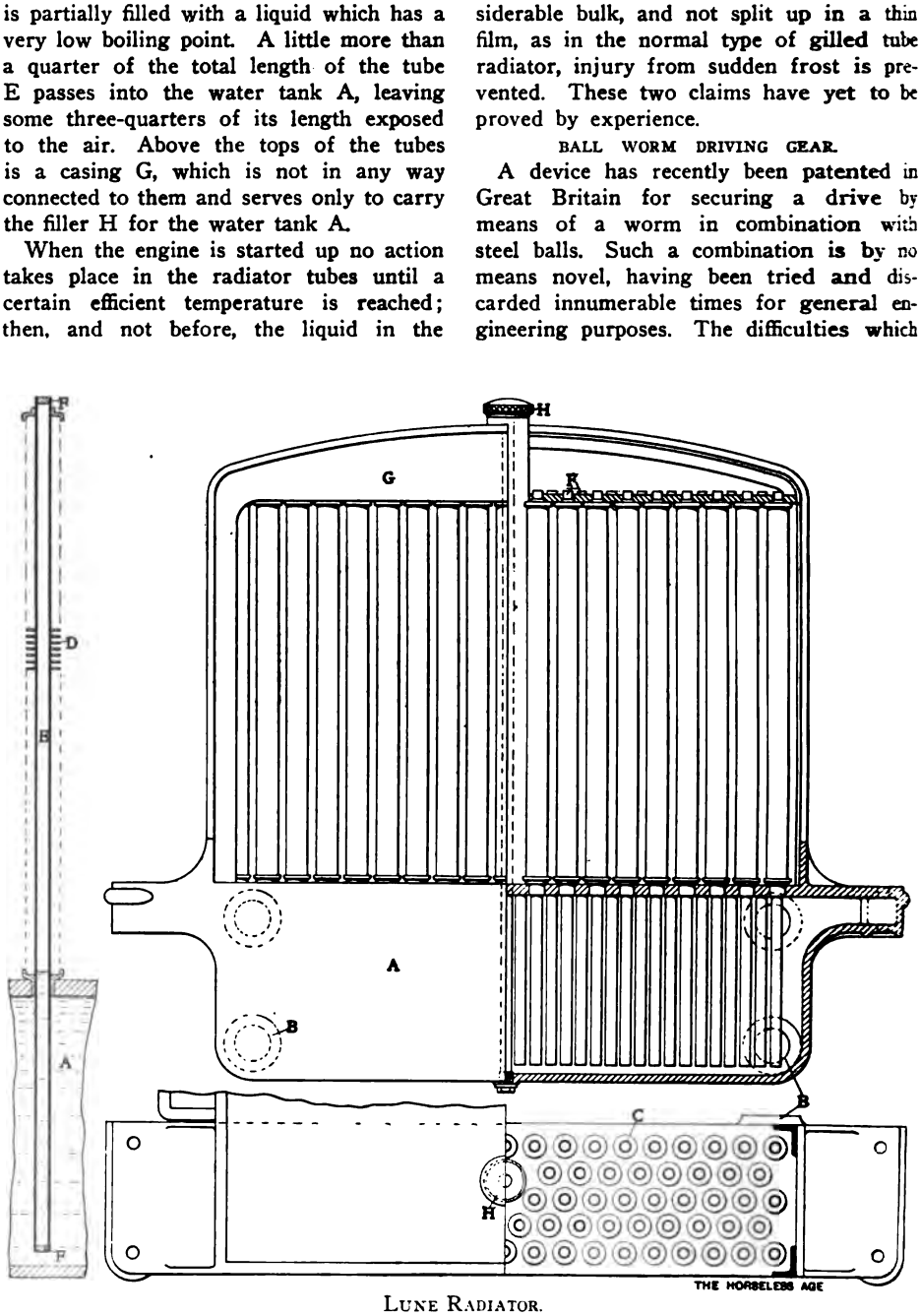
Quite a radical departure from accepted methods of water cooling has recently been patented by the head of a Lancashire (England) engineering firm, and as a result of prolonged tests has been adopted for the motor omnibuses to be turned out by the new Critchley-Norris Company. The inventor has endeavored to overcome a difficulty which has been a source of considerable expense to the large number of companies running motor omnibuses in London and the large provincial towns. This trouble arises from the fact that in a collision the radiator almost invariably suffers injury, and more often than not has to be entirely replaced. Instead of having a long length of gilled tubing with a multiplicity of bends, every one of the tubes in the Lune radiator is a separate unit, and should one, or even several, of the tubes become damaged, the action of the remainder is in no way affected, although the efficiency of the cooling arrangements is naturally decreased by the number of tubes which may have been put out of action.

The principle of the radiator is made clear by the drawings. A is the water tank and occupies the usual position of the lower part of a combined gilled tube or honeycomb radiator, and has the usual inlet and outlet pipes to engine, indicated by B. In the top of the tank A a number of holes C are drilled, the quantity of these holes depending upon the horse power of the engine, 75 to 80 being the number found suitable for a 30 horse power engine. Each of the holes is tapped to receive a separate tube. The portions of the tubes outside the water tank are surrounded by the gills D, and the tube itself, E, is hermetically sealed by the caps F at top and bottom; before sealing up, the air is exhausted from the tube and it is partially filled with a liquid which has a very low boiling point. A little more than a quarter of the total length of the tube E passes into the water tank A, leaving some three-quarters of its length exposed to the air. Above the tops of the tubes is a casing G, which is not in any way connected to them and serves only to carry the filler H for the water tank A.

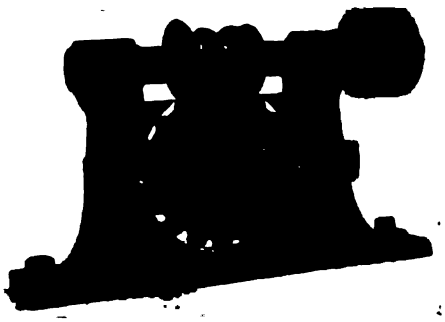
When the engine is started up no action takes place in the radiator tubes until a certain efficient temperature is reached; then, and not before, the liquid in the tubes reaches boiling point, because its boiling point is much lower than that of water. To reach the boiling point the liquid has necessarily extracted heat from the water; vapor is given off by the boiling liquid, and, ascending to the tops of the tubes E, becomes instantly condensed against the cold walls and falls down to the bottom of the tubes. This action is continuous in each of the tubes, the cooling being aided by a belt driven fan behind the radiators. The heat is distributed equally over the whole surface of the tubes, and in practice it has been found impossible to make the water boil, even among the comparatively slow moving traffic on the London streets. The inventor claims that as the tubes are only held at one point in their length, leakage is impossible, owing to the freedom thus permitted for expansion and contraction; and that, as the water in the tank is in considerable bulk, and not split up in a thin film, as in the normal type of gilled tube radiator, injury from sudden frost is prevented. These two claims have yet to be proved by experience.

BALL WORM DRIVING GEAR.

A device has recently been patented in Great Britain for securing a drive by means of a worm in combination with steel balls. Such a combination is by no means novel, having been tried and discarded innumerable times for general engineering purposes. The difficulties which



LUNE RADIATOR.



COLLIER BALL-WORM DRIVE MODEL.

have faced inquirers investigating this type of drive have been due largely to the fact that to make the worm drive the disc carrying the balls, the thread of the worm has had to be so greatly out of the perpendicular that enormous friction was set up and would only give out at the disc shaft a mere tithe of the power put into the worm. In the Collier ball worm drive the difficulty is surmounted by making the worm concave. Represented in section the two extreme outside edges would be higher than the centre; in other words, that portion of the worm in contact with the balls has the same curve as the disc in which the balls are carried. Up to the present only a working model has been constructed, but this has proved to give such results under rigid tests that good financial backing has already been found. The illustration is that of the model, the pulley on the worm shaft being used to run the device by belting so as to show the effect upon the disc shaft. The word "disc" is only used as an expression to describe the shape of the plate which carries the balls, and must not be confounded with the ancient type of disc friction drive. The worm is machined integrally with its shaft and encircles about one-fifth of the wheel it drives, and it is just in this latter respect that it differs so entirely from apparently similar devices. The worm thread is equally spaced about the concavity rather than about the axis of the worm, and forms the driver. The driven wheel is composed of a flat steel disc, somewhat thicker than the diameter of the balls it carries; at equal distances around the periphery semi-circular cups are cut, and in these cups the balls lie loosely, no cages or similar arrangement being used on the disc itself to retain them. Around the disc cheeks are cast upon the supporting standards, there being just bare clearance at the tops of the cheeks to prevent the balls touching, otherwise there would be considerable friction at these places. As the disc moves round from the top vertical position the cheeks prevent the balls dropping out. The bases of the ball cups are slightly countersunk, forming oil wells for lubricating the balls.

Exactly one-half of each ball takes the drive from the worm, the other half being in the cup, and three balls are always in contact with the worm, dividing the driving strain between them. The balls being able to turn in any direction, roll along the worm thread, and are largely helped in this action by the comparatively large amount of lubricant in the cup wells. Owing to the balls meshing simultaneously with the worm, the inventor claims that it is possible to employ a smaller and lighter gear than could be used for fixed teeth gears to transmit similar horse power. As showing the very small amount of friction, the model, of a total weight of some 50 pounds, could be driven backward; that is, the wheel will drive the worm, and this unusual result, for a worm drive, is attained, although the thread is only 8 degrees out of the perpendicular to the axis. The dimensions of the working portions of the model are as follows (and these figures will form the basis of the full size car gear to be constructed): Number of balls, seventeen; diameter, three-quarter inch; worm, 3 inches long on its axis; ball disc, 5¼ inches diameter; ratio of gear, 1 to 17.

The Baltimore-Washington Road.

Much interest attaches to a project launched by the Legislature of Maryland for the construction of "State Road No. 1," between Baltimore and Washington. The project is provided for in the Hill law passed at the recent session of the Legislature. It authorizes the Maryland Highways Commission to undertake the construction of the road, making requisitions upon the directors of the House of Correction for as many State prisoners as may be necessary to perform the work, not exceeding 100 at one time. The convicts while at work are to be guarded and maintained, are to labor eight hours a day, and are to be paid for all labor performed in excess of eight hours.

The road passes out of Baltimore along the line of the old Philadelphia turnpike, leaving the city limits at the terminus of Columbia avenue. It passes through Baltimore County to Halethorpe, entering Howard County at Elkridge, then on through Anne Arundel and Prince George counties to Washington, entering over the Bladensburg pike. The road is to be substantially built, some of the hills graded down, curves straightened, the streams covered with culverts where feasible and new bridges provided where necessary. It is the intention of the Maryland authorities to provide a dry, solid and smooth highway of about 54 miles in length between the two cities for the use of country people and for the increasing traffic in automobiles between the capital and cities to the northward.

Surveys have begun already, and tourists will be glad to learn that the worst part of the journey between Baltimore and the national capital is to be improved first. This is the section from Laurel to the suburbs of Washington, which just now is barely passable. It is the intention of Dr. William Bullock Clark, head of the State department of road building, to spend the first year's money there. Between Baltimore and Laurel the road is in good shape.

The A. C. of Maryland is to make efforts to have a part of the new pike set off exclusively for automobiles.

The project is in the nature of an experiment, especially with reference to the employment of convict labor in its construction. The House of Correction is on the line of the proposed road, and the headquarters of the laborers is consequently easily accessible without permanent resort to camps.

The Hill law differs from the Shoemaker law of Maryland in that the whole cost of construction is borne by the State. Under the Shoemaker law one-half the cost is borne by the State and one-half by the counties. It is expected that the working out of the Hill law, through the employment of convict labor, will lead to better results and more prompt construction of the highways, because the work will not be contingent upon the initiative of the local authorities.

It is many years since Maryland has made use of convict labor in public works. It was done in the construction of the "Basin" in Baltimore nearly a century ago. It is also nearly a century since Maryland undertook road building as a State enterprise, the last experiment of the kind being the old Cumberland pike, which was started in 1806 and speedily completed to the Ohio River. Other turnpikes were authorized and built about the same time in several of the northern counties of the State.

Great expectations are indulged by some of the public spirited citizens of Maryland that the Hill law will open a means of building many roads through the State without a very heavy burden upon the taxpayers.

Canadian Roads.

A Western motorist has eulogized Canadian country roads, which he avers to be much better than the average country road in the United States. He particularly mentions the road between Buffalo and Detroit. This—most of which is known as Talbot street—is perhaps the best long road in Canada and cannot be taken as an average. Talbot street was once a military highway under the régime of Colonel Talbot, who was in charge of the Crown lands in the early days of the U. E. Loyalist settlement along Lake Erie.

It has always been one of the most popular highways in America for motor and bicycle travel, being wide, level, without ditches and built of gravel. Beside it skirts Lake Erie for much of its length and traverses a fruit country. Horses in that part of the country seldom shy at motors, having become accustomed to the American touring cars years ago.

Generally speaking, Canadian country roads are considered better than country roads in the United States, but the suburban and radial roads from cities in the United States are much better.

NEW VEHICLES AND PARTS.

The Aerocar Models A and B.

The Aerocar Company, of Detroit, Mich., are manufacturing this season two distinct models—Model A, a five passenger touring car, and Model B, a light, speedy, two passenger car.

The specifications of Model A are as follows: Wheel base, 104 inches; tread, 54 inches; tires, 34x4 inches front and rear (Diamond tires are standard equipment); 24 horse power, four cylinder, vertical, air cooled engine, sliding gear transmission giving three forward and one reverse speeds; shaft drive, emergency brake on rear wheels, service brake on driving shaft, semi-elliptic springs front and rear; weight with tank filled, 1,950 pounds. The car is sold with a full touring equipment, consisting of two gas lamps, tail lamp, Prest-o-Lite tank, extra tire and inner tube in a waterproof case, robe rail and foot rail in tonneau, full set of tools in enameled sheet metal box on the running board, Gabriel horn and speedmeter.

The foregoing specifications apply equally to model B, except that 36x3½ inch tires will be used, and a two passenger body of special design, fitted with Cape top. The weight of this model cannot be given exactly at present, as the body is undergoing some slight alterations, but it will be considerably less than that of model A.

DESCRIPTION OF MODEL A.

The four cylinder, vertical, air cooled engine is of 4 inch bore by 4 inch stroke. It is made by the Reeves Pulley Company and was described on page 248 of volume 16. It may be interesting to note that the cams used are made to the specifications of the Aerocar Company; also that the engine is oiled by splash, oil being fed to each of the four compartments of the crank case by a Hill precision oiler.

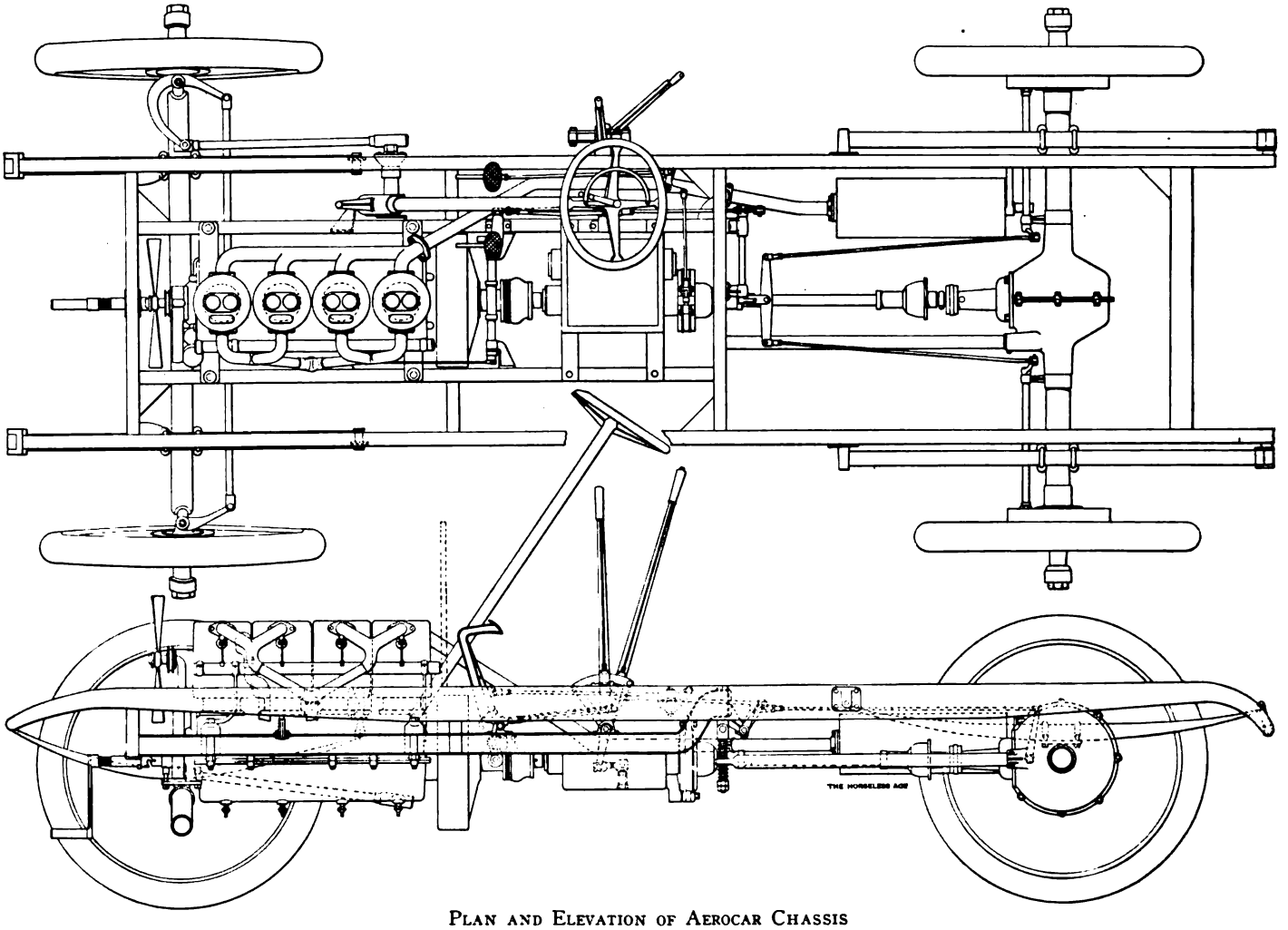
Mixture is supplied by a Universal carburetor. A piston throttle of the Aerocar Company's design has been added, which is ordinarily wide open, and is only used when the clutch is thrown out, during which time it throttles the engine to its lowest running speed. The ordinary throttle and spark controls are connected through ball joint levers and rods to a pair of small bevel pinions at the lower end of the steering column; they are operated by ratchet handles moving over stationary sectors above the steering wheel. The Herz timer is on the left side of the engine, toward the front, and is operated through bevel gears. All of the secondary wires and the primary wires to a point as near the timer as possible are inclosed in a neat fibre tube.

Sootproof plugs and a quadruple Splitdorf coil are used. A storage battery is used to supply current, while six dry cells carried in the tonneau are used as a reserve. The exhaust pipe is on the right hand side and passes with long easy bends to a Gray muffler.

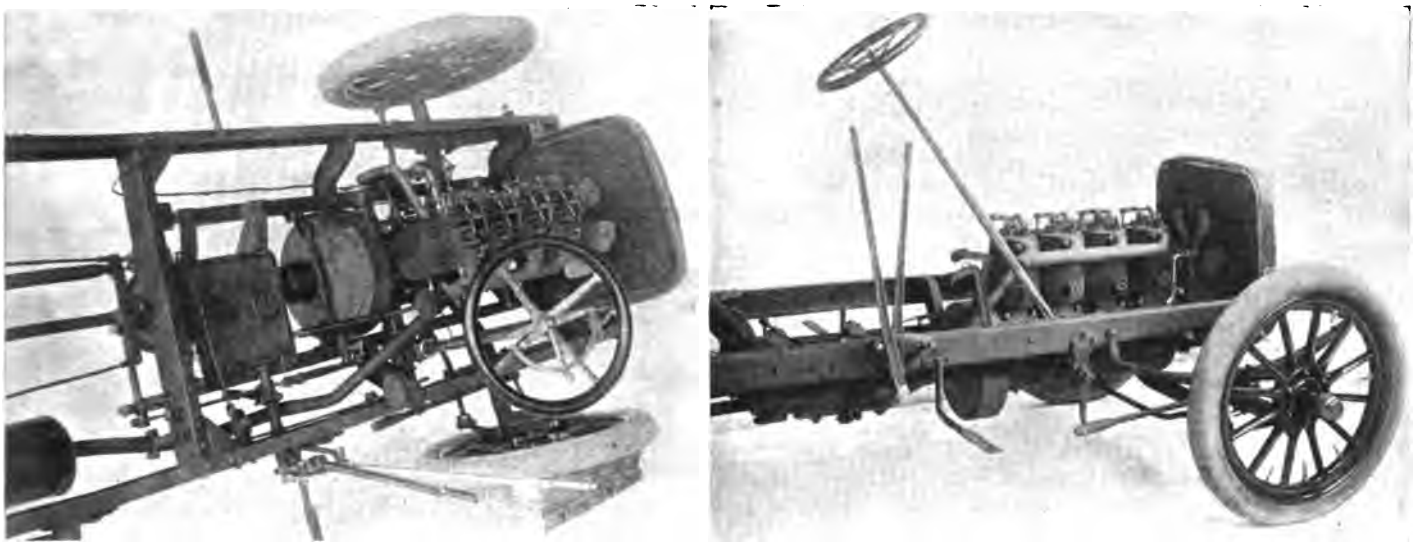
THE CLUTCH.

A leather faced cone clutch is used. The cone is aluminum, as light as possible, with the requisite strength and stiffness. The spring pressure is taken up within the clutch itself on a ball thrust bearing. The method of operating the clutch is rather unusual. Two levers B upon the clutch shaft A press rollers C against face D. Rollers C are two small Hess-Bright ball bearings, which require little or no oil for this class of work. The connections are very simple and direct here, as elsewhere on the car.

Connection between clutch and change gear is made through a combination of a universal and a sliding joint. Part E is squared on to the change gear shaft and has large reamed holes in the forked ends for bushings H. Part D has its outer ends forked and held from spreading by bolts F. In the rectangular slots thus formed slide blocks I, which can turn freely upon pins integral with cross J and are held in place by bolt G and washers K. Bolt G also holds in place the pin which passes through bush-



PLAN AND ELEVATION OF AEROCAR CHASSIS



TWO VIEWS OF THE FORWARD PORTION OF THE AEROCAR CHASSIS.

ings H. This joint is compact and strong, and permits the following motions: A sliding motion lengthwise of the shaft, a universal motion and an eccentric motion of about ⅛ inch if the change gear and motor should accidentally be forced out of alignment. The working parts are enclosed in a leather cover which is filled with grease.

CHANGE SPEED GEAR.

A Brown-Lipe change gear is used. It is of the sliding gear type, giving three forward and one reverse speeds, with direct drive on the high through a jaw clutch; it employs a single sliding set. The gears are of chrome nickel steel, and run on American roller bearings. The entire top is readily removable without disturbing the bearings.

Connection to the rear axle is made through two Spicer universal joints with a sliding square in the rear. The bevel pinion is unusually large and the reduction is 4 to 1 to the live rear axle.

REAR AXLE.

The rear axle tube has Hess-Bright ball bearings on its outer ends which carry the wheel load and are directly under the spokes. The wheels are firmly keyed to the tapered ends of the rear axle shafts and secured by nuts. The inner ends of these shafts and the short shaft for the bevel pinion run on Hess-Bright ball bearings of large size. The bevel pinions of the differential are free to move lengthwise of the axle for a short distance, though they are firmly held in all other directions. The driving gear housing has the tubes forced and riveted in but not brazed.

FRONT AXLE.

The front axle is tubular, 2½ inches in diameter, and fitted with Elliott type pivots cross connected in the rear of the axle. The spring seats are clamped to the tube so as not to weaken the tube by brazing. The front wheels run on Hess-Bright ball bearings.

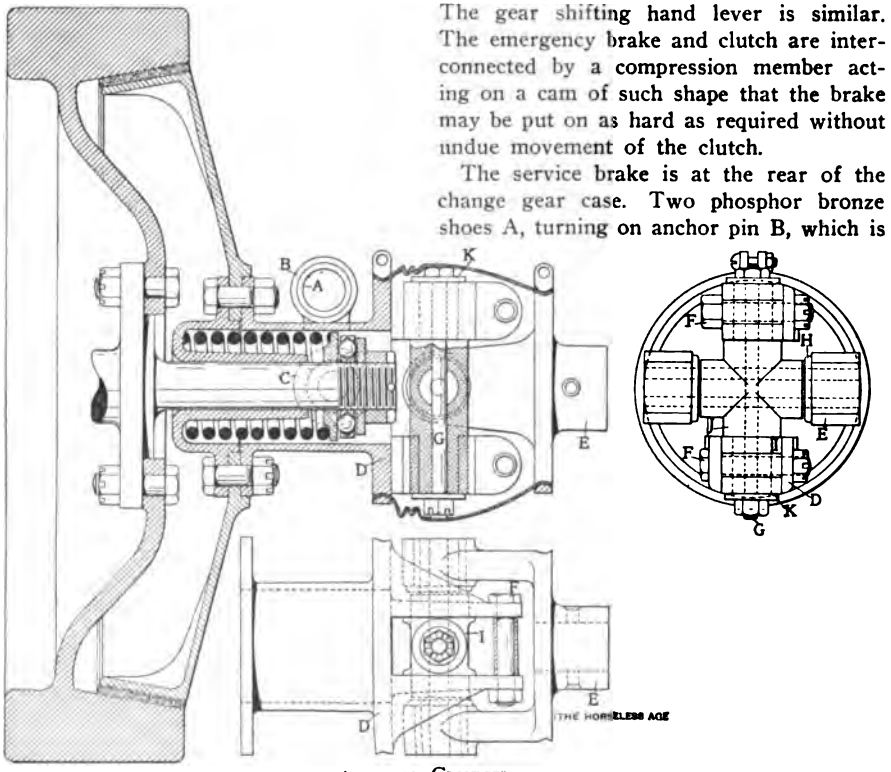
STEERING.

The steering gear is of the screw and nut type. Upon one side of the nut is a broad faced rack meshing with an integral pinion on a horizontal shaft, to the tapered outer end of which is keyed a downwardly extending lever which connects with the lever on the right steering knuckle. The steering joints are ball and socket, the rear one being cushioned by two short helical springs which press shoes within the case on the rear end of the steering connection against the ball on steering gear lever. This construction insures a tight joint and reduces the strains and wear on the steering gear. These joints are all furnished with leather bags filled with grease.

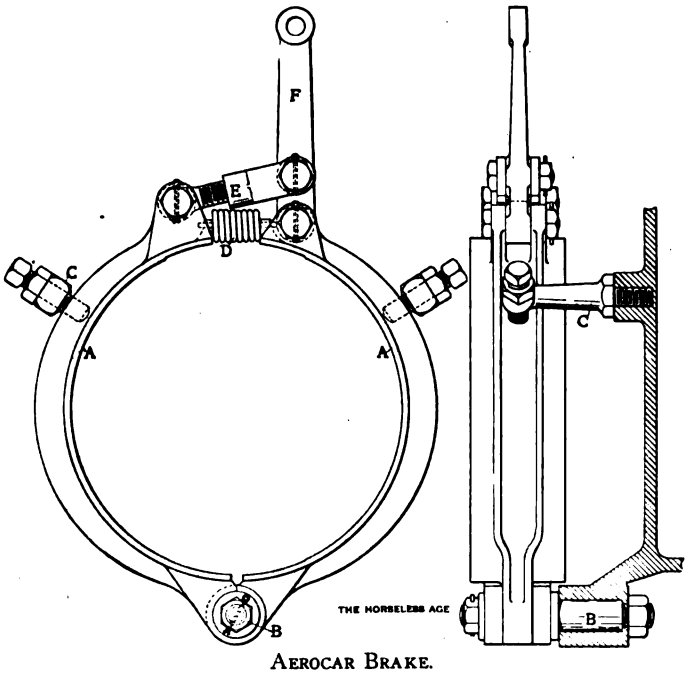
BRAKES.

The emergency brakes, which are on the rear hubs, are internal expanding and consist of sheet metal shoes faced with camel's hair belting. They are hinged together at the anchor pin and are expanded by means of a cam. The drums are of pressed steel and shields on the inner sides enclose all working parts. The shafts of the cams are unusually long and extend nearly to the driving gear housing. On their inner ends are levers connecting by rods to a short equalizer which connects to a rocker shaft fastened to the rear of the cross channel which supports the rear end of the underframe. From this rocker shaft connection is made inside the frame to a lever on the inner end of the brake hand lever shaft. It will be seen that all the brake rods are kept inside the frame, which adds much to the neatness of the machine. The brake hand lever, which is the outer of the two, is a Parsons bronze casting of I section. The ratchet pawl is operated by a thumb button connecting with a rod which lies concealed in the hollow of the I section. The gear shifting hand lever is similar. The emergency brake and clutch are interconnected by a compression member acting on a cam of such shape that the brake may be put on as hard as required without undue movement of the clutch.

The service brake is at the rear of the change gear case. Two phosphor bronze shoes A, turning on anchor pin B, which is



AEROCAR CLUTCH.



AEROCAR BRAKE.

fastened to the change gear case, are normally held against set screws in stops C by compression spring D. Pulling lever F in the direction indicated by the arrow contracts the shoes on the drum, which is made of pressed steel and case hardened. Turnbuckle E provides means of adjustment. Lever F is connected by rods and bell crank to the right foot pedal.

FRAME AND SPRINGS.

The frame is of pressed steel, 34 inches wide, with side members straight and parallel. The engine and change gear are mounted on an under frame of channel section pressed steel, which drops downward from a straight cross member in the rear and runs horizontally to a downwardly bent cross member in front. The change gear and engine are hung low, so that the driving shaft makes a very slight angle with the change gear shaft.

The front springs are 41 inches long, with hanging links in rear directly under the frame sides. The rear springs are 49 inches long and are brought outside the frame, being linked to studs fastened in forgings which fill the rear end of the frame sides. The front part of these springs serves as strut. The spring seats are free to revolve on the axle, braking and driving torque being taken up by a long tube whose front end is linked to the frame and has helical springs above and below to prevent excessive strains. Truffault - Hartford shock absorbers are furnished as regular equipment. All frame corners have substantial gussets, and the sub-frame is stiffened laterally by braces near to the centre.

BODY.

The body is large and roomy, seating five persons comfortably, beside providing space for luggage. The front seat is fitted with side doors, the left door being readily removable by lifting it off its hinges, while the right door may also be removed if occasion requires.

The device for holding robes, etc., is novel. It consists of two polished brass knobs, fastened to the backs of the front seats, which support the ends of a piece of one-quarter inch diameter round leather belting long enough to hang loosely, but which may be drawn as tightly as desired by a strap and patent buckle at the centre.

The gasoline tank, which is under the front seat, is very large, holding 22 gallons. It is made of sheet steel and is galvanized after the riveting is completed. It is held in place by straps which clamp to the tank, but are not riveted to it, thus avoiding danger of leaks from rivets working loose.

The fenders, both front and rear, are fitted with metal aprons which completely separate the wheels from the body. They are held in place by brackets fitting into rectangular taper sockets and secured by set screws.

MODEL B.

The design of model B is interesting, because it shows that the demand for fast runabouts tends to create new ideas in bodies and that working parts will be made as few as possible, in order to obtain lightness and strength. The idea followed in this new model has been to reduce the wind resistance as much as possible and to deflect air and dust or mud so that the vehicle shall be comfortable and clean. These results are sought by means of an original shape of body that is hard to describe in words and of which no photographs are yet available. The lattice in front of the engine slopes slightly backward. The hood becomes higher and wider at the rear and merges into a pressed steel wind shield at the dash; this shield flares sufficiently to cover the front ends of two doors which are nearly twice the height ordinarily used for front doors. The divided seat is low and the steering column has much greater rake than in model A. The rear compartment somewhat resembles the hood in shape but is more tapering. The entire rear end forms a door which may be unlocked and lowered to a horizontal position, where it is held by chains.

The fenders are best described by the term used by the designer, Mr. Dietrich, who calls them "sail shape." They extend very far forward, to afford protection against mud blown back by the wind; curve inward in a long sweep to the frame and backward down to the single step, thence up over the rear wheel in the same shape as in front.

There is only one hand lever, which shifts the gears, and this is brought inside the frame and has its sector under the toe board. The slot in the toe board is fitted with a sliding plate so that no wind can enter at this point.

Pushing forward the left foot pedal throws out the clutch and retards the spark, and then applies the emergency brakes. The whole pad of this pedal is arranged to rock, and this movement is transmitted through rods to a ratchet which locks the pedal in any desired position.

The springs are light and flexible, 2 inches wide and are fitted with rebound plates; that is, the long leaf of the spring has several shorter ones on top which act to prevent the spring doubling up. Oiler and battery box are under the foot board and all tools, spare parts, etc., are carried in the rear compartment, every effort being made to leave the outside as smooth as possible. The axles, frame, motor, change gear and steering gears are the same as in model A. The retardation of the



AEROCAR MODEL A.

spark is found to give quicker starting than can be obtained by throttling, and thus is advantageous on this type of car. A Heinze coil is used and a timer of special design, in which contact is made by a blade revolving between pairs of copper springs, giving an action like that of a knife switch.

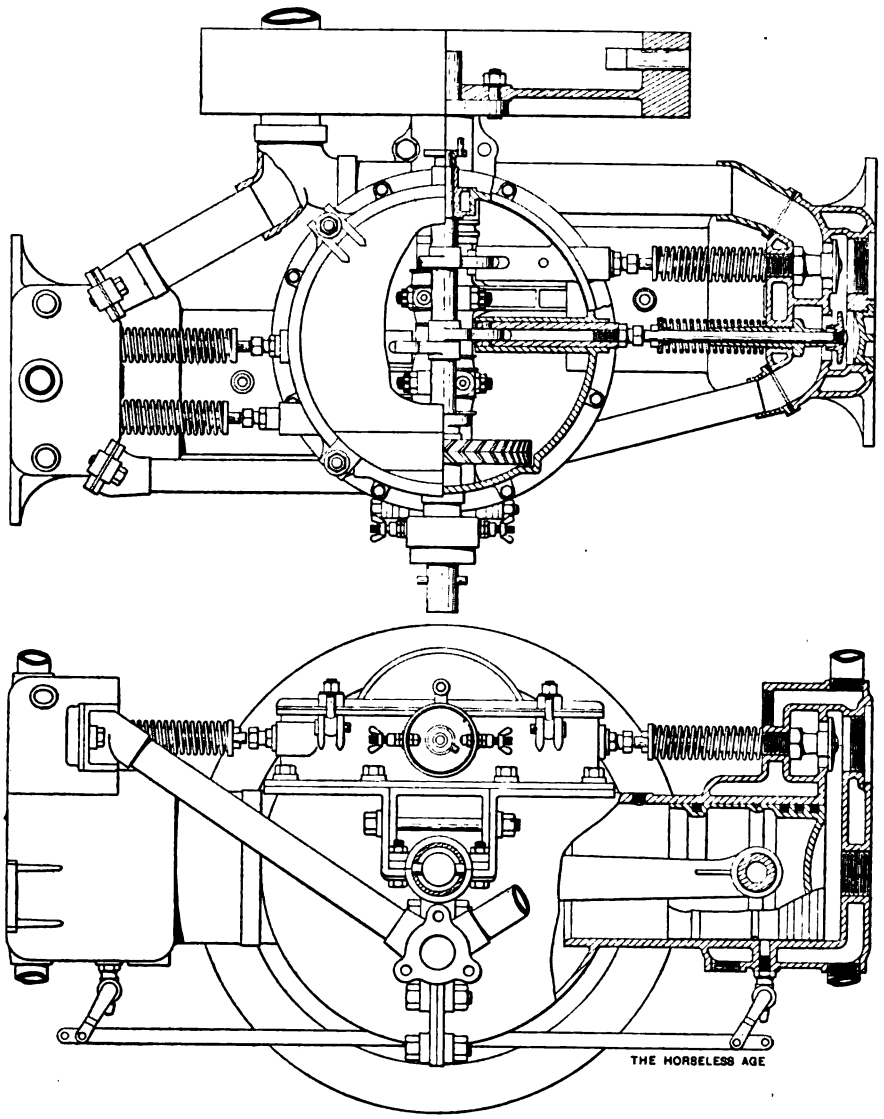
The New Westerfield 22-24 Horse Power Motor.

This motor is of the double opposed cylinder type, 5½ inch bore by 5 inch stroke, four cycle, water cooled. Each cylinder and one-half of the crank case and the valve chambers are cast integral. By this arrangement all packed joints are eliminated. The two halves are bolted together through the crank shaft centre from the centre of the crank shaft down. Above the centre of the shaft a portion is cut away in each case, and the opening so formed is filled by a piece cast integral with the top half of each bearing cap. By this arrangement the crank shaft can be removed from the engine by taking out six bolts, by removing the shaft caps and lifting the crank shaft up. Each piston and rod can also be removed without further tearing down.

In machining the cylinders each one is chucked crank shaft end down on a vertical boring mill table, and the outer end is machined perfectly true. They are then inverted and made fast in such a manner that there is no strain on the cylinder to spring it out of round while it is being bored. The flanges whereby the two cylinders are bolted together are faced off, and the cylinders are bored two cuts and taken off the machine to cool and season. They are afterward rechucked without springing, and ground to the exact size.

The crank shaft is of forged steel, subjected to a toughening process. It is turned and all wearing parts are polished. The crank pins are 2½ inches long by 1¾ inches diameter. The crank shaft is 1¾ inches diameter, and on one end is forged a 5 inch diameter collar to which the flywheel is secured by bolts. The main bearings of the shaft are 5 inches long on the flywheel side and 4¼ on the opposite side, and are of Parsons white brass.

The connecting rods are of steel, 10¾ inches long. The crank end of the rods are bushed with Parsons white brass. The bearings are cut at right angles to the rod line, and the caps are fastened on by two ⅝ inch steel stud bolts, one fastened into the cap and the other into the end of the rod. This arrangement allows the nuts to be more easily gotten at in making adjustments and prevents the cap from being replaced wrong end up should it become necessary to remove it. The stud bolts are provided with fine threads and slotted nuts, and the ends are drilled for cotter keys. The piston end of the rod is bushed with Parsons white brass, being 1¼ inches in diameter by 3 inches long. This piston is 1¼ inches in diameter, made of tool steel, hardened, ground, polished, pressed in position and fastened. The pistons are of refined gray iron, rough turned, heated and annealed, afterward returned and ground to size. The hole for the piston is bored and reamed, and the piston bosses are machined off, allowing a snug fit between for the end of the connecting rod bearing. Each piston is provided with four compression rings, three back of the pin and one near the forward end. They are roughly turned, inside and out, cut at 45 degrees and re-



PLAN AND ELEVATION OF WESTERFIELD MOTOR.

turned under pressure to size. Then they are ground on both sides, sprung in place on the piston, and pinned. The main shaft bearings are of Parsons white brass, turned inside and out, and are prevented from turning by a 3-16 inch square key their full length. Worn bushings can be replaced by new ones by removing the two outside caps and raising the crank shaft about one inch.

On top of the crank case proper is bolted a round box, in which is located the cam shaft, carrying the four tool steel cams which are keyed on. To the shaft is keyed a 1 inch face, ten pitch, bronze, double helical cam gear, which is driven by a 1 inch face, ten pitch, steel, double helical pinion on the main shaft. In this top case are located also the plunger rods that operate the valves. The plungers are tool steel, hardened, ground, polished and provided at one end with a hardened tool steel roller with integral pin. The other end of the plunger that comes in contact with the valve stem is provided with a hardened screw for adjustment. This top case is provided with a cover held down by four hinged bolts and can be quickly removed for inspection of the cams, rollers and connecting rod bearings. By turning the shaft so that each crank is at the top of the case, the bearings can be adjusted without disturbing the cams or time shaft.

The valves are of 25-16 inches outside diameter, horizontal, flat seated, and consist of gray iron heads and steel stems 7-16 inch in diameter. All four are alike. Each valve can be removed by taking out a screw plug. The flywheel is 20 inches in diameter, of gray iron, webbed, machined all over, balanced and bolted to the collar on the crank shaft by three ⅝ inch turned

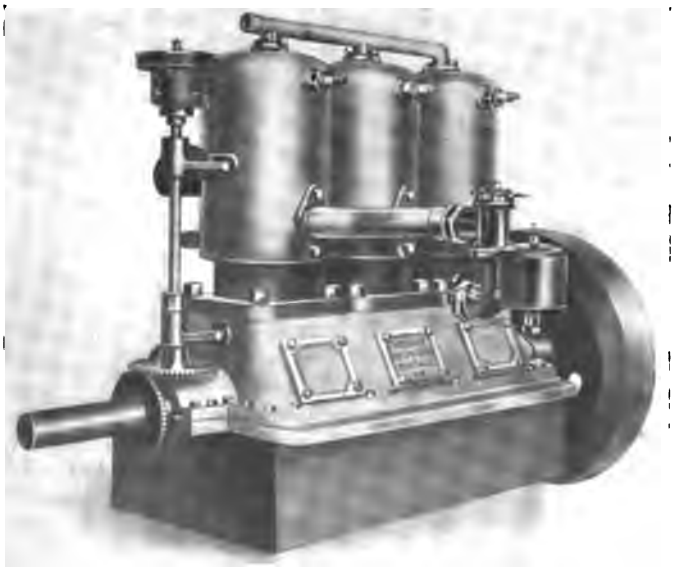
bolts and one 5/8 inch taper pin, all in reamed holes.

The exhaust pipes are of steel tubing 2 inches in diameter, fitted up and fastened in place on the engine and connected by a Y steel casting with 2 inch pipe thread for attaching the muffler. The inlet pipes are of brass tubing sweated in brass connections, to be attached to the engine and the carburetor. The carburetor is placed under the centre of the crank shaft bearing and attached by flange connections. Oiling is provided for by a force feed mechanical oiler driven from the time shaft. The water piping consists of 3/4 inch pipe for inlet and 1 inch for outlet.

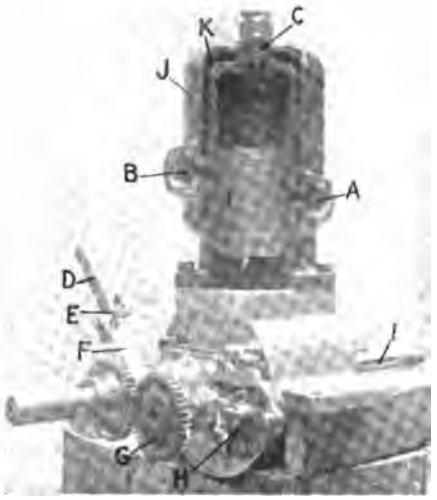
The Wright Two Cycle Motor.

The Wright Motor Works, of 48 South Division street, Buffalo, N. Y., who have been manufacturing marine motors exclusively so far, have recently brought out a two cycle automobile motor which is made in various sizes and with from one to six cylinders. One of the illustrations herewith shows their three cylinder 40 horse power motor, and the other a part sectional view of the single cylinder 3x3 inch motor.

The salient feature of this engine is a fourth port in the cylinder wall, controlled by the piston, which is claimed to make explosions in the crank chamber absolutely impossible. The cycle of operations of the engine may be described with reference to the part sectional view. The up stroke of the piston draws a fresh charge through the inlet port A into the crank chamber. The down stroke compresses the charge in the crank chamber, from which it escapes through a transfer passage into the compression chamber, above the piston just before the completion of the down stroke. When the piston has completed six-sevenths of its down stroke the exhaust port B begins to open; immediately afterward the third port (not shown) opening into the



WRIGHT THREE CYLINDER TWO CYCLE ENGINE.



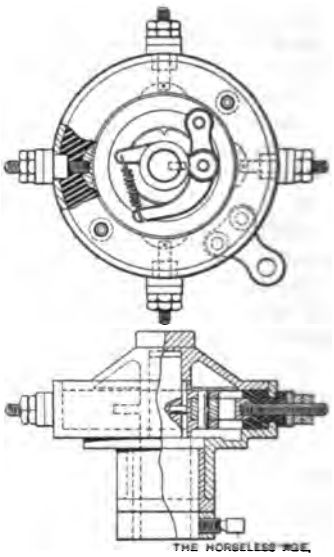
WRIGHT SINGLE CYLINDER MOTOR.

compression chamber begins to open and at the same time the fourth port (not shown) begins to close. During the interval that both the third and fourth ports are open the mixture from the crank chamber rushes into the compression chamber, where a deflector on the top of the piston directs the flow of the charge toward the head of the cylinder. At the beginning of the up stroke of the piston the third port and exhaust port are closed and the charge thus trapped in the upper chamber is compressed prior to the explosion at the end of the stroke. Meantime a fresh charge is being drawn into the crank chamber as already described.

The engine does not require a carburetor of the usual type, being fitted with what is referred to as the Wright generator, which consists of a needle point feeder or mixer. Jump spark ignition is used, the photo showing the various parts of the ignition outfit—the spark plug C, the spark lever D, the binding nut E for the battery wire and the contact spring F. Among the improvements in this engine are mentioned the extra long crank shaft bearings, the bushings of which can be renewed without dissembling the machine. A circulating pump H, of the gear type, is combined with the motor, being driven by the gear wheel G, and circulates the water through the jacket space K, to which connections are made at top and bottom in the back. The flywheel is keyed to a tapered portion I of the crank shaft. The single cylinder 3x3 engine is claimed to develop 2 to 3 h. p.

The Milwaukee Timer.

A new self adjustable timer, made by the Milwaukee Auto Engine and Supply Company, 706 Winnebago street, Milwaukee, is of the self adjustable roller type, is made dust proof and is lathe finished throughout. The case and cover are of cast aluminum. The waterproof fibre ring, smoothly finished, is pressed into the case and held in place by four screws; it has half round pockets milled in it for the pressed-in contact inlets, which are made of soft drill rod, tapped, pinned and adjusted with studs. The stud of each contact inlet is insulated from the case with a hard fibre ring, held in position by a round slotted lock nut and adjusted with two hexagon nuts for fastening the connections. The lower part of the case is bored to receive an oil ground bronze bearing. The hollow machined shaft running in this bearing is adjusted with a removable hinged finger, constructed with a roller and a self acting spring. The hardened tool steel roller running in oil on the inside of the fibre ring surface makes the contact when it touches the steel inlets. The end of the hollow shaft is mounted with roller, lock nut and set screw, and when the timer is adjusted



MILWAUKEE ROLLER TIMER.

to the motor the hollow shaft slips over the cam shaft and is held in position by set screw and lock nut.

Uncomfortable Familiarity.

A writer in an English paper thinks that four is the greatest number of persons that even a big car can carry comfortably on a tour, unless the three in the back seat do not mind (to use an Irish expression) "sitting familiar." But on several days of fast travel they would have to sit very familiar indeed, and it is just a question whether the familiarity might not become irksome and uncomfortable, especially when complicated by the presence of luggage and wraps.

COMMUNICATIONS.

Bases of Awards in Contests.

Editor HORSELESS AGE:

We have seen so much published in all the automobile papers since the Two Gallon Efficiency Contest, regarding the "points awarded," that there is danger of our losing sight of the fact that the average owner of an automobile, that is, of a pleasure vehicle, is not so much concerned with the number of points which he may be awarded in a contest of this kind as he is with the actual number of miles traveled by his car with the consumption of 1 gallon of gasoline; that is, he would much rather know that his car traveled 37 miles on the consumption of 1 gallon than that, although it traveled only 30 miles, by an arbitrary method of calculation he had been awarded a greater number of points than a competitor who had traveled 35 miles.

And we notice in your current issue, May 16, that the handicap weight has been determined to have been 1,370 pounds too great; that is, instead of adding 800 pounds to the dead weight of the car, 570 pounds should have been deducted, which renders the results as determined by the points awarded, that is, the distance traveled multiplied by the weight of the car plus a constant, very unsatisfactory.

While no doubt for commercial vehicles, where the cost of delivery per ton mile is an all important factor, some such basis in a competition would be necessary to determine to the user's satisfaction which vehicle was the one which he desired, for other purposes it does seem that the distance traveled by a car in regular touring condition, with its full quota of passengers, per gallon of fuel, would be for the owner the most satisfactory basis of comparison.

The same line of reasoning would seem to apply to the classification of cars entered in different contests, such as the recent Wilkes-Barre hill climb. We note in one of the trade papers this week that there is a good deal of discussion as to the advisability of classing the cars by prices. We find that of several cars entered in the same class, that is, between certain price ranges, "one car would be pitted against another of twice its horse power and even more."

Again, I believe the question of price is one which concerns the owner of the car, and if he has a car costing $2,500 of 30 horse power entered in the same class with another costing $2,500, developing only 18 horse power, it is quite reasonable to suppose that the first car would win in any such contest, and the owner should be correspondingly gratified.

To sum up the idea, the manufacturers, I am afraid, are for the time being losing sight of the facts concerning such contests, which are of prime importance and of great interest to the buying public, in an endeavor to establish certain points of mechanical efficiency which, if figured on any of the bases so far advanced in all these various contests, would seem to be of small value when correctly analyzed.

RUDOLPH RIEGE.

Jump Spark versus Make and Break.

Editor HORSELESS AGE:

I read H. C. Gibson's article on "Jump Spark versus Make and Break" in the current issue of THE HORSELESS AGE. It seems rather strange at this date that anyone should take the position that as long as a spark ignites the mixture the strength or size of the spark will have no appreciable effect on the performance of the motor.

Probably all motorists of any experience have noticed how much better their cars run with a freshly charged set of batteries than with a partially charged set. This difference is readily noticed even when the partially discharged set of batteries are not run down enough to give even a sign or suspicion of missed explosions. Another fact which goes to prove the effect of the spark on the rapidity of flame propagation through the mixture is the relatively small advance required with the make and break spark as compared with the jump.

As regards the influence of the position of the spark on the rate of flame propagation, the centre of gravity of the charge would doubtless be the best position if it were not for practical considerations. In the first place the charge in the explosion chamber is neither uniform nor pure. It is likely to be very nearly so, however, near the inlet valve, and therefore this portion of the mixture is, generally speaking, quicker burning than the rest. As a good start is everything, it is better, as a general thing, to have the spark occur in the inlet valve pocket. Besides this there are other practical considerations, such as protection of the spark points from lubricating oil and keeping the plug cool by the inrush of the fresh charge, which favor the location of the plug in this position.

It is rather hard to see how connecting the ground wire to the frame, either of the engine or even of the chassis itself, can lead to inefficiency. Presumably this inefficiency is thought to be due to the resistance of the joints between the engine casing and the cylinders, or, on the other hand, to the resistance through the bearing and gear teeth of the gear driving the circuit breaker or commutator. Some data on these resistances might doubtless prove interesting.

As regards the "capacity" of the wires affecting the action of the coil, in the case of the primary this may be dismissed by saying that the wiring simply acts as an extension of the condenser already fitted to the coil, and the additional condenser effect would probably be negligible, or, if noticeable, would probably be a benefit. As regards the secondary wires, it may be said that these are now generally as short as possible, but even here the condenser effect would probably be of benefit rather than otherwise.

With respect to reliability, there is very little choice between the two systems when they are properly installed. Undoubtedly, when efficiency from a thermodynamic standpoint is considered, the low tension magneto make and break is superior to the jump spark system. This may in certain cases be offset practically by the advantage of easy starting, adjustment and repair. It therefore becomes more or less a matter of personal opinion as to which system is best for each individual user.

While I am personally inclined to favor the jump spark, it does not seem that anything can be gained for either side of the controversy by allowing false arguments to go uncorrected. HAROLD H. BROWN.

Adjusting Magneto on Mercedes Car.

Editor HORSELESS AGE:

I have a Mercedes car with Simms-Bosch low tension magneto for ignition. I had the magneto off to have it remagnetized and don't seem to be able to get it timed right. Will you kindly tell me in which position the armature should be with the piston just at the top of the stroke or at the exploding point, with spark advance lever retarded? Also, about where engine is set to explode with the spark retarded?

W. W.

[We are not familiar with the details of adjustment of individual cars, and cannot, therefore, direct you how to get the adjustment exactly the same as before taking the device apart. Presumably, with the spark lever fully retarded the spark occurs very slightly after dead centre. Also, we believe that Mercedes cars all have rotary Simms-Bosch magnetos without means for changing the relative position of armature and field with change in the position of the spark lever. The Simms-Bosch rotating magneto will induce one complete impulse of current during a motion of its sectors of 45 degrees, or one-eighth turn. The current is zero when the sectors are directly opposite the pole pieces. The electromotive force induced increases and decreases gradually, and is strong enough to furnish an igniting spark for perhaps half the duration of the total impulse, or beginning at 11 degrees past the dead centre and ending at 34 degrees past the dead centre. When the spark is set late, say one-eighth inch past the dead centre, it should therefore occur when the sectors are 34 degrees past the position directly opposite the pole pieces.

These are the considerations which we would apply if we were confronted with the task of readjusting the magneto, but if you want to avoid experimentation you should apply for instructions to the builders of the car or the magneto.—ED.]

Editor HORSELESS AGE:

In your issue of May 2 I notice a communication from G. W. Ingham regarding back firing into the carburetor. There are a number of possible causes for this trouble, but at a distance it is hard to say positively which one it is. An engine will do this when the batteries are weak or the vibrator points fused, or when there is a dirty spark plug, or a broken porcelain; in fact, nearly anything will cause it that will cause the engine to miss. Too long a contact on the timer (or commutator) will sometimes cause back firing, if there is some other cause for missing, as a missed explosion will sometimes cause the inlet valve to open by suction, or a vacuum in the cylinder during what should be the explosion stroke, even with a mechanically operated inlet valve, especially if the throttle is partly closed or the mixture weak. I have cured this trouble in a number of cases by making the length of contact shorter. With the spark retarded an engine should throttle down so it will just turn over and keep running.

O. V. H.

Editor HORSELESS AGE:

In the May 2 number of THE HORSELESS AGE I note a letter from G. W. Ingham asking questions about the cause of back firing in an air cooled auto. From the description of the car I judge it is a certain make of which I have little knowledge, but I own a four cylinder air cooled car, and as I was troubled in much the same way for quite a time, and appear to have found the cause, my experiences may help him out; at any rate he might look the matter up.

For quite a while before the firing back hurt the running of the car I noticed when I was going down hill with my high speed clutch in, gasoline turned off, and spark retarded, that there was more or less back firing, but I paid no attention to the matter, taking it as part of an air cooled proposition. After running between four and five thousand miles this back firing became worse, especially at starting, and I began to hunt around for the trouble, going over the machine, but while at times it appeared to have lessened again it would bob up.

One day while looking over a new car of the same make as I am using, I happened to try to press down the springs on the exhaust valves and found it was pretty near all I could do to press them down. I then walked over to my machine and tried the same thing, and found they were very much weaker. Right then and there I had four new springs put on the exhaust valves, which took about an hour, and my trouble was at an end. Now there is not a sign of back firing, even in going down hill, and she runs like a bird. If your springs are not as stiff as on a new machine, put on new springs; the whole cost will not be over a couple of dollars. Air cooled engines will not do satisfactory work with weak springs on the exhaust valves.

have talked with others and they have had something like the same experiences. I know nothing about the auxiliary exhaust except that the cars having same appear to throw out smoke badly, but presume they have their advantages, and see no reason why the same cause that worked against good action on my car would not apply to that kind of an exhaust.

H. S. BUCKMAN.

Quality of Spark—Solid Tires.

Editor HORSELESS AGE:

In your issue of May 16 Mr. Gibson makes the claim that "quality of spark does not produce any great difference in the time taken to burn the fuel, provided the spark is capable of igniting the mixture at all, and that it occurs at the right time." It seems to me that this is contrary to common experience, for many a user has noticed the difference betwen a fresh set of batteries and a weak set, although with the weaker set his timer may have been properly advanced and his engine not missing an explosion. A large spark at the right time avoids negative work perhaps. There is some not fully understood difference between merely igniting an explosive and detonating it, and this difference seems to apply in a gas engine to a perceptible degree and cannot be denied, but must be taken into consideration. Mr. Gibson's remarks as to the undesirability of a multiplicity of small terminals is quite correct.

Permit me to reply to "Mechanical Engineer's" remarks re solid tires by saying that since the discussion mentioned we have tried out solid tires quite faithfully and abandoned them. The facts of the matter as I see it are, that on stony roads nothing can equal the pneumatic, and whether a road is rough or not depends largely on the speed, so if speed is wanted the pneumatic must be used, but if the roads are smooth and the speed is low the solid tire will serve. It would be of interest to know where "M. E.'s" roads are located.

CHARLES E. DURYEA.

["Mechanical Engineer" resides on Long Island.—ED.]

Valve Setting.

Editor HORSELESS AGE:

In looking over your column of "Communications" we saw a request by Mr. Dearden for an exhaustive article on "Valve Timing." Since material on this subject would also be applicable to our needs, we would be more than pleased to see such a discussion published by you.

We are designing a four cycle, stationary, vertical, water cooled, gasoline engine, of 3 inch bore by 4 inch stroke, to run 950 r. p. m. In consulting various authorities on gas engine design in regard to fixing the point at which the inlet valve should close, we find that designers differ very widely; one giving as low as 3 degrees and another as high as 42 degrees past the dead centre, would like to know if there is any reason for this difference and if so, what it is. There are no doubt others who are not certain about this question.

J. H. BIGELOW.
H. C. KRAUSE.

[This subject was covered in an article on "Cams," by Morris A. Hall, in the issue of March 21, 1906. We believe that the diagram Fig. 1 in that article represents good average practice, except possibly as to the inlet opening, which could be made earlier, occurring on the dead centre. The inlet should remain open until not slightly after dead centre, not more than 3 degrees. If it remained open for 20 degrees after dead centre a considerable portion of the charge drawn in would, at high engine speeds, be expelled again during the motion of the crank through this 20 degrees. For very high speed a somewhat later closing is permissible, as the cylinder does not fill to atmospheric pressure during the suction stroke, and the momentum of the inrushing column of gases causes the inflow to continue for a short period after the dead centre has been passed. But at low speeds the cylinder will be filled at dead centre, and if the valve remains open after that the charge will be forced out again. A compromise of a small lag in closing must therefore be adopted.—ED.]

Speed Mania and Other Nuisances.

Editor HORSELESS AGE:

Having carefully read the communication of "S." I fail to see that the broad assertion of the *Herald* under its caption, "To check the craze for speed," has been answered. Anyone with a sense of justice and knowledge of the facts regarding the criminally careless exceeding of the speed limit will agree that it is high time to check the speed mania.

It seems to me that the hysteria is developed by "S," and while a good deal of the letter is true, if the automobilists generally are execrated and the laws made necessarily severe, there is no one to blame but the "road hog" and "speed crank."

As matters stand at present it is absolutely unsafe for respectable automobilists to drive on some of our roads when the police are absent, and sometimes even when they are present. Being perfectly sane and having no desire to risk my own life or endanger the lives of others, I drive along the road in a car to enjoy the drive and always well within the speed limits. I am entitled to exactly the same consideration from others, not only morally but by law. One Saturday afternoon about two weeks ago, going from Long Island City to Jamaica on the Queens man boulevard we probably passed fifty machines going in the opposite direction. Before it was after 5 o'clock very few were coming the other way, and the mounted police were left. Very few were going under the

an hour, while some were going over 40 and 50, tearing along as if their lives depended on getting to town quickly. At one point two cars were approaching us and when about 200 feet distant the rearmost turned out to pass the other. Now, while they saw that they could not possibly pass the other car before reaching us, do you suppose they held back the few seconds necessary to pass us? Not a bit. They kept right on and forced us to turn out into the soft roadway to give them room and avoid an accident, although we were well to the right of the middle of the road. The slower of the two cars was going fully 40 miles per hour. The spirit shown is contemptible.

Coming back to town the following Sunday afternoon at about the same hour two large touring cars raced past us, the faster one at possibly 60 miles per hour and passing the other when about opposite us, the slower one not much slower either.

Knowing the facts I am not surprised at people building "thank-you-mams," which practice you justly condemn. But if we want fair treatment we must deserve it. We must put a penalty on reckless driving that will deter, and nothing short of imprisonment will. And why not imprisonment? Are these lunatics that entirely ignore the weekly, if not daily, record of accidents, some fatal, entirely due to excessive speed, to go free on payment of a mere money fine? Are they any less criminal than a thief that attacks you directly?

No matter where I go in my car or carriage I am entitled to safe passage, and not to have my life and limb put in jeopardy every time one of these road hogs passes. If they would only endanger their own lives I would say "God speed," and the sooner the inevitable happens the better. But, of course, it is the innocent one that suffers usually.

Compared with the speed craze, other nuisances are hardly worth mentioning. Nevertheless people using headlights should be told to use them properly, and not in such a manner as to disconcert others approaching them. Quite a number of headlights are now properly directed downward, but there is much room for improvement. The pivoted searchlight is an abomination, and the user should be punished as a public nuisance.

Regarding the smoke and smell nuisance mentioned in one of your last issues, I think the chief fault lies in careless adjustment, or none, of the lubrication. There is no excuse for either smoke or smell. It is really surprising though what a number of cars will smoke disagreeably. One would think the owner, if not the driver, would have more pride in his car than to allow it. Probably he is ignorant on the subject and thinks it is unavoidable, especially as the other expensive cars are smoking the same way or worse. My own observation indicates that it is only the large and expensive cars that smoke so badly, the smaller cars and ruabouts being practically free from both smoke and smell. It seems to be a rule, the bigger and more expensive the car the bigger the smoke and odor. Going into a garage nowadays, when one or more of the big cars have the motor running, the atmosphere is stifling and the odor indescribable.

HENRY W. STRUSS.

Horse Power of Gasoline Motors.

Editor HORSELESS AGE:

Some months ago there appeared in your paper a formula for determining the horse power of a gasoline engine. The formula read:

$$\frac{d^2 \times \text{Stroke} \times \text{R. P. M.}}{15{,}250} = \text{H. P.}$$

Will you kindly explain the significance of the "15,250," and tell me if you have another formula which will bring a closer determination of the horse power?

W. OSWALD BATES.

[The brake horse power of a single cylinder gasoline motor is equal to

$$\frac{d^2 \times s \times \text{M. E. P.} \times \text{R. P. M.} \times e}{4 \times 12 \times 33000},$$

where d is the cylinder bore; s the piston stroke; M. E. P., the mean effective pressure during the power stroke; R. P. M. the revolutions per minute, and e the mechanical efficiency. The M. E. P. will be about 85 pounds per square inch. The factor 15,250 in the equation you quote is therefore evidently equal to

$$\frac{\text{M. E. P.} \times e}{4 \times 12 \times 33000}.$$

We would advise you to read an article on "Rating Motors by Cylinder Dimensions" in our issue of May 2.—ED.]

Feats of a Delivery Wagon.

Editor HORSELESS AGE:

Two interesting feats performed recently by a gasoline motor delivery wagon at Buffalo, N. Y., attracted considerable attention and served to open the eyes of prospective purchasers of commercial vehicles to the possibilities of business motor trucks when properly handled. During the rush of May moving, when there was a scarcity of horse vans for moving household goods, a light delivery motor wagon, which is used here for demonstrating purposes, was secured in an emergency to move a carload of household goods from a freight car on the tracks at the Miama street freight depot to a residence in Irving place, about 4 miles distant.

The car was in charge of a competent driver, who was keenly alive to the importance of making a good record. He pulled up before the door of the freight car about 8:30 in the morning and began to load, with the assistance of a helper. With goods taken from the centre of the car, the loading proceeded rapidly, and within twenty minutes the automobile was heaped 4 or 5 feet high with a miscellaneous assortment of furniture that looked a good deal heavier than it actually was. Although the weight may not have been excessive, it was conceded that the wagon had a good load on, and it certainly looked topheavy. When the engine was started the car responded nicely to the lever, started smoothly on its way, and, gathering speed as it rolled on to the asphalt street, disappeared around a corner.

A group of men, who had been watching the procedure with much interest, became so absorbed discussing motor power versus horse power that the flight of time was not noticed. Their discussion was interrupted by the surprised remark from one of the group: "There she is back again." There was the automobile, empty, running into the freight yards, ready for another load. Watches were pulled out. The wagon had been gone a little less than an hour.

"Where did you leave the load," "How far did it go," "What happened," were some of the questions shouted at the driver.

"Hauled it about 5 miles, unloaded and came back," was the answer.

It was hard to believe, but the driver was working against time and could not stop to make lengthy explanations. A piano was rolled out of the freight car, and it was decided to make a special trip with this for a load. Away went the wagon again, and in fifty minutes it was back loading for a third trip before dinner time. In the afternoon two more trips were made, and a little before 4 o'clock p. m. the driver reported at the garage with his work finished. It was the consensus of opinion that a team of horses, with double the force of helpers, could not have done the work in the same time.

This was the same truck which recently demonstrated its ability to accomplish a task that two heavy dray horses had attempted unsuccessfully. The team had got stalled in the effort to drag the stump of a tree from in front of the property now occupied by the Fisk Tire Company on Main street. The upper branches of the tree had been sawed off, and after loosening the earth around the roots the stump, about 5 feet long and maybe 2 feet in diameter at the base, had been pulled over by the workmen and lay on the ground, with the roots still sticking into the ground. The big team had struggled hard to drag the stump into the middle of the street, and the workmen were about to begin cutting at the roots again when the little automobile came along and the driver asked permission to show what he could do.

He was laughed at, but the novelty of the idea won him consideration, and he was told to hitch up while the horses were given a chance to take a needed rest. The chain from the tree stump was fastened to the rear axle of the motor car and the engine started. The hind wheels of the wagon went spinning around in the mud and slush, without budging the tree. The driver was not easily discouraged, however. "I've got plenty of power," he said, "but not traction enough. I need more load over the hind wheels."

Five of the biggest fellows in the gang of

workmen were ordered into the car. Under their combined weight the springs looked as if they might be ready to collapse. The engine was started again and the clutch let in slowly. There was a sound of straining and snapping among the roots of the tree trunk; the trunk itself changed its position uneasily and seemed to straighten itself out. Then the little car appeared to pull itself together for a final tug; there was a sudden snap, with a splutter of dirt at the root of the tree, and the car moved forward a few inches with a jerk. It then settled down to a steady pull, and the stump rolled over on its side as it was towed slowly into the middle of the road from where it was later carted away. The driver said: "I knew I could do it. The public has a lot to learn yet about the working capacity of a motor car."

The car apparently suffered no injury from the unusual strain. S. E.

Cause of After Explosion.

Editor HORSELESS AGE:

Will you or one of your readers tell me what is wrong with and suggest a remedy for a motor that explodes two or three times (occasionally only once) after turning off the switch? After turning off the switch the engine will make four to eight revolutions in stopping, and during the last turn or so there will be an explosion in the cylinder. I have been using kerosene oil once daily, believing the trouble to be caused by burnt oil igniting the charge, but it still continued. What can I do to prevent it? J. U. B.

[The trouble is undoubtedly due to carbon soot on the walls of the cylinder and head, and you should take the cylinders off and carefully scrape them clean.—ED.]

Solid Tires.

Editor HORSELESS AGE:

In reply to "Investigator," whose query in regard to "solid tires" appeared in the May 9 issue of your esteemed journal, I wish to say to him and to the large number of others who have had their "stomachs full" of punctures, explosions, chafed inner tubes and expensive, soul destroying delays, that I have for over two years driven a single cylinder runabout on solid tires, that they have covered nearly 25,000 miles and look perfectly good for thousands of miles more, without requiring one moment's attention or one cent's expense in all this time; that they have not injured my machine, which is in perfect order today and always ready to go; that I have demonstrated beyond any question—no matter what any machine man or tire man may say to the contrary—that they are comfortable, economical and very satisfactory. I have had no breaks not common to the same machine on pneumatics; had no more trouble with the engine, nuts, etc., than with pneumatics. That they will ruin a machine is all pure theory which two years' experience has demonstrated is wrong.

Before putting on solid tires two years ago I was obliged to keep two machines, and my facts proven by two years of constant use warrant me in declaring that one machine equipped with solid tires is far more reliable than two equipped with pneumatics. Solids eliminate the tire question from your mind, with all that such elimination implies.

All the horrible things predicted to happen to me and my machine are proven to be imaginary. My machine has not suffered, my spine is A 1, and my temper is improved many per cent. They undoubtedly are the most Christianizing influence of the twentieth century, and their use will greatly purge the language of the autoist, whose vocabulary is becoming "unfit for publication" through the exasperation of "flat tires." I am having a new Chambers machine equipped with them, and know I shall have peace and economy with my auto.

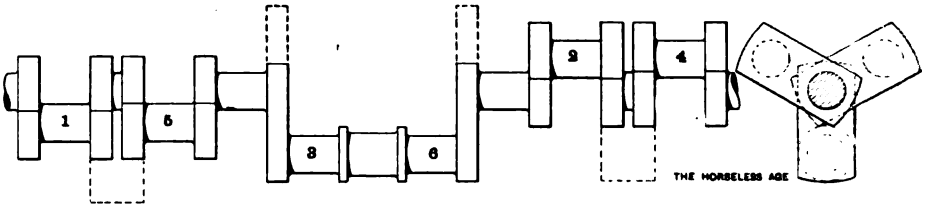
A. N. COLLINS, M. D.

Six Cylinder Crank Shafts.

Editor HORSELESS AGE:

Having been helped several times by your valuable answers to some of my questions in the query column of your paper, would like to ask a few more in regard to a six cylinder, four cycle automobile motor. What is considered the best practice in the placing of the throws on the crank shaft? That is, which pistons travel together and how many degrees are they set apart? Also what is the accepted rotation of firing?

GEO. E. STODDARD.



[The construction of six cylinder engines has only recently been taken up, and we do not believe that there can as yet be said to be anything like recognized best practice in six cylinder crank shaft design. In the Mercedes six cylinder marine engine, which has individual cylinders, the crank has seven bearings and consists essentially of three double throw cranks set at angles of 120 degrees with each other. In the Napier, Stevens-Duryea and other six cylinder motors, only four bearings are employed on the crank shaft. The crank shaft may be considered as made up of two three-cylinder crank shafts, with throws at 120 degrees, and one end crank pin of one shaft being joined directly to one end pin of the other shaft, as shown in the sketch. While the crank is balanced as a whole, the individual balancing parts are rather far removed from each other laterally, and to secure absolutely smooth running it is advisable to fit balance weights to the crank arms, as indicated in dotted lines.

There are evidently six explosions in two revolutions, or three per revolution, so that explosions come at equal intervals of 120 degrees crank motion. As regards the order of firing the cylinders, we consider it best to have succeeding cylinders fairly well apart, so that the stresses on the crank shaft are distributed as well as possible. The order of firing might be as indicated in the sketch.—ED.]

A Correction.

Editor HORSELESS AGE:

In the report of the Two Gallon Efficiency Contest in your issue of May 9, 1906, on page 670, you state that I had a special arrangement on my 24 horse power Berliet for forcing every drop of gasoline down to the carburetor. I wish to state that there was no special arrangement of any kind on this car, and it was put in the run exactly as it was delivered to me by the American Locomotive Automobile Company, and in the same condition as it is being run today. There was no cork or rubber tube or anything else used, and the ordinary pressure system from the exhaust was the only means used for forcing gasoline from the pressure tank up to the carburetor.

Will you kindly correct in your next issue your statement to this effect and oblige. H. K. BURRAS.

Reckless Driving in Paris.

The renowned French scientist, Curie, the discoverer of the element radium, recently met his death on the streets of Paris through being upset by a cab horse and run over by a truck. We learn from our French contemporaries that there has been absolutely no indignation in the daily press on this occasion at the reckless manner in which cabs and other horse vehicles are being driven on the boulevards and public places of the French capital, as there was when a prominent Government official was killed by an automobile. The fact is that all sorts of vehicles are driven in Paris at a pace that makes the streets rather unsafe for aged persons and others of less than ordinary agility.

Automobiles are to be used for police purposes in Prague, Bohemia. The Chief of Police has arranged for the purchase of a powerful motor capable of carrying twelve or fifteen men, which it is expected will prove extremely useful in transporting officers in the speediest manner to points where they may be required. If the plan proves as successful as is anticipated, more automobiles will be added. The cars will be an interesting feature in the frequent and exciting Czech-German disturbances.

OUR FOREIGN EXCHANGES

Manufacture of Lubricants.—Adulterants.

(From a paper, by J. W. G. Brooker, read before the Auto-Cycle Club of Great Britain and Ireland).

By far the most important automobile lubricant is mineral oil obtained from petroleum. At the present day the bulk of the best lubricating oils are manufactured from American petroleum. There are several methods in use. In the first place we have ordinary distillation. The petroleum is run into a still and heated, water and low boiling point liquids are driven off, the heat is increased and the heavier fractions obtained, till finally, after considerable and prolonged heating the still contains only a semi-solid pitch or coke-like mass. The heavier distillates are purified in the usual manner with acid and alkali, and a pale yellow or amber yellow oil results, which is useless for cylinder lubrication except in well cooled stationary gas engines. The defects of this process, which has been almost entirely discarded, are the great heat of the still, causing partial decomposition or "cracking" of the heavier distillates, and the aid of chemicals, which, even by the use of large quantities of water, it is extremely difficult completely to remove from a heavy oil.

The second and more generally followed method is as follows: After the first fraction of water and light oil has been driven off small quantities of superheated steam are blown through, and at the same time a partial vacuum is produced in the still, both of which assist the vapors to distill off with the minimum of decomposition; the effect is such that an oil boiling at, say, 250 degrees centigrade, in the ordinary still comes over at less than 200 degrees centigrade in the vacuum still, and at a greater speed. During the course of the vacuum distillation several fractions are collected. The first are comparatively light bodied and have medium boiling points; the last are very viscous and distill over with some difficulty. The residue in the still when a good petroleum stock is used is of a vaseline consistency, and is filtered warm through animal charcoal or bone black, whereby the finest and most expensive cylinder lubricant is produced.

By the above process the bulk of the yield is what is called "distilled oil." A third process to produce a maximum yield of "natural" or "reduced oil" is very much on similar lines, except that the distillation is not carried very far, so that the residue in the still is much larger. This is filtered warm through animal charcoal, and a "charcoal filtered, reduced" oil results.

Russian petroleums are less suitable for the manufacture of a viscous lubricant. They are less pure, and after distillation leave a greater proportion of residue in the still, which cannot be worked up into lubricant like the American residues. On heating, a lubricant from Russian sources thins much more rapidly than a similar bodied oil from American; but it will stand a much lower temperature before solidifying. For their purification the chemical treatment with sulphuric acid and alkali is relied upon. In refractory cases the residue is dissolved in naphtha or light petroleum, filtered and treated with sulphuric acid and potassium bichromate, and subsequently with the usual alkali and water. The product is then reheated till the last traces of water and the lighter portions of the oil have been driven off, when it is filtered through charcoal.

ADULTERANTS OF LUBRICANTS.

The variety of substances added to a lubricant for one purpose or another is very great. Each has its use—some improve, others do the reverse. There is a material variously known as "thickener," "viscom," etc., intended to be added to a thin oil to increase its viscosity. It consists of cottonseed or other vegetable table oil saponified with alkali and the resulting soap precipitated by alum; the aluminum oleate and stearate is washed with water, dried and thoroughly incorporated with three or four times its weight of mineral oil. Ordinary soap is also sometimes added to a lubricant; it imparts body and gives a fine sparkling appearance, but it is quite unfit—indeed harmful—for cylinder lubrication. Water, although not exactly an adulterant, is often found in a badly prepared lubricant; it causes great trouble, especially in cylinders, and particularly if vegetable oils are also present.

Another adulterant added to improve the viscosity of a poor oil is india-rubber; it is said to prevent the tendency of an oil to gum on the bearings. Imagine its effect if it gets into the combustion chamber by mistake!

The point, however, of greatest interest is whether to countenance the addition to the mineral oil of vegetable oils, such as cottonseed, rapeseed or olive oil; or of animal fats, such as lard, tallow, neatsfoot oil or sperm oil. In their favor it may be said that they have a very low setting or solidifying point, and when heated thin much less rapidly than do mineral oils of a similar viscosity. Further, they are more resistant to high pressure, hence their use under certain conditions for heavy steam and gas engines. In fact, for gas engine purposes the admixture of 5 to 10 per cent. of vegetable oil with the mineral oil is distinctly beneficial. Again, it has been conclusively proved that the tendency of a vegetable oil to develop acidity and to absorb oxygen is very greatly checked by the presence of mineral oil. So that Messrs. Price & Co., who pin their faith to a compound oil—that is to say, a pure hydro-carbon or mineral oil admixed with a little neutral fatty matter—have a strong case in their favor. Gas engines have been run more successfully with a compound than with a pure mineral lubricant, and they claim that with suitable modifications the same will hold good in gasoline engines. The following are a few arguments against the use of vegetable oils, even in small quantities. They all develop acidity, particularly at high temperatures, which has a corrosive action on metals. They nearly all absorb oxygen from the atmosphere, and thicken or gum on the bearings. At a high temperature, such as might be met with in an air cooled cylinder, the fatty matter would be burnt into a tarry deposit, while a mineral oil at the same temperature would be merely volatilized and swept out of the cylinder with the exhaust gases. It is, of course, possible that with the cylinder running cool, the temperature at which the vegetable portion will be decomposed is not reached; but then, who can be certain, with an air cooled cylinder, that it will always run cool?

The Dust Problem.

An interesting communication on the dust problem, by Mervyn O'Gorman, appeared in a recent issue of the *Automobile Club Journal*, of London. At the time of the Easter holidays, when large numbers of car owners venture out into the country in England, much annoyance to pedestrians and frequently accidents result from the dust thrown up by cars.

Observation is of two kinds—the lazy kind, whose useful result can only be an increase in the vocabulary of execration; and the intelligent form, which, by noting minute differences and by suggesting intelligent hypotheses to explain them, can eventually guide us to reproduce on all cars the minimum dust-raising qualifications which may be noted on any one. The publication and record of such observations from the largest possible number of points of view is invaluable. The motorist may observe why one road surface is less dusty than another; the pedestrian why one car is less dusty; the manufacturer may report that with the same car one type of tire is less dusty. If only the cause of the dust be forthcoming, all cars can within a reasonable time be brought up to the better standard. So far only generalities have been reached. We find that:

(1) Sharp corners and excessive road cambers lead to slip, and, therefore, to dust.

(2) More dust is raised by cars from a rough road than from an equally dusty road if it be smooth for an equal speed of traveling.

(3) Watering the road moderately diminishes the dust.

(4) Tarmac is one of the best anti-dust road surfaces. Tar-macadam, the spreading of crude oil on roads, the spreading of oil emulsions in water on the road, are important palliatives.

(5) Wood, asphalt, cobbles and setts are not dusty save after use by horse traffic.

(6) Cars with smooth, boat-shaped under surfaces are less dusty than others.

(7) Cars with flaring mudguards fitted

with leather flaps near the road level are more dusty.

(8) Cars on high wheels well clear of the ground are less dusty.

(9) Cars with large tool boxes at the back reaching low down between the back wheels are dusty.

(10) Large car bodies are in some cases dustier than small ones.

(11) Blowing off the exhaust near the ground is dusty.

(12) Cars fitted with engines having an insufficient flywheel or an ununiform turning effort from any cause are more dusty.

(13) Cars whose chassis are mounted on very easy springs having a large up-and-down travel will suck up the dust with each rise and fall of the body on rough roads.

(14) Front wheels—or rolling wheels—raise less dust than back wheels or driven wheels.

(15) Smooth pneumatic tires are dusty.

(16) Solid or pneumatic rubber tires are more dusty at higher speeds, and with high-powered engines.

(17) Non-skid devices, such as small steel studs, etc., not only do not increase the dust, but actually diminish it.

Among the instructive negative conclusions from experiments made by the Automobile Club we find:

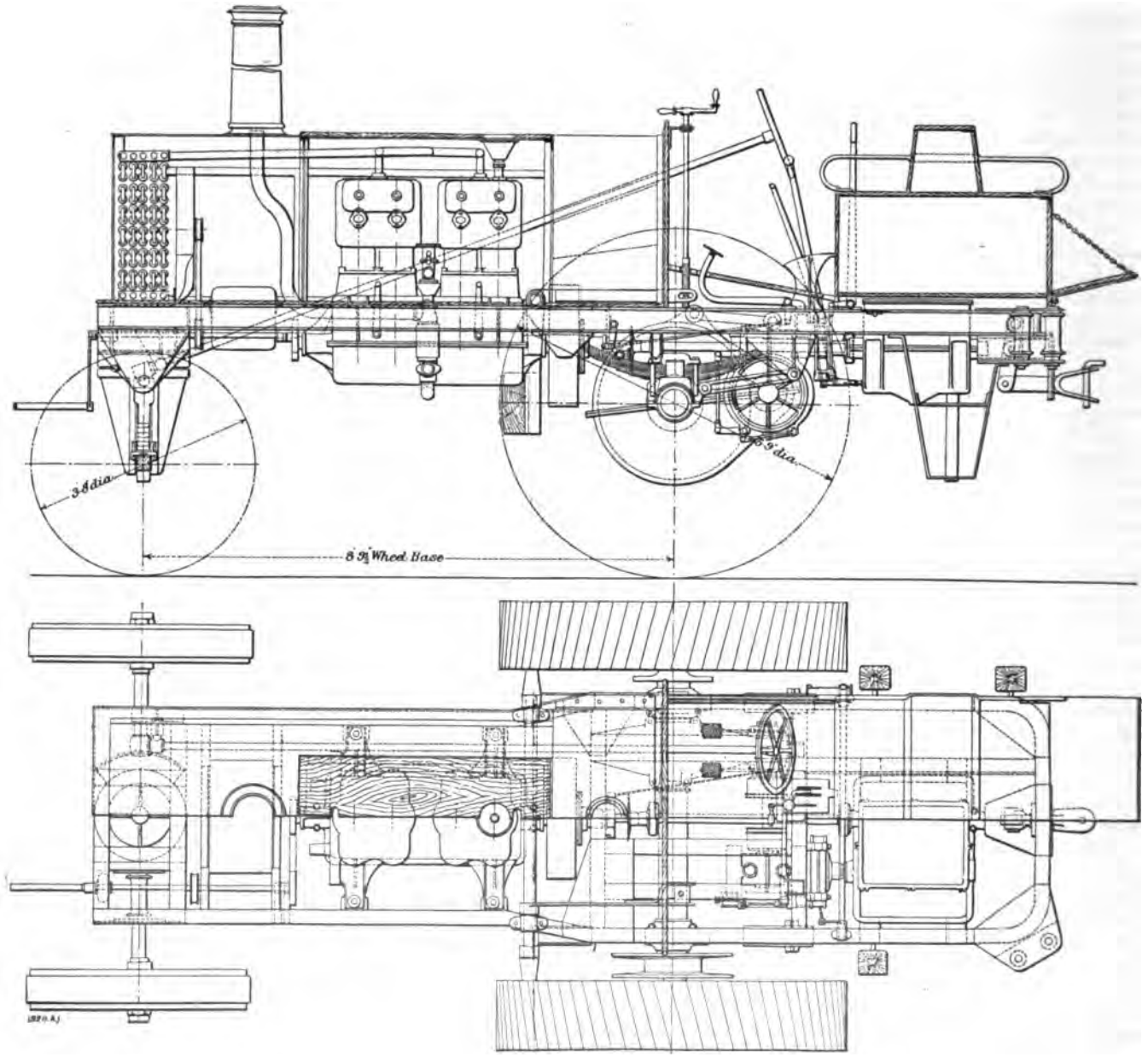
(18) That a car fitted with two long vertical dust screens placed near the ground between the road wheels and the chassis, and extending the full length of the car edgewise to the direction of traveling (i. e., arranged to prevent the dust-laden air thrown up by the road wheels from mixing with the air draught which passes underneath the car), showed no improvement from these attachments.

(19) Horizontal screens fixed so as to closely embrace the driving wheel tires, and adjustable to various heights from the ground, were tried, in the hope that they might throw back on to the road the dust-laden air raised by the wheels, and so prevent it from becoming entangled in the air eddies at the back of the car. No good result was obtained.

British Military Gasoline Motor Tractors.

Two gasoline motor propelled tractors have recently been supplied by the firm of J. I. Thornycroft & Co., Ltd., Basingstoke, England, to the British War Office, one a two cylinder, 25 horse power, and the other a four cylinder, 40 horse power machine. A plan and an elevation of the last mentioned are shown herewith, reproduced from *Engineering*.

The cylinders of the larger motor are each 6 inches in diameter, and the stroke is 8 inches, the 40 horse power being developed at 600 revolutions. The guaranteed performance was to pull a load of 5 tons



Military Tractor.

under what was described as "any practical conditions;" a term which included such a surface as that of a ploughed field. The average speed was to be 8 miles per hour. The fuel used is paraffin, the contract being that the engine should be started with paraffin, a Vesuvius lamp being used. All valves are mechanically operated. Electric ignition is applied, both low tension and high tension systems being fitted, so as to afford an alternate means for securing explosion. The standard make and break type is used for the low tension current, and the Eismann system for high tension ignition.

The engine is encased in the usual manner, there being splash lubrication. Half compression cams are fitted to facilitate starting. There is a chimney to take the exhaust, the escaping gases being much diluted by the induced current of air caused by the exhaust, an arrangement which is said to render them quite inoffensive. The cylinder jackets are provided with cooling water by means of a rotary pump. The water is cooled by a system of partial evaporation.

Power is transmitted from the engine through a disc clutch, and then by a central shaft and toothed gearing of the ordinary type. The change speed gear is of the sliding spur wheel type, and gives three speeds and a reverse. The leading wheels are 3 feet 8 inches in diameter by 8 inches wide, and the driving wheels are 5 feet 9 inches in diameter by 14 inches wide. Both driving wheels can be locked by a pin. The brakes are of the drum type, one being operated by a pedal on the foot plate; the other, which is an emergency brake, is of the usual traction engine screw down type. There is accommodation on this larger tractor for carrying water, lubricating oil, and fuel for a run of 100 miles.

The smaller tractor has a two cylinder engine of the same type, the cylinders being 6 inches in diameter, with an 8 inch stroke. The vehicle is designed to operate a field searchlight. The dynamo is placed on the tractor, and will generate a current of 152 amperes at 75 volts. The dynamo is driven from the engine by a belt. Current is taken from the generator to the searchlight on the trailer by means of a flexible cable wound on a drum. The drum can also be used for hauling the trailer or for pulling the tractor itself out of a bad place.

Transmission in the case of the 25 horse power vehicle is through a friction disc clutch, and by means of bevel and spur gearing to a second countershaft, and thence to the differential on the back axle by means of a Renold roller chain. There are three speeds and a reverse. The driving wheels, which are of special crucible cast steel, are 4 feet 3 inches in diameter, and 12 inches wide. The steering gear is of the central pivot type, with worm and quadrants. Two drum brakes are fitted, one working on the countershaft and operated by a pedal; the other, which is operated by a worm and hand wheel, engages on the back axle. The three changes of speed give 1½ miles, 4 miles and 8 miles per hour.

The official tests for the 40 horse power tractor, which have been satisfactorily carried out, included a trial on the road when pulling a gross load of 14 tons on an incline of 1 in 12, and a trial on soft ground, the gross load hauled being 7 tons; and a brake test of the engine when in position on the vehicle; the radiator, fuel tanks and other fittings, as supplied, being used. The tractor was also made to haul its load while running forward and backward, and, finally, to pull its load out of soft ground with the winding gear.

The smaller tractor was made to drive its dynamo at full load, and also to make a road trial of 200 miles at full speed.

Gas Engine Experiments.

At a recent meeting of the Royal Society a paper by the Hon. Charles A. Parsons was read on "The Specific Heat of, Heat Flow from, and other Phenomena of the Working Fluid in the Cylinder of the Internal-combustion Engine." The author said that he proposed to describe experiments made with a gas engine of 60 b. h. p. devised to obtain data necessary for a more complete theory of the internal-combustion motor, and also to discriminate between the effects of continued combustion in a gaseous explosion and specific heat change at temperatures between 200° and 1,500° C. The new method of experiment consisted in alternately compressing and expanding the highly heated gases within the engine cylinder while cooling proceeded, and observing by the indicator the successive pressure falls and compression and expansion curves from revolution to revolution. From some 200 indicator cards, taken under varying conditions, had been calculated: (1) A curve of apparent specific heat of the gaseous contents at constant volume between 200° and 1,500° C.; (2) curves of heat loss to the enclosing walls; and (3) distribution of heat in the working cycle calculated from diagrams only.

The apparent specific heat at constant volume was proved to increase from 22 foot-pounds per cubic foot at 200° C. to 27.4 foot-pounds at 1,500° C., and an examination of expansion curves and specific heat determinations made at different engine speeds and jacket temperatures showed that combustion was proceeding and accounted for a part of the apparent increase of specific heat.

The curves of heat loss showed that for equal temperature differences, heat loss per unit surface exposed increased with density. From these curves mean temperature of the cylinder walls had been calculated and shown to vary at full load from 190° C. for the whole stroke to 400° C. for the three-tenths stroke.

Calculations had been made of heat distribution in the working cycle of the fluid which showed that the total heat present in the form of combustible gas could be accurately calculated from the indicator diagram alone by means of the new data obtained in the investigation. He would point out that with a sufficiently sensitive indicating instrument the rate of continued combusion could be determined, and the true change of specific heat obtained from experiments made by the new method. The determination of the specific heat of gases heated by high compressions, such as 1½ tons to the square inch, was suggested to avoid the complications introduced by combustion. The experiments showed that the rate of loss of a mass of flame at 1,000° C. to the comparatively cold walls of the cylinder was less than the rate of addition of heat by work performed by the piston, so that the flame temperature in the first compression rose from 1,000° C. to about 1,300° C. In other words, compression in 0.25 sec. enabled a mass of flame to be handled in such a manner as to obtain accurate results. In his experiments with maximum pressures of 400 pounds per square inch, nearly 28 tons total pressure was applied from 120 to 160 times per minute. With reference to Mallard and Le Chatelier's experiments, no curve of specific heat could be deduced from their observations, and he would point out that the curve of apparent change of specific heat of certain gases from 0° to 1,500° C. had been here determined experimentally for the first time. The gases forming the working fluid consisted mainly of carbonic acid, steam, nitrogen and oxygen.

The British Motor Union will prepare for the benefit of purchasers of cars a model form of agreement between the buyer and manufacturer which would be satisfactory to both parties, and a sub-committee has been appointed to consider and draft the agreement. It is pointed out how important it is for the purchaser of a car to have a satisfactory contract, in which provision is made for all points on which a dispute or misunderstanding might arise.

According to a report of the Belgian consul, the roads in the Philippines are very poor, and the opportunities for trade in automobiles with the islands are small. Carriage building is said to be highly developed in Manila. Some automobiles have been imported from the United States, France, England and Germany, the importance of the imports from these countries being in the order named.

It is arranged that the International Association for Testing Materials, which holds its congresses about every three years in industrial centres in various countries, shall this year meet in the Academy of Science at Brussels, from September 3 to 8.

It must be admitted that Europe is still ahead of us in automobile matters. According to the latest mail, a certain small manufacturer in England has just brought out a thirteen cylinder car.

LEGISLATIVE and LEGAL

Hiring Automobiles.

By Xenophon P. Huddy, LL.B.

The business of letting automobiles for hire is being taken up by many for the coming season. Not only in the cities, but also in the country and various shore resorts, automobiles will soon be available for renting purposes. The substitution of mechanical power for pleasure driving on the highways has, naturally, greatly reduced the demand for horses, and the livery stable business has in consequence depreciated, and some of those who were heretofore occupied in that business have either quit altogether or have taken up the automobile. It is a recognized fact throughout the country districts that the motor vehicle has superseded the horse, not only as a means of pleasure driving, but as a means of gaining a livelihood in providing pleasure driving outfits, the latter being necessarily a result of the former.

The changed conditions in reference to the livery stable business bring up for consideration the rights and liabilities of those who are engaged in letting automobiles and those who hire them. The rights and liabilities of these parties are substantially the same as the rights and liabilities of a livery stable keeper and a party who hires a horse, but in so far as the automobile is a new kind of vehicle, possessing unique characteristics, and since it is in many respects a machine of more or less complicated parts, necessarily the legal responsibility of the lettor and renter are to some extent different, in the application of the rules of law at least, from the responsibilities existing in cases of hiring a horse.

When the automobile is hired there is created in law a bailment. The party letting the automobile is termed the bailor, and the party hiring the vehicle is called the bailee. The relation created between the parties is called a bailment. It constitutes a contract. The owner agrees to let the machine, and the hirer agrees to pay for it. From this relation created between the parties many important responsibilities arise. The law of bailment is probably as old as any other branch of the law known to the legal profession and is equally important.

We will first consider the responsibilities of the automobile owner, the party letting the automobile. He is under obligation not to allow an automobile to be hired which is not in a safe condition for the purpose for which it is let. He is responsible if a defective and unsafe vehicle is allowed to go out of his garage, and this obligation necessarily requires an inspection of the machines that are available for the purpose of renting. He should give a thorough examination of those parts of the machine which are likely to get out of order from continued use.

Turning to the obligations of the party who hires an automobile, and comparing him with one who hires a horse, it is found that he is obliged to use the machine with reasonable care, and must not abuse it. Any injury which the machine may suffer while it is used in a manner detrimental to an automobile will render the hirer liable to the owner. Of course, ordinary wear and tear is to be expected, and any breakdown which is due to a defective condition of the automobile would not subject the party hiring it to the payment of damages. If the vehicle is hired to go to a certain place, over a particular course, the hirer has no right to take the machine by a different route or to a different place, unless permitted to do so by the owner. If the party hiring the machine drives the automobile to a place altogether different from that contemplated by the agreement of the parties, he commits a conversion of the machine and is liable for whatever injuries may happen to it while using it contrary to the agreement. It is the duty of the hirer to use reasonable care in protecting the automobile from collision, defects in the highway, and from theft, but only reasonable care is required. He does not guarantee or insure that the machine will be returned in as good condition as when delivered to him.

The party letting the machine, of course, has a right to the price agreed upon to be paid for the use of the automobile. Where, however, no price is expressly stated in the agreement, a reasonable compensation would be the amount which the hirer must pay. What constitutes a reasonable compensation would depend upon the prices which are ordinarily paid for the renting of similar machines.

At the stipulated time for the return of the automobile the hirer is obliged to deliver it to the owner, or if no time has been agreed upon, then it must be returned upon demand from the owner, or at a reasonable time thereafter. The hirer is obliged to deliver the machine to the owner in good condition, except ordinary wear and tear, and except breakage which has resulted from the fault of the owner. Upon delivery of the machine to the owner in proper condition and payment of the price, the relation of bailor and bailee between the parties ceases. The contract is terminated.

In support of the propositions set forth above, appended hereto are a number of decisions which, although rendered in connection with cases in which horse and animal drawn vehicles were involved, apply also to the motor carriage.

GOING BEYOND PLACE AGREED UPON.

Where a party hires an automobile to go a fixed distance, and goes beyond it, there is a conversion for which action will lie.—(Super. 1855) Fish vs. Ferris, 12 Superior Court (5 Duer), 49; (Common Pleas 1855) Disbrow vs. Tenbroeck, 4 E. D. Smith, 397.

The hirer of an automobile for the expressed purpose of riding to a particular place, a certain number of miles away, is guilty of a conversion in riding it a number of miles farther during which time the automobile is destroyed in an accident resulting from non-actionable negligence.—Disbrow vs. Tenbroeck, 4 E. D. Smith, 397.

Where a party hires an automobile to go a fixed distance and goes beyond it, there is a conversion for which action will lie.—(Super, 1855). Fish vs. Ferris, 12 Superior Court, Tenbroeck, 4 E. D. Smith, 397.

CARE OF AUTOMOBILE.

One who hires an automobile to go on a journey is bound to drive it moderately, to treat it as carefully as any man of common discretion would his own, and to supply it with suitable fuel; and he is liable only for negligence, unskillfulness, or willful misconduct.—Harrington vs. Snyder, 3 Barb., 380.

INJURY INCIDENT TO USE.

The hirer of an automobile, who is chargeable with no ill treatment, and employs the automobile to no other use than that which was expressly agreed on and paid for, is not liable for an injury naturally incident to the use of the automobile. The law imposes the risk on the bailor.—Millon vs. Salisbury, 13 Johns., 211.

EXPENSE OF REPAIRS.

If a hired automobile breaks down on the journey, without fault of the hirer, the expense of its repairs is to be borne by the owner.—Harrington vs. Snyder, 3 Barb., 380.

NUMBER OF PERSONS TO BE CARRIED.

When both parties are silent as to the number of persons to be permitted to ride in a hired carriage, the hirer is authorized to carry such number as the vehicle was made for.—Harrington vs. Snyder, 3 Barb., 380.

LOSS BY FIRE.

An agreement by the hirer of chattels, "to surrender the property in as good a condition as reasonable use and wear thereof would permit," does not make him responsible for their loss by fire, as it simply expresses the legal obligation which would rest upon him without any special agreement.—Hyland vs. Paul, 33 Barb., 241.

The hirer of chattels, in the absence of special agreement, is not bound to make good their loss by fire while in his possession, without his fault.—Hyland vs. Paul, 33 Barb., 241.

NEGLIGENCE OF GARAGE KEEPER.

The hirer of an automobile may be liable for the negligent acts of a garage keeper in attending to the automobile.—Hall vs. Warner, 60 Barb., 198.

RETURN OF AUTOMOBILE.

If an automobile, hired upon condition that it be returned on one day's notice in the same condition as when received, is destroyed without fault of the hirer, but while in his possession, the hirer is excused from the performance of the condition, and the fact that the contract of bailment is in writ-

ng does not increase his common law liability as bailee.—American Preservers Co. vs. Drescher, 4 Misc. 482, 54 State Rep. 266, 24 N. Y. Supp. 361.

Where defendant took machines under a lease providing that he might surrender the lease and the machines, held, that he must surrender the machines before he could escape liability for their rental, and that a surrender of the license to use them was not sufficient to discharge him.—Willcox & Gibbs Sewing Machine Co. vs. Himes, 50 State Rep., 489; 67 Hun., 648; 21 N. Y. Supp., 760.

The New Maryland Law.

BALTIMORE, Md.—All provisions of the new Maryland automobile law are now in effect, and many changes are of interest to motorists who have occasion to cross the State, going to and from Washington.

The rate of speed allowed in the open country is raised from 10 to 12 miles per hour, the same to be reduced to 6 miles an hour upon the sharp curves of a highway, at cross roads, in the built up portions of cities, towns and villages, and when passing horses. If horses are driven by women or children the motorist must alight and lead the horse by the machine, if requested. In cities of 16,000 inhabitants or over (Baltimore, Annapolis, Hagerstown and Cumberland) a speed of 12 miles an hour is allowed. Speed must be reasonable at all times.

Non-residents must take out a Maryland license, which costs $3, and which is good as long as the car is owned. A license is required for every car. There is no exception in the case of demonstrating cars or agents' machines.

License numbers are required on the front as well as the back of every car. Cars may be run if the lights fail, if the driver proceeds slowly and sounds his horn every 200 feet.

The county commissioners and Baltimore police commissioners are given the right to set aside any highway for racing.

The power of imprisoning for violation of the speed laws is transferred from magistrates to courts of criminal jurisdiction.

Chauffeurs are required to take out a special license, costing $2, and there is a provision requiring punishment for drivers who take a "rake off" on repair costs. A justice of the peace may revoke a chauffeur's license for flagrant violation of speed laws. The chauffeur's badge may be worn wherever the holder desires, and need not be shown on the arm.

The attempt to get a provision exempting non-residents touring Maryland from the license tax, and one asking for 20 miles in the open country, failed.

Judge Lacombe's Decision.

In order to correct an erroneous impression, due to incorrect published reports regarding the decision of Judge R. H. Lacombe of the United States Circuit Court, denying the Hartford Suspension Company a preliminary injunction pending the trial of their suit against Hollander & Tangeman for using and selling the Diezemann shock absorber, we are asked to print the following statement from the Diezemann Shock Absorber Company:

We beg to inform the trade that the statement heretofore published to the effect that his Honor Judge Lacombe had decided the suit brought against Hollander & Tangemann in our favor, was inadvertent and incorrect. His honor did not pass any judgment upon the merits of the controversy, but merely declined to grant an injunction, pending the trial of the suit. His opinion was as follows:

"Upon the argument the suggestion as to trademark and unfair competition was not pressed. There is left only an application for an injunction upon an unadjudicated patent of recent issue, where there is a substantial conflict as to the prior art. These questions should be left for final hearing. Motion denied."

THE HORSELESS AGE gave a correct report of the decision in the issue of March 28 last.

"Gentleman Cop" Shoots Holes in Tires.

BALTIMORE.—After a lengthy hearing of charges against Noah Walker, a "gentleman cop," who works for Baltimore county without pay, the county commissioners last week gave him authority to shoot at cars when the drivers were violating the speed limit.

Yates Pennington, a well known motorist, was in his car with his wife, three-year-old daughter and a chauffeur. When they neared the Maryland Country Club, on Park Heights avenue, Walker, who was in hiding in a small trolley car shelter, rushed out, waved his hand for the car to stop, and as it went past him drew a revolver and fired. Witnesses said he aimed at the rear tire, but he claimed he fired into the road.

The commissioners cleared him of charges laid by Mr. Pennington and complimented him on his efforts to prevent speeding. They told him to continue his methods and he announced he was going to stop machines, if he did have to shoot holes in the tires. During the trial a clipping was read telling how a Chicago policeman, who had hurt four people by shooting the tire of a car, escaped punishment after a jury trial.

Park Heights avenue was built partly by horsemen, which is responsible for the hard feeling existing.

Ontario's New Law.

TORONTO, Ont.—The Legislature of Ontario has recently passed an automobile law providing that permit numbers, 5 inches in length, shall be displayed on both the front and back of the vehicle, and should be kept clean. No other numbers than those issued by the Provincial Secretary may be displayed. Searchlights may not be carried. In case of an accident the person in charge of the motor vehicle shall return to the scene of the accident and give in writing to anyone demanding the same his own and the name and address of the owner of the vehicle. Violation of the principal provisions of the act makes an automobilist liable to a fine of $50 for the first offense, $100 for the second offense, and imprisonment for the third offense. Arrests may be made without warrants by all peace officers for all violations, and by any person for violation of the principal provisions.

Both City and State License Numbers.

PHILADELPHIA.—Hereafter Philadelphia automobiles must carry a city license number, as well as a State license number. The Supreme Court of Pennsylvania has sustained the decision of the Common Pleas Court that the new State law does not conflict with the city ordinance requiring a local license and tag.

It was purely a test case, brought by the A. C. of Philadelphia in the name of H. Bartol Brazier, and no sooner was it lost in the lower court than the club carried it to the highest tribunal in the State for final adjudication. Many automobilists feel that the decision puts an unjust burden on them.

Virginia Cities and Counties Asked to Act on New Law.

RICHMOND, Va.—The Secretary of the Commonwealth has sent a circular letter to the councils of all cities and the boards of supervisors of all counties in Virginia calling attention to the sections of the recently adopted automobile law, which provide that it shall not become effective until adopted by these local bodies, and urging prompt attention in order that the Secretary may take the steps necessary to carry out the provisions of the law.

State Law Supersedes Baltimore Ordinance.

BALTIMORE.—The test case to determine whether the new 12 mile an hour law in Maryland cities applied to Baltimore, where it was in conflict with a city ordinance allowing only 6 miles an hour, was decided in favor of the State law this week by Judge Harlan. Jesse L. Cassard, Jr., who was arrested to make the case, was cleared, and automobilists who drive in Baltimore can keep within the new law with safety. The case was brought up at the instance of the A. C. of Maryland.

S. F. Edge sends us a list of parts in the Napier cars, which parts total 7,049. The radiator alone is made up of 1,832 parts. These figures refer to a 24 horse power chassis, and Mr. Edge observes that considering the very large number of parts that go to make up a car, it is a wonder automobiles are not more expensive than they are.

According to a report of the Belgian consul, the imports of automobiles into Portugal in 1903 were as follows: From France, $165,360; Italy, $19,080; United States, $16,960; Spain, $6,360; Belgium, $4,240; Germany, $4,240.

COMMERCIAL APPLICATIONS

Wisconsin Auto Transit Company.

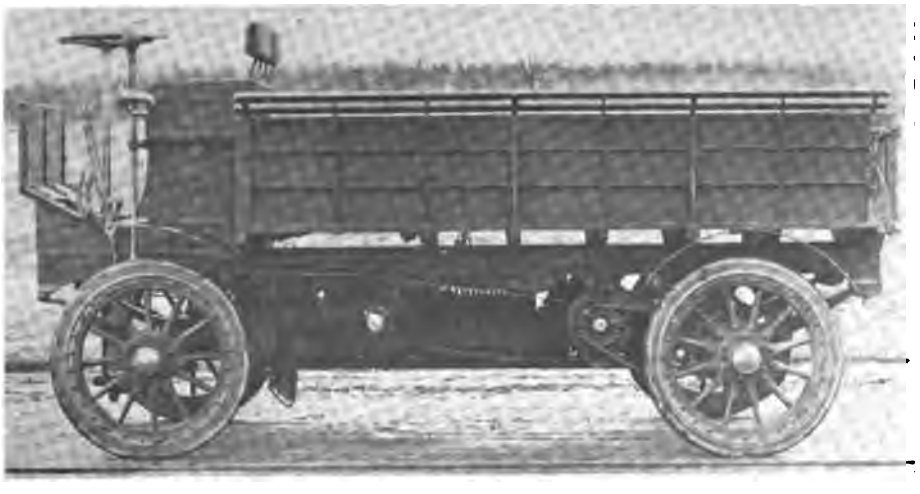
The Wisconsin Auto Transit Company have postponed the opening of their automobile passenger service between Manitowoc, Two Rivers, Mishicott and Kewaunee, Wis., until June 1, when the first car will be put in commission. Delivery of a second car has been promised by June 10, and they plan to purchase a third car as soon as possible. Special bodies are being built for the cars at Manitowoc. The route will be 30 miles, over excellent gravel roads. Two round trips will be made daily, starting at 6 in the morning and finishing at 8 in the evening.

It is the purpose of the company to handle freight as well as passenger traffic, and a contract has already been closed with a canning factory at Two Rivers to haul the product of 700 acres of pea land a distance of 8 miles to the factory at Two Rivers. The crop will average about 3,000 pounds to the acre. After this contract is completed they will establish a freight service between Mishicott and Two Rivers with the same truck.

The company is incorporated under the Wisconsin laws, with an authorized capital stock of $10,000, all of which will be invested in their equipment the present year. The officers are as follows: President, Charles F. Schuetze; vice president, R. M. Schuetze; secretary and treasurer, W. C. Sieker.

Knox Three-Thousand Pound Express Wagon.

The Knox Automobile Company, of Springfield, Mass., have just brought out a smaller size of their new style of double reduction motor trucks, the first model of which, a 3 ton size, was described in our issue of September 13, 1905. The present model, which has a load capacity of 3,000 pounds, and a maximum road speed of 15 m. p. h. (corresponding to 900 r. p. m. of the motor), is herewith illustrated. The engine is a two cylinder 5x7 inch, rated at 16-20 horse power. A two speed and reverse planetary change gear is used, from which the power is transmitted by a single chain to the jack shaft, and thence by a double chain to the rear wheels. The front axle is constructed of channel steel, and the rear axle of 2 inch solid square steel. All wheels are 34 inches in diameter, fitted with Timken roller bearings, and with 3½ and 4 inch solid rubber tires in front and rear, respectively. The car has a wheel base of 100 inches, and a wheel tread of 56 inches in front and 58 inches in the rear. The body may extend 111 inches back of the driver's seat, and may be made 47 inches wide inside the wheels, or 60 inches wide if it overhangs the wheels.



KNOX THREE THOUSAND POUND EXPRESS WAGON.

New York's Municipal Automobile Bill For 1905.

John R. Davies, chairman of the committee on finance of the New York board of aldermen, has prepared a statement showing that the cost of maintenance, repairs and operation of the twenty-one automobiles owned by the city during the year 1905 amounted to about $25,000. It is as follows:

Department.	Cost of Cars.	Repairs.	Maintenance.	Chauffeur
Fire	$4,000	$1,042.25	$1,173.32	$1,200.00
Fire (two months only)	4,000	380.87	350.47	200.00
Water Supply, Gas and Electricity	5,235 (2 cars)	.....	1,412.05	1,472.50
Parks	8,170 (4 cars)	250.00	1,407.67	1,888.25
President, Borough of Brooklyn	2,500	726.28	367.73	576.00
Bureau of Highways, Brooklyn	980	284.20	292.06	360.00
Bureau of Sewers, Brooklyn	960	101.28	99.90	288.00
Docks and Ferries	995	330.67	116.63	1,290.44
Health	9,700 (4 cars)	1,707.71	316.15	260.01
Police	4,800	1,961.00	.....	.....
President, Borough of Richmond	4,651 (4 cars)	2,398.56	895.05	1,390.00
Totals	$45,991	$9,182.82	$6,431.03	$8,925.20

Sight Seeing Service in Buffalo.

A number of 24 passenger electric sight seeing cars are to be operated in Buffalo this summer by the Auto Sight Seeing Company. These cars, which are painted a canary yellow, are fitted with terraced seats, and are equipped with double motors and direct chain drive. The Auto Sight Seeing Company has been incorporated to take over the sight seeing business formerly conducted by the Autocar Equipment Company, who are the manufacturers of the cars. They expect to run four cars of this description on the streets of Buffalo. These cars will start from Ellicott square every 15 minutes during the season and make the trip up Main street, Delaware avenue, through the park system and along the lake front. The price for this trip is 50 cents. In addition to the electric sight seeing cars the company is putting on a sixteen passenger gasoline touring car with terraced seats, to make daily trips to Niagara Falls and return.

Gasoline Delivery Wagon Gives Satisfaction.

Ostermoor & Co., mattress manufacturers, 116 Elizabeth street, New York, write us that they have been using an 8 horse power gasoline delivery wagon for over fifteen months, and have found it very satisfactory. The expense for repairs during that time has not exceeded $100, which sum includes the cost of repairing injuries received from its having dropped with an elevator some three and one-half stories.

Boston's Municipal Automobile Bill.

The report of the Boston City Auditor shows that the city of Boston owns seventeen automobiles, which cost $20,167.61. Maintenance brings the total up to $28,716.08.

The report shows these departments to own machines valued as follows:

Public buildings department, value of machine, $600; wire department, $550; street department, paving division, $415.26; hospital relief, $2,757; police department, $693, $782 and $785; building department, $1,350; park department, $650; schoolhouse department, $1,995; treasury department, $1,003.50; fire department, $1,107, $1,542.50 and $708.15; engineering department, $1,094; street department, sewer division, $1,074.

In addition there is the machine bought by the city on which Mayor Fitzgerald paid $1,000. This car cost $4,061.20, and aside from the mayor's donation the following portions of the cost were charged to the other departments:

Supply department, $561.20; sewer department, $500; street department, $500; street cleaning and watering department, $500; bridge department, $500; water department, $500.

The expenses for maintenance are charged to these several departments as follows:

Building department, $3,142.50; schoolhouse department, $1,471.66; treasury department, $1,713.57; engineering department, $220.74.

Motor Bus Pool in London.

The pooling system, which has been in use in London in connection with horse buses for many years, will be applied to motor omnibuses by proprietors in the pool. Two motor omnibuses are reckoned the equivalent of three vehicles worked by horses, and each motor omnibus running will draw out of the pooled receipts 22 cents per mile run. The purpose is to avoid injurious competition. On this basis has been formed the Amalgamated Motor Bus Company, with a capital of $1,000,000, to acquire the rights of the following omnibus associations: Atlas and Waterloo, Camden Town, John Bull, Islington and Old Kent Road, King's Cross and Barnsbury.

Commercial Vehicle Notes.

The Kankakee (Ill.) fire department has purchased an automobile for Fire Chief Walter E. Price to use in going to fires.

The Country Club at Sewickley Heights, a suburb of Pittsburg, is planning to use a motor bus between the railroad station and the clubhouse.

The Winchester Repeating Arms Company, New Haven, Conn., are testing the efficiency of a 3 ton gasoline truck with a view to substituting such vehicles for their thirty trucks.

The Franklin 1½ ton truck described in our issue of April 11 was recently subjected to a week's demonstration for a wholesale grocery house in Syracuse, in which it carried a total of 111,862 pounds of freight, or 18,644 pounds per day. We are informed that the cost of supplies, etc., during the week was $4.87, or a little more than 81 cents per day.

As it has been decided that the Nantucket Central Railroad will not be operated between the towns of Nantucket and Siasconset, on Nantucket Island, the coming summer, the selectmen are seriously considering the application of John R. Bacon and William F. Codd for a license to operate an electric automobile passenger and freight line. The islanders are strongly opposed to motor cars in any form, but the cutting off of their railroad service presents a new problem.

The Anglo-French Herald Motor Company, Ltd., has been formed in London to acquire the motor manufacturing business carried on by La Société Anonyme des Moteurs et Automobiles Herald, of Rue Carnot, Levallois Perret, Paris. At the present time there are twenty "Herald" motor cabs in London, which have been purchased by the Metropolitan Cab Company, which company, it is said, is now negotiating for the delivery of more. A considerable number of French automobile manufacturing businesses have been thus "floated" in London during the past two years.

Reproduction of Selden Car Examined by Judge Parker and Experts.

An automobile built by Henry R. Selden and George B. Selden, Jr., sons of George B. Selden, said to be an exact reproduction of the vehicle constructed by their father in 1877, was given its first public exhibition last Saturday afternoon. It had been stored in the cellar of the Decauville garage, Broadway and Fifty-sixth street, New York, for several weeks past, and access to it denied to those interested in examining it.

The taking of testimony in the suits brought by the Selden licensees is now in progress in this city, the cross-examination of George B. Selden being conducted by Judge Parker, counsel for the defendant. In view of the importance attaching to the original machine built by Mr. Selden, Judge Parker asked for an opportunity for himself and his technical advisers to examine the reproduction, and the time was set for last Saturday at noon. He was on hand with Prof. R. C. Carpenter, head of the Mechanical Engineering Department of Cornell University, Jesse M. Smith, a New York patent lawyer, and a stenographer. Henry R. Selden was present to answer questions about the machine. He was questioned by the expert and his answers were taken down by the stenographer. George B. Selden, Sr., was also present. In addition there was a crowd of newspaper men.

Judge Parker stated that the presence of so many members of the press was a total surprise to him, as he understood that the examination was to be private and purely for the information of himself and his experts.

"We were greatly interfered with by such a crowd of reporters," he said, "and I cannot imagine how they found out that we were going to examine the car. I surely did not send them word, and if the licensed association people did so without saying anything to me about it, I regard it as a personal affront. Our proceedings were so greatly embarrassed that we shall have to get at it another time.

"One point of great interest which was brought out was that the plaintiffs no longer insist that the original Selden engine was built on the principle of the Otto engine, but admit that it was a continuous flame Brayton type. If this admission had been made in the first place, we would have been saved six months of labor and great expense in taking testimony.

"In the engine shown us the only parts that date back to 1877 are the castings for three pressure cylinders without heads, and for three air cylinders; also the piston for one cylinder of each type."

When Marcus I. Brock, of the A. L. A. M., was told of Judge Parker's surprise that the newspaper men had been invited to be present he said: "I am in turn surprised that Judge Parker should feel that way, and I see no very good reason for it. I cannot believe the newspaper men interfered with his examination. We did not mean any affront to him. Naturally the various automobile journals have taken a great interest in this machine, and we thought it was a good opportunity to let them learn something about it when technical men were examining it."



GEORGE B. SELDEN AT THE WHEEL OF THE CAR BUILT BY HIS SONS.

Automobiles Burned Without Gasoline Explosions.

Fire damaged the garage of the Auto Express Company, Detroit, Mich., $2,000, May 11. The bodies of eight automobiles in the building at the time were burned, and the chassis badly damaged. The cause of the fire is unknown.

An unusual feature of the fire was the absence of gasoline explosions. The tanks on the burned vehicles were located just back of the seat, so that they were in the very centre of the fire caused by the burning bodies. They were of galvanized iron, with seams riveted and soldered; about 2 feet high, 40 inches long and 5 inches thick lengthwise of the vehicle. The back, sides and top were double, but the front, which was exposed to the most heat, was single. These tanks contained an inch or more of gasoline, and the one in the hottest part of the fire was found to contain 3 gallons. That the heat was intense is shown by the fact that solder on some of the joints melted and ran down, and that in one case the seams toward the top appeared to be opened. The fire from the oil and grease on the machinery heated the gasoline, piping and carburetors pretty thoroughly. The fact that they gave no trouble may be taken as rather strong proof that the systems of gasoline distribution in use upon cars at the present time are not sources of danger as regards fire.

Automobile Boiler Explosion.

The boiler of a Stanley steam car, belonging to H. A. Perkins, agent of the Rock Island Railroad, at Omaha, Neb., gave 'way suddenly on Sunday evening, May 13, while the car was being driven at Farnam street and the boulevard, Omaha. The boiler is located on the forward part of the frame, under a bonnet. The two crown sheets let go, the upper one passing through the bonnet and up into the air, while the lower one was projected against the ground. It is fortunate that the boiler was located in front and that no one was sitting over it. The occupants of the front seat were injured by packing, which was blown into their faces, while those in the rear seat escaped with the nervous shock. It is claimed that a brass fitting from the boiler was found after the explosion at a distance of three blocks, and that a number of windows were broken by the concussion. The boiler is of what is known as the fire tube type.

The A. M. C. M. A. as Tire Manufacturers.

An advertising agent sends out a statement concerning the Ajax Standard Rubber Company and its connection with the American Motor Car Manufacturers' Association, from which we cull the following:

"The Ajax Standard Rubber Company, Horace De Lisser president and general manager, with works at 420 East 106th street, New York city, is controlled by members of the A. M. C. M. A. The Ajax Company has no secret process and throws its plant open to the inspection of the public. It will bid for public favor in competition with the G & J Tire Association (the so called Tire Trust). The Ajax tires are molded and not wrapped, and cost 15 per cent. more than other makes. Members of the A. M. C. M. A. using these tires will (it appears) apply the standard sixty day guarantee to the tires as well as the rest of their car."

New Thomas Runabout.

The E. R. Thomas Motor Company have added to their regular list of stock cars the 50 horse power runabout, here illustrated. The chassis of this car is the same as that on the company's regular touring cars. The body has three seats, two in the front, which are separate, and a rumble seat which folds in behind. When the rumble seat is folded in the deck back of the front seat is flat. Just behind the rumble seat is a large compartment into which a special trunk may be fitted, or it may be used just as it is for carrying baggage.

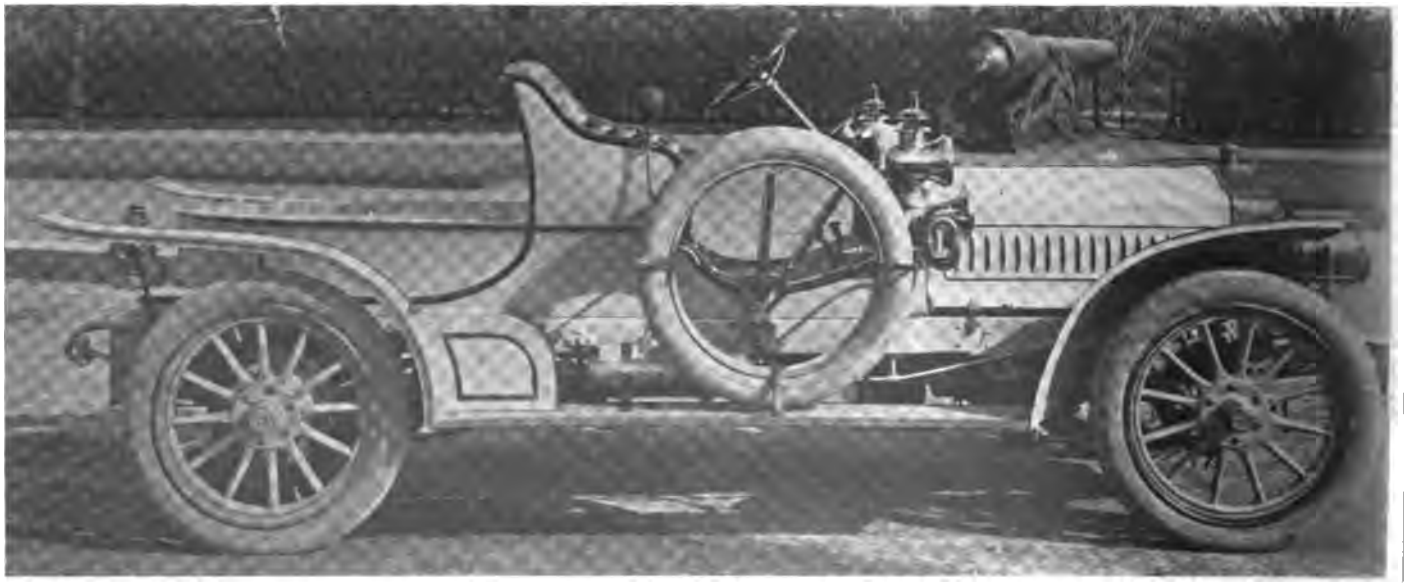
Rumor of a Merger.

The organization of the De Luxe Motor Car Company, recently chartered under the laws of New Jersey, has given rise to some rather startling rumors in connection with the Pope companies. It is reported in Cincinnati that the new company is backed by the controlling interests in the Pope-Tribune, Pope-Hartford, Pope-Toledo and Pope-Waverley concerns, and that these organizations are to be combined, their present plants dismantled, and a new central factory to be built somewhere in Michigan or Ohio.

It is possible that these rumors may have had their origin in the fact that F. M. Keeton, formerly general sales manager of the Pope Motor Car Company, of Toledo is the secretary and general sales manager of the new company, and Frank S. Davis and John A. Herzog, formerly designers and engineers for the Pope Motor Car Company, of Toledo, are among the incorporators of the De Luxe Company. They were the designers of the Pope-Toledo car, and it is said that they will now design a 40 horse power car, which the new company will manufacture.

George M. Verity, president of the American Rolling Mill Company, Middletown, Ohio, is president of the new company. Ralph R. Caldwell, an attorney of Cincinnati, is another incorporator.

The publicity department of the Pope Manufacturing Company, Hartford, Conn., informs THE HORSELESS AGE that these rumors are absolutely without foundation. As the Pope Manufacturing Company own a majority of the stock of the Pope Motor Car Company, a merger would accomplish little, and there is no thought of dismantling their present plant and building one central factory.



THE NEW THOMAS RUNABOUT.

Awards in the British Tire and Speedmeter Trials.

The judges' report and award in the tire section only of the above trials was issued on May 25, the trials having concluded on March 31. The trials extended over 4,000 miles and the roads were for the greater part of the time in bad condition, being either loose, owing to the rolled flints and road metal, or heavy and greasy, owing to the frequent rain. The covers and tubes were selected by the judges themselves from a large stock in the manufacturers' warehouse, and were branded and sealed. They were under continuous official observation from the commencement to the end of the trials. One manufacturer only, the Collier Tyre Company Ltd., competed, with three sets of covers and tubes, and the performances are recorded as follows:

One set of 815 mm. by 105 mm., beaded edge or clincher type, fitted to a Rolls-Royce 20 horse power car of a total weight, including passengers, of 2,940 pounds. Average weight of cover, 17 pounds 10 ounces; average weight of tube and valve, 4 pounds. Causes and times of involuntary stops: Three punctures, occupying 64½ minutes; one cover burst and replaced with new one and new tube on road, 29 minutes; tubes pumped up seven times; total of stoppages, 93½ minutes. Cost per ton mile has been taken as the most satisfactory method of arriving at the actual performance of each entry. Each set of tires had been debited with initial cost of covers and tubes put into use, less estimated value of the remaining "life" of each cover and tube, and plus cost of repairs carried out, plus the following penalty for punctures or bursts: To the 240 bad marks, rated at 1d. each for each puncture or burst, 1 per cent. was added or deducted for each minute taken in excess or less than 60 minutes in effecting the necessary replacements. Reckoned on this basis, the operating cost of 815 mm. by 105 mm. tires works out to 1.90 pence per ton-mile of the car, or equivalent to 2.48 pence per car mile. The cost of covers, tubes, punctures and repairs amounted to $348, while the credit total at the conclusion of the trial was $141.25, the debit balance being, therefore, $206.75.

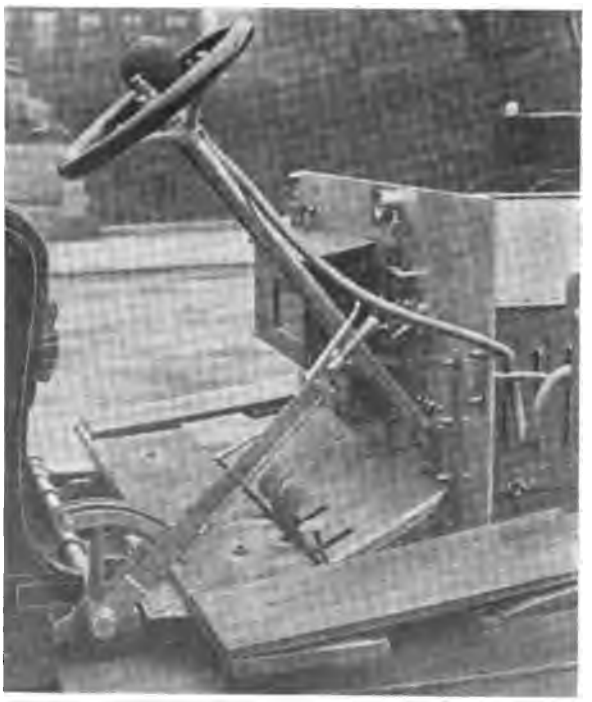
The second set were 34 inches in diameter, provided with Collier's patent fixings and fitted to a 20 horse power Dennis car, weighing with full load 3,539 pounds. Causes and times of involuntary stoppages: Three punctures, 131 minutes; covers changed front to rear wheels twice, 77 minutes; tubes exchanged and cover patched on inside, 65½ minutes; total, including small details, 238½ minutes. Tubes pumped up seven times. Cost per ton-mile, 2.11 pence, equivalent to 3.34 pence per car mile; cost of covers, tubes, punctures and repairs amounted to $510.25; credit total at conclusion of trial, $225; debit balance $285.25.

The third set of Collier tires were 36 inches in diameter by 5 inches by 5¼, and were fitted to a 28 horse power Daimler car of a total weight, with passengers, of 4,550 pounds. Weight of each cover, 41 pounds; weight of each tube and valve, 4 pounds 12 ounces. Cause and time of stoppages: Two punctures, 64 minutes; two burst covers, 91 minutes; one cover replaced because cut through by a broken glass bottle, 50 minutes; total stoppages 205 minutes. Tubes pumped up once only on the eighth day. Both steering wheel tires went through trial without a single mishap. Cost of covers, tubes, punctures and repairs amounted to $899.50; credit total at conclusion of trial, $387; debit balance against tires, $512.50. Cost per ton-mile, 3.08 pence; cost per car mile, 6.15 pence.

The judges awarded a gold medal to each set of tires.

The Napier Gearless Car.

On Monday, May 9, a Napier six cylinder 60 horse power car started for an official trial under the observation of the Automobile Club of Great Britain. The trial is over a distance of 1,000 miles, and is undertaken with the object of testing the latest Napier production; this car is quite unique owing to the fact that it has no change speed gear, it possessing only one forward speed, which is direct between engine and road wheel, and a reverse. Like all other trials of the A. C. G. B. I. this one is strictly under normal touring conditions; that is to say, the car starts each day from the centre of London, passes through the thick traffic of miles of busy thoroughfares and follows a different route each day to a place 80 to 100 miles from the starting point, and returns to the club's lock up garage each evening, an official observer never leaving the car until it is placed under lock and key each night. The car is being driven by Cecil Edge, and on the first day was taken down to the automobile track by the edge of the sea at Bexhill, some 65 miles from London, and there tested to find out the highest and lowest speed the car was capable of covering without the clutch being touched. Over a carefully measured distance the following are the times taken by the official timekeepers of the club, Messrs. F. Straight and A. V. Ebblewhite: The highest speed attained was 59.2 miles per hour, and the slowest speed 4.45 miles per hour. This is a truly remarkable performance for a car without a gear box, as the range of the speed is between that of a moderate walker and an express railway train. The appended illustration shows the dashboard and side of the car, and only the brake lever is observable, the pedals being those for brake, clutch and accelerator respectively. The other fitments on the dashboard are, taking them in order from left to right, hand pump for air pressure to petrol tank, glass fronted box for high tension ignition, synchronizer and distributer, single high speed trembling coil and above this the single sight feed oiler to engine bearings and water pressure gauge. On the steering wheel are throttle and ignition levers, and immediately over the middle of the steering column a switch for cutting out the electrical circuit.



CONTROL DEVICES OF THE "GEARLESS" NAPIER CAR.

Trial of the Hedgeland Solid Anti-Skid Axle.

Between the 5th and 12th of April a 1,000 miles official trial by the British Automobile Club, under the usual conditions, was held of the Hedgeland anti-skid solid axle, a device new to England, but well known in the United States. It was fitted to one of the new four cylinder 26-30 horse power Cadillac cars, the ordinary live axle and differential being replaced by the Hedgeland device. The car weighed, ready for the road but without passengers, 3,659 pounds, of which 1,938 pounds were carried on the back axle. The average additional weight due to the passengers was 740 pounds per day. On the six days that the trial extended 1,000½ miles were covered without any stop due to the axle, and at the termination of the final day's run both hubs were sealed by the club's officials. The weather was dry during the whole week. On one day a long series of trials were carried out in which the car was run at different speeds and under varying conditions over a specially prepared slippery surface. Many experiments were also made with blocks of wood and other obstacles placed in front of either driving wheel, both on slippery and on dry surfaces. Further experiments, in which the brakes

were suddenly applied, were made on the same surfaces. At the conclusion of the trials the judges issued the following report: "At the end of the run of 1,000 miles the axle was examined by the judges and found to be in good condition and showed no signs of wear, and the report of the official observer shows that the axle ran throughout without attention and silently. The observer further reported most favorably on the steering and behavior of the car on the straight, round the corners and curves, no manipulation of the clutch being necessary. The experiments showed an appreciable absence of any tendency to slip or skid. The usual system of braking on the propeller shaft or with the engine is not readily adaptable to a car fitted with the Hedgeland axle." The report is signed by the Hon. Arthur Stanley (chairman of the club), W. Worby Beaumont (chairman of the expert and technical committee) and Julian W. Orde (secretary).

Cincinnati Hill Climbing Contest.

The second annual hill climbing contest, under the auspices of the A. C. of Cincinnati, was held last Saturday on Paddock road, and was witnessed by about 5,000 people. Many of the entrants failed to put in an appearance, and the women's race had to be called off on that account. The course of three-quarters of a mile was in good condition, having been specially prepared. The road has several sharp turns necessitating almost full stops in rounding them. The grade of the hill is reported to be from 10 to 15 per cent., but the actual grade is not known, as President Duttenhofer did not obtain this information from the city engineer. It is much to be regretted that clubs as a rule do not obtain such information about the grades in hill climbing contests, and their failure to do so detracts materially from the value of any results.

Starts were made three minutes apart to eliminate the danger of accidents, and the starting time was telephoned to the judges at the finish. No records were broken, although in the free-for-all event O. F. Pogue's time of 1:01 was only two-fifths of a second below Andrew Hickenlooper's record established last year.

The drivers who came in first and second in each event received a handsome silver cup.

SUMMARIES.

Class 1—Runabout.

A. R. Morgan (Franklin), first. Time, 1:26.
A. G. Brunsman (Stoddard-Dayton), second. Time, 1:30.
E. J. Carpenter (Duryea), third. Time, 1:50.
Thomas P. Stack (Reo), fourth. Time, 2:17 4-5.
A. C. Anderson (Franklin), fifth. Time, 2:45.

Class 2—Touring Cars, 12 to 24 Horse Power.

H. F. Fulton (Franklin), first. Time, 1:24.
Miss Charlotte Allen (Stevens-Duryea), second. Time, 1:29.
L. W. Anderson (Buick), third. Time, 1:34.
Sidney Black (Buick), fourth. Time, 1:37 3-5.
J. Baum (Buick), fifth. Time, 1:47.
Robert C. Crowthers (Compound), sixth. Time, 2:30 3-5.
H. C. Hoefinghoff (Buick), seventh. Time, 2:50 4-5.

Class 3—Touring Cars, Four Passengers.

F. F. Bradley (Pope-Toledo), first. Time, 1:09.
A. G. Brunsman (Stoddard-Dayton), second. Time, 1:18 1-5.
Albert Krippendorf (Pope-Toledo), tie for third. Time, 1:20.
H. H. Hoffman (Pope-Toledo), tie for third place. Time, 1:20.
Standard Auto Co. (Pope-Hartford), last. Time, 3:00.

Class 4—Touring Car, Four Passengers.

F. F. Bradley (Pope-Toledo), first. Time, 1:07.
Henry Burkhold (Thomas), second. Time, 1:23.
J. G. Hughes (Stearns), third. Time, 1:28 4-5.

Class 5—Free for All.

O. F. Pogue (Packard), first. Time, 1:01.
W. W. Balke (Packard), second. Time, 1:02 4-5.
Albert Krippendorf (Pope-Toledo), third. Time, 1:05½.
F. F. Bradley (Pope-Toledo), fourth. Time, 1:06.
H. H. Hoffman (Pope-Toledo), fifth. Time, 1:11.
Henry Burkhold (Thomas), sixth. Time, 1:14 1-5.
J. G. Hughes (Stearns), seventh. Time, 1:20.
Sidney Black (Buick), eighth. Time, 1:37.

OFFICIALS OF THE COURSE.

General Manager—President Duttenhofer.
Starter—Joseph Monford.
Assistant Starter—Harry Watters.
Judge at Finish—R. W. Humphreys.
Timer at the Start—Harry Watters.
Timers at the Finish—Dr. L. S. Colter, Dr. A. B. Hyle, J. D. Allison and L. D. Oscamp.
Managers of Course—Foster Bradley and Val. Duttenhofer, Jr.
Distance of Course—Three-quarters of a mile.
Best Time—By O. F. Pogue, 1:01.
Condition of Course—Slow.

Slow Enough to Arrest.

The E. R. Thomas Motor Company inform us that Harry Tate, one of their testers, was running a car through Kenmore, a Buffalo suburb, at slow speed recently, when he was stopped by the village constable and arrested on a charge of speeding. He was informed that an hour before he had gone through the opposite side of the town at the rate of 40 miles an hour. At the trial none of the four witnesses were able to say that Tate was the man who was doing the speeding. Nevertheless, he was fined $5.00. Later a court official explained the whole matter by saying: "We held a meeting last night and decided that this speeding must stop. This man was the first to come along slow enough for us to catch, so we arrested him."

Second Annual Economy Contest of New York Motor Club.

Entry blanks and the complete rules of the second Annual "National" Economy Test of the New York Motor Club have been sent out. The tour is to take place on June 20, 21 and 22, over the road from New York to Albany, to Springfield, Mass., and back to New York, a total distance of 430 miles. The competition will be on a basis of the cost per ton-mile, and there is no division of entries into classes. A gold and a silver cup and a bronze medal are offered by the club for the cars making the three best records, and certificates of awards will be given to all competitors who finish. A pilot car will be used to distribute confetti along the road, and in addition complete running directions will be furnished all drivers. The test is in charge of the contest committee of the club, Harry Unwin chairman, assisted by the technical committee, and the officers of the test will be a referee, a superintendent of garages, a superintendent of observers, a quartermaster and a chief inspector. The entry fee is $100, and entries close with A. B. Tucker, secretary of the club, No. 31 West Forty-second street, at noon of Saturday, June 16.

New Incorporations.

The Automobile Company, of Hamilton, Limited, Hamilton, Ont.—Capital, $40,000.

Atlas Automobile Company, Dover, Del.—Capital, $200,000. The incorporators said to be from Pittsburg.

New York and Coney Island Auto Company.—Capital, $10,000. Incorporators, H. Seigel, L. Goldstein, H. Goodman, New York city.

Joseph N. Smith & Co., Detroit, Mich., manufacturers of automobile trimmings, have increased their capital stock from $25,000 to $100,000.

Trout Auto Livery Company, Chicago.—Capital, $2,500; dealing in automobiles. Incorporators, David Trout, Warren M. Trout, Bion L. Trout.

George H. Terry Company, New York.—Capital, $25,000; to manufacture motors and engines. Incorporators, G. H. Terry, S. C. Smith and Arthur Thompson.

Flexible Tire Company, Springfield, Mass.—Capital, $60,000; tires, wheels, etc. President, William G. Marr; treasurer, R. J. Talbot; clerk, J. K. Hillard, Springfield.

The Empire Garage Company, Cleveland, Ohio.—Capital, $10,000. Incorporators, R. H. Paton, M. E. Steere, Joseph C. Sparrow, John D. Paton and Herbert A. Steere.

The Holmes-Booth Auto Company, Cleveland, Ohio.—Capital, $25,000. Incorporators, W. N. Booth, E. Holmes, H. G. Dickinson, B. J. Erlanger and J. M. Smith.

Bergdoll, Ambler Company, Camden, N. J.—Capital, $100,000; to manufacture, etc., automobiles or motor vehicles. Incorporators, J. A. MacPeak, F. R. Hansell, G. H. B. Martin, Camden.

New York and New Jersey Lubricants Company, New York.—Capital, $7,000; to make and deal in lubricants. Incorporators, T. A. Matthews, W. F. Kimball and F. J. Barnes, all of New York city.

Passaic Motor Car Company, Passaic, N. J.—Capital, $50,000; electricians, mechanical engineers, manufacturing and store automobiles, etc. Incorporators, J. B. Ryall, A. W. Ryall, G. Ryall, Passaic, N. J.

The Faulkner-Mills Company of New Bedford, Mass., manufacturers of gas engine ignition specialties, recently moved to Summer street, Providence, and changed their name to the Providence Spark Coil Company.

Itala Import Company, New York.—Capital, $50,000; to manufacture and repair automobiles, steam and electric, gasoline, etc.; carriages, vehicles, etc. Incorporators, H. S. Velsor, Huntington, L. I.; J. H. Demarest, Saranac Lake; R. Condon, New York city.

The Dragon Automobile Company, Kittery, Me.—Capital, $550,000, of which $300 is paid in; to manufacture and deal in automobiles and equipments of all kinds. Officers: President Harold P. Knowlton, of Malden, Mass.; treasurer, Albert E. Knowlton, Boston, Mass. Certificate approved May 12, 1906.

MINOR MENTION



The Milwaukee A. C. has secured rooms the St. Charles Hotel.

The Reo Automobile Company, Lansing, lich., are planning to erect an addition to ieir plant.

A hill climbing contest will be held at alley Mills Hill, 8 miles southwest of Inianapolis, May 24.

A hill climbing contest was held, under ie auspices of the Minneapolis A. C., on ie Riverside driveway last Saturday.

"The Law of Automobiles," by Xenophon '. Huddy, of the New York Bar, published y Matthew Bender & Co., New York, will e issued from the press about June 1.

Manufacturers as well as owners of automobiles are beginning to use monograms o distinguish their cars. They are made by . A. Salman, 17 Bromfield street, Boston, Mass.

B. F. Everitt, Detroit, Mich., has just aken possession of his new factory at Clay venue and the Grand Trunk Railroad. Automobile tops and trimmings will be nanufactured.

The St. Joseph (Mo.) A. C. has organized with the following officers: President, Huston Wyeth; vice president, Louis T. Golding; secretary, R. E. Culver; treasurer, Henry Krug, Jr.

C. Arthur Ellis, editor of the *Indian Sporting Times*, Bombay, India, is planning to publish the "History of Motoring in India," including touring guide with maps. It will be illustrated.

E. O. Hagan has been appointed receiver of the Tennant Auto Tire Company, of Springfield, Mass., on application of Ira W. Wallace. The liabilities are estimated at about $9,000, and the assets consist mainly of the patent.

The Ford Motor Company inform us that tests of their six cylinder motor, using alcohol fuel, have shown a greater actual horse power than is obtained with the same motor running on gasoline. We can only say that this result is contrary to all other similar tests which have come to our notice.

The New Jersey Automobile and Motor Club has elected the following officers: President, Joseph H. Wood, Newark; vice president, Angus Sinclair, East Orange; secretary, H. A. Bonnell; treasurer, James C. Coleman; trustees, Dr. James R. English, Irvington; W. C. Shanley, J. W. Mason and Paul E. Heller, Newark. The club has 500 members, and a clubhouse will be erected.

It is reported that a company is being organized with large capital for the manufacture of automobiles, etc., under the patents of T. J. Sturtevant, of the Sturtevant Mill Company, East Boston, Mass., which have been fully described in previous issues of the HORSELESS AGE. It is said the horseshoe nail factory of the former Putnam Nail Company, Neponset, Mass., has been purchased and will be fully equipped for the new business.

The Topeka A. C. has passed a rule that every member shall report violations of the speed laws that come under his observation.

A branch of the Pennsylvania Rubber Company, of Jeannette, Pa., has been opened at 717 Main street, Buffalo, N. Y. F. W. Walters will be the manager.

The Dayton Electrical Manufacturing Company, Dayton, Ohio, have recently doubled the floor space of their plant. A new shipping department has been added.

The second annual hill climb of the Cleveland A. C. will be held at Gates Mill hill, 10 miles from Cleveland, Decoration Day. The hill has an elevation of about 450 feet to the mile.

The H. H. Franklin Manufacturing Company, Syracuse, N. Y., inform us that up to May 1 they had delivered about 1,000 of their 1906 cars, and are now delivering at the rate of about ten a day.

Owing to the heavy dust which covered English roads in April, there has been a great demand for a dust absorbing respirator for automobilists, according to a London dealer in automobile apparel.

The New York Automobile Trade Association has admitted the following firms to membership: Hartford Suspension Company, Maxwell-Briscoe Motor Company, Matheson Company of New York, Covell & Crosby Motor Company, Wayne Automobile Company of New York, Frayer-Miller Motor Company and the Lozier Motor Company.

The Chauffeurs' and Repairers' Association of Indiana has been organized at Indianapolis, with the following officers: President, William Davidson; vice president, William Rugenstein; secretary, Fred Wiltshire; assistant secretary, Frederick Seegar; treasurer, George Swihart; directors, Harry Bell, Minor Farley, Gus Krause and Jesse Sutherland.

From reports to hand it appears that there will be a great demand for automobiles in San Francisco in the near future, and the agents of the Coast appear to be rising to the occasion. We learn that G. A. Boyer, Franklin agent, and Mr. Bill, the Rambler agent, both placed important orders for cars shortly after the fire, and that shipments to them have already been made.

At the annual meeting of the stockholders of the Haynes Automobile Company, Kokomo, Ind., May 15, the following officers were elected: President, Elwood Haynes; vice president, G. W. Charles; secretary and treasurer, Calvin Haynes; directors, Elwood Haynes, Walter Haynes, Calvin Haynes, G. W. Charles, C. C. Cartwright, John A. Jay and W. O. Johnson, of Chicago. A dividend was declared.

It is reported that the Shah of Persia has ordered several sets of the Constantini motor roller skates, which were recently described in the trade press. This recalls the time when Sir Mortimer Durand, the British Minister to Persia, introduced ice skates into Persia, when the Shah had his ministers fit them on and was very much amused by their pranks. Probably he will repeat the same joke when the motor roller skates arrive.

Considerable opposition has developed to the proposed rule for the Glidden tour, barring all cars weighing less than 2,000 pounds, and requiring all cars to be equipped with touring bodies and to carry four passengers. The rules will finally be decided on by the N. A. A. M.

The Ford Motor Company call attention to the fact that whereas a four cylinder motor may stop with the crank exactly in dead centre, in which case it would be impossible to start it on the spark, in a six cylinder motor one cylinder always contains a charge ready to act on the crank upon explosion, and such a motor can therefore always be started on the spark during a reasonable period after shutting it down.

Trade Personals.

George W. Dunham has been appointed chief engineer of the Olds Motor Works, succeeding H. E. Coffin.

A. W. Edwards has been appointed sales manager of the St. Anne Kerosene Motor Company, St. Anne, Ill.

Alfred Reeves has been elected secretary of the New York Automobile Trade Association, succeeding W. P. Kennedy.

B. Stanchfield, formerly with the Olds Motor Works, has purchased the interest of Dan Wurges in the firm of Wall & Wurges, Lansing, Mich.

Samuel A. Miles, secretary of the N. A. A. M., sailed on the Amerika May 10 for a visit to his old home in England, and an automobile tour through France and Germany.

Richard Bacon, Jr., formerly manager of the Chicago branch of the Studebaker Automobile Company, is now with the George A. Crane Company, 1208 Michigan avenue, Chicago, instead of with the Pardee-Johnson-Hamell Company, 1220 Michigan avenue, as previously reported.

New Agencies.

East Stroudsburg, Pa.—F. R. Porter, Rambler cars.

Pittsburg, Pa.—Fort Pitt Automobile Company, Oldsmobiles.

Grand Rapids, Mich.—Lubeck Automobile Company, Oldsmobiles.

Chicago, Ill.—Walden W. Shaw, 1532 Michigan avenue, Berliet cars.

New York City.—The Zim-Rock Motor Car Company, Smith cars.

Fall River, Mass.—John Williams, 464 Pleasant street, Reo and National cars.

Milwaukee, Wis.—Solliday & Co., Third and Wells streets, Queen cars (State of Wisconsin).

Garage Notes.

Jay Cook has opened a garage for electric vehicles at Long Beach, Cal.

C. D. Velie will erect a garage at 225 Clinton avenue, Minneapolis, Minn.

Solliday & Co. have opened a garage at Third and Wells streets, Milwaukee, Wis.

Frederick A. Clark is fitting up a garage at Main and Ninth streets, Zanesville, Ohio.

Roy Jones, W. T. Gillis and R. M. Miller are to build a garage on Second street, Los Angeles, Cal.

W. L. Nichols, an automobile dealer, has leased the eight story warehouse, which is in the

street, New York.

Middleton & Son, San Francisco, will open an office in Oakland.

The George J. Scott Motor Company, New York agents for the Glide cars, have moved to 1720 Broadway.

E. Charbonneau & Sons will establish a garage at Ironwood, near Hurley, Wis. They will handle Rambler and Pope-Toledo cars.

The recently incorporated Passaic Motor Car Company, Passaic, N. J., will open a garage at 147-151 Main avenue, in that city.

The Ludwig Automobile Company, 1335 West Susquehanna avenue, Philadelphia, have opened a branch office at 236 North Broad street.

The Mansfield Automobile and Supply Company are planning to establish a garage at Ashland, Ohio. They will handle the Cadillac cars.

A. S. Brown will open a garage at Mt. Royal avenue and Dolphin streets, Baltimore. Harry G. Broadbelt, formerly of the Motor Car Company, will be associated with him.

The Rockford Engineering Company will open a garage at 311 and 313 South Main street, Rockford, Ill. Eugene Hart and Walter B. Taylor are the proprietors of the company.

Trade Literature Received.

J. H. Bullard, Springfield, Mass.—Booklet, "The Bullard Speed Recorder."

Cadillac Motor Car Company, Detroit, Mich.—Catalogue of 1907 Model H Cadillac car.

Moline Automobile Company, East Moline, Ill.—Catalogue of 1906 models of Moline cars.

Albert Mans, "Les Lierres," Dieghem, Belgium.—Booklet of the "Amans" Pneumo-Suspension.

Morgan & Wright, Chicago, Ill.—Booklet, "Automobile Tires: Clincher, Dunlop and Single Tube."

Knox Automobile Company, Springfield, Mass.—Bulletin of Knox waterless express wagon, size D6.

White Sewing Machine Company, Cleveland, Ohio.—Booklet, "What People Say About the White Steam Car."

A. A. Allen, New York Manager Dayton Electrical Manufacturing Company, 220 Broadway.—Circular of Apple Ignition System for 1906.

Patents Issued April 24, 1906.

818,402. Pneumatic Tire Plug.—David Apstein, Bridgeport, Conn. Filed June 24, 1905.

818,460. Sparking Ignition Controlling Means for Explosive Engines.—Joseph S. Moreland, Rochester, N. Y. Filed April 21, 1904.

818,469. Detachable Drive Chain.—Leonard R. Rogers, Worcester, Mass. Filed August 22, 1904.

818,568. Tire for Vehicles.—Edward B. Sims, Western, Neb. Filed June 27, 1905.

818,612. Regulator for Gas and Petroleum Motors.—Henry Crouan, Clichy, France. Filed January 3, 1899.

818,646. Shock Absorber for Vehicles.—Robert P. Winsor, Providence, R. I. Filed September 5, 1905.

818,647. Shock Absorber for Spring Vehicles.—Robert P. Winsor, Providence, R. I. Filed September 5, 1905.

818,662. Slide Gear.—Herbert H. Buffum, Abington, Mass. Filed July 8, 1904.

818,734. Ball Bearing.—Eugene Blin, Aubervilliers, France. Filed October 22, 1904.

818,735. Means for Cooling Internal Combustion Engines.—Fred H. Bogart, New Britain, Conn. Filed April 4, 1905.

818,747. Variable Speed Friction Gearing.—Edward P. Cowles, Warren, Ohio. Filed October 4, 1902.

818,768. Electrical Controller for Electric Vehicles.—Karsten Knudsen, Chicago, Ill. Filed January 13, 1902.

818,771. Tire for Wheels.—Hans Maerker, Wiesbaden, Germany. Filed August 28, 1905.

818,815. Brake for Motor Cars.—Rasmus Buggé, London, England. Filed March 25, 1905.

818,853. Carburetor.—Louis Renault, Billancourt, France. Filed May 29, 1905.

Schultz, Hawkeye, Ia. Filed April 17, 1905.

818,898. Variable Speed Mechanism.—George W. Marble, Chicago, Ill. Filed December 7, 1904.

818,919. Roller Bearing.—George D. Scheiffler, Jackson, Mich. Filed September 22, 1904.

818,957. Elastic Vehicle Wheel.—Frank L. Harmon, Beverly, Mass. Filed August 17, 1904.

818,967. Automobile Steering Device.—Charles F. Jenkins, Washington, D. C. Filed October 19, 1905.

Review of Specifications.

810,783. Friction Clutch.—Jonathan D. Maxwell, Tarrytown, N. Y. January 23, 1906. Filed July 25, 1904.

A multiple disc clutch is the subject of this patent. The principal claim is:

"In a clutch, the combination with a driving and a driven shaft arranged in axial alignment with their ends abutting, a facing disc having an axial sleeve secured to the end of one shaft and forming a socket to receive the end of the opposite shaft, a series of discous plates mounted on said sleeve at one side of said disc, a longitudinally movable facing disc at the other side of said plates, a feather secured to the sleeve and engaging notches in the plates and movable disc, a yoke secured to the shaft opposite that to which the sleeve is secured and having outwardly extending arms provided with lateral ends extending longitudinally over said plates and discs, a second series of discous plates mounted on the sleeve between the first plates and discs and free to turn thereon and provided with notches in their peripheries to engage the ends of the yoke, flat springs secured to one face of each of the plates of the second series outside the peripheries of the first series and each engaging the adjacent plate of the series at its ends to force said plates apart, and means for moving the plates of one series into frictional contact with those of the other against the action of said springs."

810,869. Power Transmitting Device.—John Baragwanath King, Plymouth, England. January 23, 1906. Filed April 10, 1905.

The object of this invention is to provide for gradual change from one speed to another in differential gearing from independent gines running at different speeds, the variation of transmission is ... by varying the speed of one of the ...

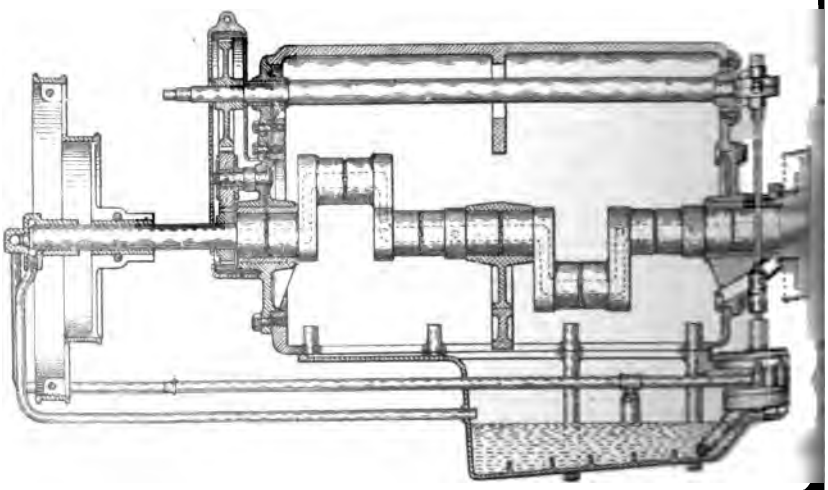
In carrying the invention into ... effect two engines are arranged ... side, with the shafts in line. The ... run normally at different speeds, ... rear engine, in order to balance ... engine, will run at one-third ... of it. As shown, the rear engine ... in direct line with the fore engine ... and parallel thereto is arranged the ... drive shaft, which may extend to the ... axle of the automobile.

The crank chambers of the respective gines are cast in one piece therewith ... intermediate chamber or gear box.

Fast on the rear engine shaft is the ... rier for the differential pinions, which ... with the differential pinion loose on ... said shaft. Meshing also with the ... is the main drive pinion of the fore ... Keyed to the pinion is a loose spur ... A second spur wheel, having the same ... ber of teeth as the wheel, is keyed ... rear engine shaft, and said spur ... mesh with the other spur wheels ... the same size and carried loose ... main drive shaft. Fast on the shaft ... carrier for the differential pinions ... mesh with pinions fixed to the spur ...

810,959. Oil System.—Howard ... penter Marmon, Indianapolis, Ind. ... ary 30, 1906. Filed February ...

The engine oiling system ... shown in the specifications of this ... consists of a modification of that ... in which the oil is pumped from the ... tom of the crank shaft to the ... bearings, the overflow returning ... crank case well. A gear pump ... the well is driven by gears and ... the half time shaft and delivers ... through a pipe to the front end ... drilled out crank shaft. An outlet ... vided at each bearing for its ... Provision is made for the return ... a second pipe of the excess oil ... to the crank shaft.



No. 810,959.

...THE...

Horseless Age

VOLUME 17 MAY 30, 1906 NUMBER 22

THE NEW YORK PUBLIC LIBRARY
ASTOR, LENOX AND TILDEN FOUNDATIONS

WINTON MODEL-K

Performs Heroic Service in Helping Earthquake Sufferers

Mr. W. P. LEVY, of San Francisco, writes, under date of May 8, as follows:

"Immediately after the earthquake shock on the morning of the 18th ult. I jumped into my Winton Model K and started for my office. On the way I was held up by Police Officer D. C. B. McCarthy and taken to Mayor Schmitz at the Hall of Justice, where I was impressed into the hospital service. I did duty for fifteen days.

"During the first two days of the conflagration I rescued at least fifty people, among them being the motorists' friend, Captain Gleeson, of the police department, who for the past year has had charge of automobiles in Golden Gate Park. The Captain was injured by a premature blast and was taken to the Mechanics' Pavilion, where I rescued him and took him to the Presidio Hospital. Upon my return I found the pavilion in ashes. To know that I had rescued the Captain, who has been the friend of every motorist in San Francisco, is a great pleasure to me.

"During the first four days and nights I did not sleep altogether three hours. My Winton was in constant use, and during the fifteen days' service I AVERAGED 150 MILES PER DAY, OR A TOTAL OF 2,250 MILES. DURING THE ENTIRE TIME MY CAR WAS NOT WASHED, I DID NOT SPEND TEN MINUTES ON ADJUSTMENTS, and the only thing I have to regret was that I robbed your demonstrating machine, which I found opposite your garage in Jefferson Park, of a tire, for which I hereby apologize.

"I question if any other car of any make or price in this city has done as good work as mine, with as little attention, and you are at liberty to send any incredulous persons to me, or to members of the Police or Red Cross Department, of this city, whose names I will gladly furnish upon application. My address is 158 Tremont Avenue."

The WINTON MOTOR CARRIAGE CO.

Licensed under Selden Patent. **CLEVELAND, OHIO, U. S. A.**

Winton Branch Houses in New York, Boston, Philadelphia, Pittsburg, Chicago and London. Winton Sales Agencies in all important places.

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to be able to remove or apply truck tires in your own plant without machinery or complications.



Diamond

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For Motor Trucks and Commercial Cars ARE MADE THAT WAY

Simply drive them on or off with a mallet, and tighten or loosen flanges with a wrench.

Except in cases of extraordinary accident, however, these tires do not require removal after being applied.

The only scientifically correct tire ever offered for the purposes named.

Here are some points in which it excels all others:

Enormous Traction.—Giving the most substantial grip.

Rigidity.—Utterly impossible to creep or come off.

Simplicity.—Base and attaching device are one and the same.

Twin and triple types used for tires above five-inch size.

Economy.—Phenomenal wear at low cost per ton-mile.

Scientific Balance.—Base and tread proportioned rightly for their work.

Quality.—DIAMOND.

WRITE FOR SPECIAL CATALOGUE.

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Perfect Spring Action

is given by the **Vestal Friction-Band Shock Absorber.** It does not act on the springs under ordinary conditions, but allows a movement of two inches between axle and body before it begins to check the compression or rebound.

This gives perfectly free and comfortable spring action on smooth roads—on rough roads, the band friction brake comes into action and checks the violent compression and recoil.

If you value comfort, write for literature and prices.

VESTAL SHOCK ABSORBER COMPANY

5917 Baum Street, East End **PITTSBURG, PA.**

Put a LEA "*Speedistimeter*"

on your car and always have right before you a accurate record of



speed, distance and time of day

Speed recorde total and tri Odometers and day Chelsea aut clock combined in waterproof bras case.

Guaranteed accura and lasts as long as t car.

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Garages in Great Britain.

By Victor Hart.

Garages and repair shops in Great Britain are nearly all in the transition stage, mainly because the majority have been developed from bicycle repair shops. Up to the middle of the year 1900 the ownership of automobiles was confined to comparatively few enthusiasts, who were wealthy enough to possess accommodation upon their own premises for their cars, and these machines being nearly all of French origin any replacements required were procured from France and fitted on the premises, while everyday repairs were usually carried out by the owners themselves. The Automobile Club trials of 1900 were mainly responsible for arousing interest in the modern method of road locomotion. The British motor industry as a whole really dates from that year. Trained "engineer mechanics" who understood even a little of car construction were as difficult to find as the proverbial needle in a haystack, with the result that every little bicycle repairer, both in town and country, hung out a big sign with the word "garage" written upon it, even though ninety-five out of every hundred had but the vaguest notion of automobile principles, and most of them had never even handled a steering wheel. So it came about that the car repair business gradually fell into their hands, and as this developed the bicycle trade was pushed out to make room for the more remunerative business.

The bicycle shops were but ill equipped for the work, and the premises being usually in back thoroughfares, where rents were low, were hardly the places which would accord with present day ideas in respect to accommodation. As a rule, the only extra provision made for the reception of cars was to widen the front door, and in occasional rare instances to put in a new shop front. As the multiplication of cars brought along more trade, the adjoining or back premises would be rented, with the consequence that most of these places are inconveniently situated for access from the street, are subject to bad fire risk, and if a car has to be moved in or out several others must also be moved. The difficulties surrounding garage accommodation in the larger towns are due to many causes; buildings in main or wide thoroughfares capable of housing many vehicles and having a clear run from end to end without supporting pillars are few and far between, and the rents are almost prohibitive. If a ground floor is desired to be rented with the idea of making alterations to suit it for automobiles, the whole of the building must be taken on at least a twenty-one years' lease, with the risk to the renter of himself letting the upper portion for offices, etc., and with the stipulation that at the end of the term the premises must be restored to their original condition. Even where the option of determining the lease at periods of seven, fourteen or twenty-one years is given, the placing of the building in a condition of *status quo ante* is invariable. Save in rare cases the men who run garages are not capitalists, nor can they find financial backing, and thus the statement made above, as to "transition," holds good.

Even in London, large as it is, buildings which have been especially erected for garage purposes can be counted on the fingers of one hand; while of others which have been altered so as to adequately deal with the housing and repair of a large number of cars, twelve to fifteen would be an outside reckoning. Nearly all the so called garages in London can only find room for from four to twelve vehicles, and because of the high rents which prevail the charge for housing only, without washing down or other accommodation, is usually $2.50 to $3 per week; therefore, men with moderate incomes who own light vehicles usually put them up in the stable of some local tradesman such as the baker, butcher or green grocer, for about $1 per week. Except in

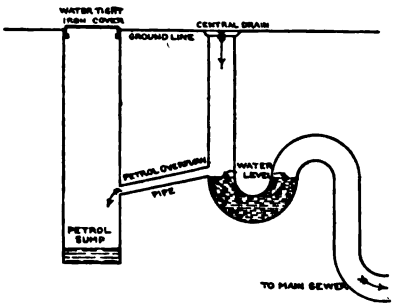


Fig. 1.—Method of Disposing of Waste Gasoline.

the central portion of London—and this remark equally applies to all provincial towns—houses (dwellings) renting at $300 per year and upward usually have sufficient space in the garden at the back or front for the erection of a motor shed. Livery stable keepers are gradually awakening to the business automobiles will bring, and some of them offer housing accommodation only at very high rates. Some firms, such as Friswell, Farman Brothers, etc., who originally conducted mainly a garage and repair business, have now practically discarded the first named to allow for the immense growth in the sale of vehicles, it being far more profitable to have the room for something upon which a big profit can be quickly realized than to have a car going in and out at all hours, and which at the end of twelve months will not have produced as much cash as the new car will in as many days.

Motor omnibuses are slowly but surely displacing horsed vehicles in London and elsewhere, some 350 running in London, and about a similar number in other large towns, and here again it has been largely a question of endeavoring to utilize existing stabling and sheds, rather than that the companies concerned should spend money on special buildings. In the illustrations annexed to this article it will be seen how fully this contention is borne out, and only where companies have been specially floated with large capitals, for the exploitation of passenger carrying, has money been spent for the erection of proper buildings. Gardens, railway arches, old warehouses, etc., have all been pressed into service, so that annual charges for rent can be kept down to the lowest limit. For the reasons thus given at length the descriptions which follow mainly concern accommodation for omnibuses. The large number of wagons for goods carrying purposes (amounting to a possible total of 800 at the moment of writing) are iuvariably housed on the premises of the firms who work them, and when repairs are needed these are effected on the spot by some of the manufacturers' workmen sent along for the purpose; or else, if the repairs are too big to be tackled with the petty fixed tools there, the vehicle is either taken to a general machine shop or sent back to the maker.

Precautions Against Fire.

No special conditions have yet been imposed on garage proprietors, public or private, with respect to fire possibilities, but there is no doubt that in London the London County Council (which is the controlling authority for the erection of buildings and the prevention of fire for an area of some 8 to 10 miles radius from the central point at Charing Cross) will seek Parliamentary powers in the near future to bring motor garages more directly under its supervision. In a new garage just completed, and the plans for which had to be passed by the London County Council, the owner was compelled to pave the whole of the floor with fireproof material and to arrange the floor at the entrance in such a way that in case of fire no lighted gasoline could flow out; this was effected by keeping the floor dead level to within some 4 feet of the door sill, and gradually sloping upward to the latter, with a similar slope on the exterior, so that the bottom of the door stands 4 inches above the floor level.

There is at present no regulation which prevents any quantity of gasoline being washed down into the sewers, but there is reason to believe that something will be framed to overcome this possible danger to life and property. At the establishment just mentioned this has been ingeniously provided for, and having proved successful in its purpose, the scheme will doubtless be embodied in any future enactment. The designer terms his device a "gasoline trap"; all cars are washed down on a concrete floored space outside the main garage walls, the four sides all sloping to a central drain; taking advantage of the well known fact that the specific gravity of gasoline is higher than that of water, and that it consequently floats on the surface of the latter, a branch is taken off just at

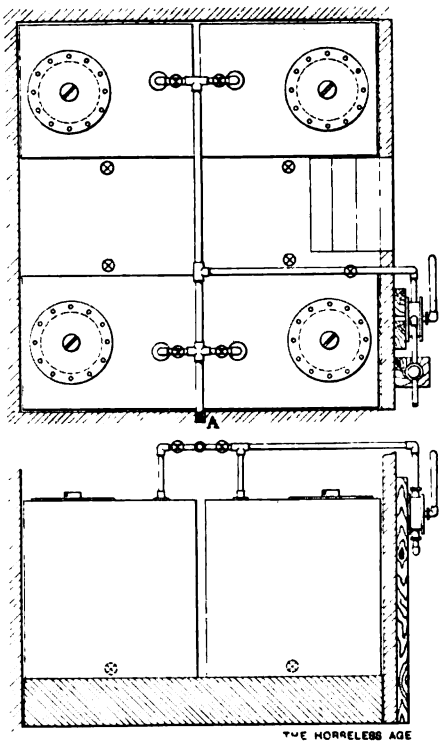


FIG. 2.—GASOLINE SUPPLY.

the top of the water level in the S trap below the vertical drain, and this branch is sloped down gradually to a sump, which is placed several feet distant from the central drain; a vertical shaft is taken down from the floor to the sump, and is covered in at the floor level by a watertight iron plate. The sketch in Fig. 1 will make the construction quite clear. From a large number of tests which have been made it has been proved that when quanities of gasoline and water have been agitated together and poured down the central drain at least nine-tenths of the petrol has been recovered from the sump, and of even such a small quantity as 1 pint of gasoline mixed with 10 gallons of water the same proportion was recovered.

The only fire precautions seen in garages generally are buckets of sand, standing in out of the way corners, and a few chemical fire extinguishers of the well known bottle variety, hung in racks upon the walls. Every motor omnibus in London now carries one of these chemical extinguishers conveniently placed within reach of the driver, and these have been the means of saving a number of vehicles from total destruction. Owing to the great increase in the number of places where gasoline is stored or used in London, the L. C. C. has recently given instructions for all the fire brigade stations to keep quantities of sand ready for instant use, and in addition stocks of sand are to be kept for fire extinction purposes at the large number of depots where the garbage and sprinkling wagons are stored, so that the firemen will not have far to go, in whatever quarter of the city a conflagration may occur.

The conditions under which garages have been gradually established have resulted in many quite unsuitable buildings being used, some of them having dwelling houses above them and others being carried on in wooden erections sandwiched in between rows of shops and business premises. The governing authorities are hard to move where vested interests are concerned, but it is certain that power will be given to gradually bring these danger spots within control, and such businesses, when carried on for profit, will have to be conducted in absolutely fireproof buildings. Public opinion in Great Britain is wholly against interference with what is termed "liberty of the subject"; in other words, privately owned and housed automobiles will continue to be stored in any kind of shanty the owner may think fit, subject only to the local building regulations.

GASOLINE STORAGE.

The Home Secretary (one of the principal members of the Government) has the power under what are known as the Petroleum Acts of Parliament to issue any regulations for the storage of petroleum or its products, of which, of course, gasoline forms a branch. When the 1903 motor act was passed certain rules were issued and are very rigidly enforced, by which the storage of gasoline is regulated. Any person not selling or using gasoline for profit can store on his premises up to a total of 60 gallons in 2 gallon cans, provided it is placed in a metal or brick built receptacle, situated at least 20 feet from a dwelling, and such storage place must be properly ventilated. Local authorities are given powers of inspection to see that the act is observed; but so far as private gasoline storage is concerned, the regulations are more honored in the breach than in the observance, and the writer has not yet heard of a prosecution. No license fee is payable where gasoline is stored for private use and not for sale. Where gasoline is stored for sale, in any part of a district where there are dwelling houses or business premises, the same conditions as to keeping in 2 gallon cans and in a separate storehouse apply; a fee of $1.25 is payable for a license, which is renewable annually. But the quantity which can be stored for sale rests entirely with the inspector or similar official representing the local authority, as much as 300 gallons being permitted in some districts, in 2 gallon cans. Where larger quantities are necessary, as in the case of some of the large omnibus companies, up to as much as 4,000 gallons has been allowed. In the latter case, the tanks for storing the gasoline in bulk must be placed under ground, in what practically constitutes a concrete vault, and with suitable safety valve for releasing any pressure of gas that might be accidentally generated.

Fig. 2 shows a plan in elevation of a typical set of storage tanks in an omnibus garage; the fuel is pumped in from a horsed tank wagon through the inlet A, and can reach either of the four tanks, each of a capacity of 250 gallons, by opening one or other of the screw-down valves; for filling the tanks of the vehicles a pump is placed in some suitable position and can draw off from either tank in the same way. In garages in thickly populated neighborhoods, where it is a physical impossibility to provide a storage 20 feet away from the building, permission is granted to put the fuel within the building; in such cases very stringent conditions are imposed, and only separate 2 gallon cans are allowed, with a limit of 60 gallons; the storage place must be sunk into the ground at the very lowest place in the building and must be entirely enclosed, top, bottom and sides, with a fireproof metal sheathing. The tank which is thus formed to hold thirty cans must have a hinged cover, and always be locked immediately a can is removed.

The penalties for any infringement of the specified terms of any particular license to store gasoline are very severe, and fines up to $400 can be imposed. The inspectors

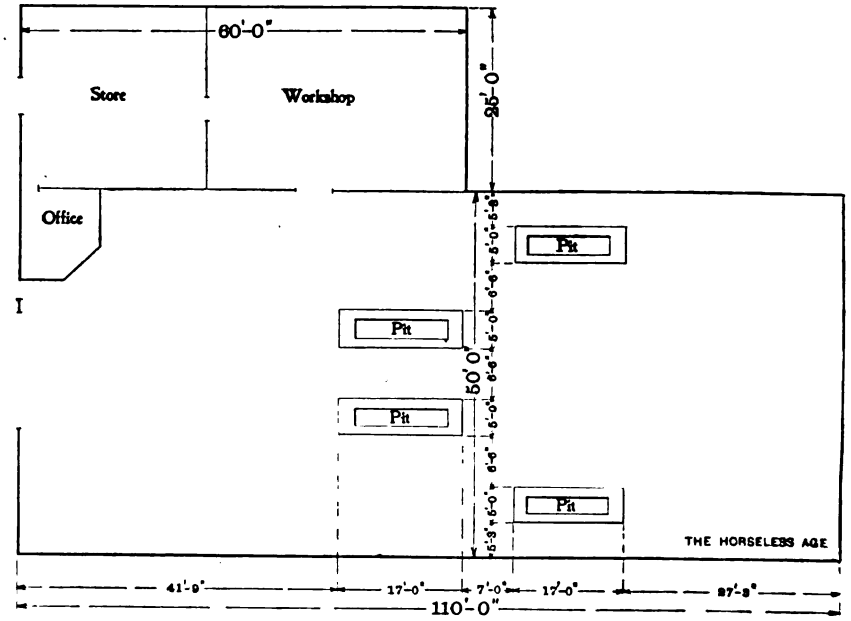


FIG. 3.—PLAN OF LONDON GENERAL OMNIBUS COMPANY'S GARAGE.



FIG. 4.—INTERIOR OF LONDON GENERAL OMNIBUS COMPANY'S GARAGE.

have power to visit every corner of any place where gasoline is stored, without previous warning, at any time during business hours. The inspectors are usually well educated men who are paid a sufficiently good salary to place them above the temptation of bribery, with the result that London may be considered better protected from gasoline fire dangers than any other city in the world. As proving the efficacy of the elaborate precautions, only roughly indicated above, a particular instance may be cited. The premises of the Ariel Motor Company in Long Acre, London, were entirely destroyed by fire in the middle of 1905, the cause of the fire being attributed to a lighted match thrown carelssly among a heap of oily waste. An underground storage for gasoline was used in the basement (into which the whole building had practically collapsed); when the site was cleared for rebuilding a month later the store was found to be quite intact, and the few cans of gasoline therein still held the full 2 gallons each.

GARAGES FOR PUBLIC SERVICE VEHICLES.

The tremendous expansion in the use of motor omnibuses in London has compelled the different companies to erect special buildings, and the one belonging to the London General Omnibus Company was only completed in September last, and is situated in one of the northwestern suburbs of the city. Fig. 3 is a plan of the building and Fig. 4 gives a view of part of the interior. The frontage is 75 feet and the main building is 50 feet wide, with a length inside of 110 feet, accommodating twenty-four double decked vehicles. The roof is supported on three heavy steel girders, carried from wall to wall and resting on steel box columns; half the roof is glazed and half slated, and there are a large number of windows in every side wall, giving ample light in the daytime. Eight long lines of smooth stone are laid down for the wheel tracks, and these stones are whitewashed every day, the space between the stones being paved with blue bricks. The vehicles are usually backed into the garage so as to be able to be driven straight out each morning, and the use of whitewashed stones is to enable the drivers to keep in the correct track without being put to great trouble and without inadvertently colliding with another omnibus.

By the side of the main garage is the superintendent's office, and alongside is the store for spare parts and tools and the workshop. Tires, wheels, lubricating oil, grease, etc., are also kept in the store, which is in charge of a man who is responsible for the valuable goods therein, the spares held in stock alone being valued at $6,000. In the workshop are a large screw cutting lathe, a milling and shaping machine and a vertical drill, with a full equipment of smaller tools for executing the largest repairs. The tools are driven by a 6 horse power electric motor.

The garage staff comprises a foreman, one turner, three fitters, storekeeper and clerk for day duty, and all night there are a foreman and two or three repair hands. These men have only to deal with the mechanical parts of the vehicles, a separate staff of cleaners being employed to wash down and keep clean the exterior and interior of all the vehicles. The company owning this garage has a large number of depots in every part of London for housing the 700 odd pair horsed omnibuses it owns, together with the 8,000 horses to run them; as new motor omnibuses are purchased the depots will be gradually converted for the more up to date traffic.

The garage just described is exceptional because of the conveniences it possesses, both in respect to access from a wide thoroughfare to an interior quite free from columns or projections, and the amount of head room for space to the roof. The next plan is that of a converted horse stable and coach house used by a provincial omnibus company at Torquay. This building houses eight single deck omnibuses, and the arrangements for storing are well served in the building. Fig. 5 sufficiently explains the details, but there is one feature which needs special mention. That part of the building nearest the top in the plan is partitioned off from the rest by corrugated iron, and is used only for repairs; an exceptionally long pit extends for nearly the full length, it being 47 feet long, 3 feet 9 inches side to side, and with a depth of 4 feet 10 inches. The top of the pit is edged round with strips of iron, raised a few inches from the floor, the front end of the strips meeting together so that the wheels are automatically guided into position to bring the chassis central over the pit. This is a particularly glaring example of how not to do it, because the pit is too deep by some 10 to 12 inches; moreover, if an omnibus is at the far end from the door, and there are others in front of it over the pit, the latter must be taken right out into the street before the first one can be moved. The arrangement of the pits in separate tracks, as in Fig. 3, is far more convenient and involves no disturbance of the other vehicles.

A makeshift form of garage is that used by another provincial company at Bath, this being erected in what were originally vegetable growing grounds attached to a large house in the centre of the town. This building is constructed of corrugated iron attached to a skeleton iron framing. The plan is shown in Fig. 6, exterior view in Fig. 7, and interior in Fig. 8. The exigencies of the long, narrow building compelled the planning of a pit much on the lines of that at Torquay, as shown in Fig. 8. The plan shows that there is plenty of room for future extensions, and when

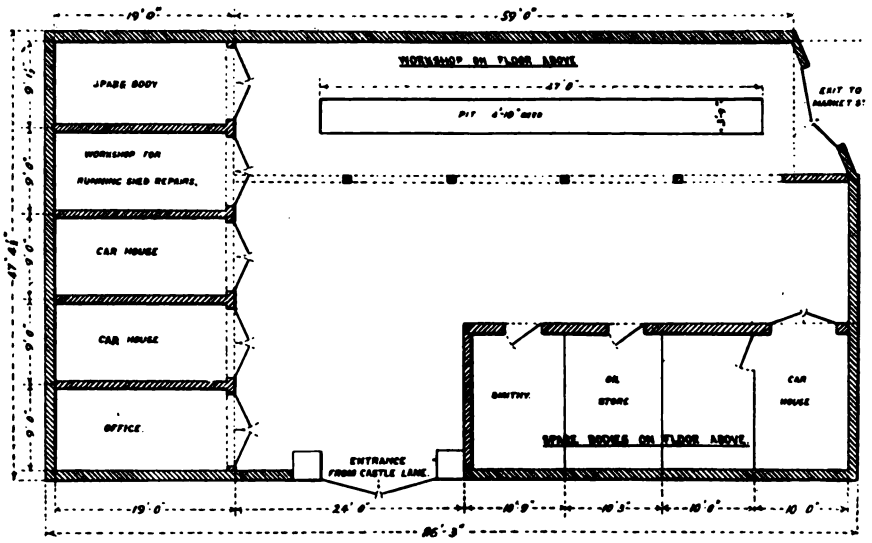


FIG. 5.—PLAN OF TORQUAY BUS GARAGE.

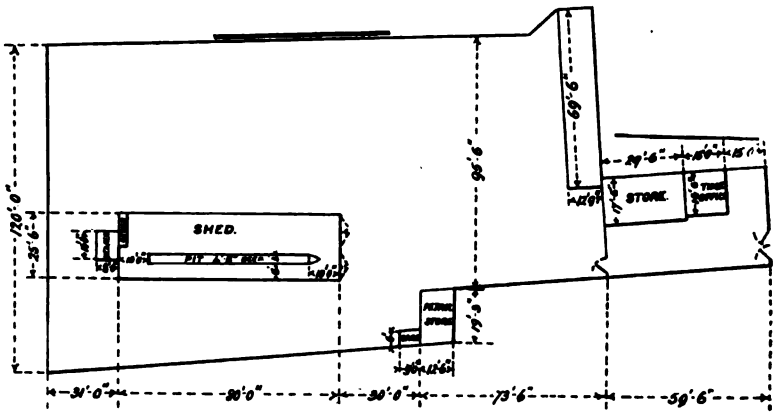


FIG. 6.—PLAN OF BATH OMNIBUS COMPANY'S GARAGE.

these are made the pit will doubtless be altered. The interior is heated by hot water pipes connected to a heater outside the building, so as to obviate any mishaps from burst water jackets or radiators in cold weather. The building is lighted at night by incandescent lamps, as are the store, office and a converted stable seen in the right hand corner. The gasoline store holds 1,000 gallons, and to prevent any possible risk of fire is not artifically lighted; if access is wanted at night-time, a Davy miner's safety lamp has to be used. In Fig. 8 examination will show small iron girders crossing the pit at regular distances, these being placed in this position for jacking up wheels or holding up any part of the chassis when a vehicle is under repair. They have been found extremely convenient, and form a feature that is worth copying.

A plan is given in Fig. 9 of a garage belonging to another London omnibus company, and this is interesting because the place was originally given up entirely to horses, but these were cleared out some nine months ago. The place is 177 feet long, and varies in width from 27 feet 6 inches at the entrance to 80 feet at the rear. The company who own this garage possess 6,500 horses, and in addition to some 200 omnibuses a multitude of all sorts of horsed vehicles which are hired out. Thomas Tilling, Limited, the company referred to, were the first bus firm to appreciate the money earning power of passenger motor vehicles, and the garage in Fig. 8 is perhaps only a stepping stone to much larger things. Thirty-five double decked omnibuses can be stored here, and as it fronts on two streets there are good facilities for moving the vehicles in and out without disturbing others already in position. The smaller places on the plan were there before the alterations were effected, and they have worked in exceedingly well for the general scheme. At the top of the plan will be observed the gasoline store, which is sunk below the floor level; next to it is the lamp room, an important feature of the business, as all the vehicles which run in public service are lighted at night by compressed acetylene gas. Steel cylinders are carried below each vehicle to supply several burners, and these cylinders are changed and recharged every three days. In the store the usual assortment of spare parts, tires, etc., is carried. The space marked "drawing office" on the plan is not usually found in similar garages, but the reason for installing it is that all repairs, big or small, are executed on the premises to proper specifications, and not by rule of thumb, and the cost of keeping a draughtsman has been more than repaid in the saving of time, when the mechanics can get out the jobs just as if they were machining parts in a regular factory.

In the smithy is installed a 60 ton hydraulic press for fixing and removing the solid rubber tires from the wheels, the pumps for operating being driven by an electric motor. This press has been of much use, in addition to its ordinary work, in taking off the metal collars around the fronts of the wheel hubs, wheels off shafts, etc. In the smithy are forges, anvils and all the requisites for general ironsmith's jobs; a gas oven for annealing and case hardening completes the plant here. A large stock of spare road wheels is always kept ready in case of a breakdown, these wheels being stacked each in a separate rack along one side of the smithy. Part of the centre of the garage is occupied by the clerks' office, superintending engineer's office and three more stores for small parts which have been made on the premises, and for such things as lamps, cushions, rugs and the hundred and one things which must be purchased outside.

The machine shop is exceptional, measuring 27 feet wide by 60 feet in length, and has a really fine plant of machine tools, which are being added to as occasion demands. Two other garages of much larger capacity are being erected by Tillings in the immediate neighborhood of the one described, and it is intended to deal with repairs and replacements for 100 omnibuses in this machine shop. Without attempting to catalogue all the fixed tools, some of them may be noticed as showing that the business has been undertaken in a thoroughly practical manner. There are several lathes, including a 10 inch Lang, a 6 inch Lang and an 8½ inch Bradford; there is a Cincinnati universal cutter grinder, a No. 3 Cincinnati double universal milling machine for gear wheels, pinions, etc.; a 26 inch upright Barnes drill, a Hills twist drill grinder, a Star power hack saw, and a splendid Sigourney sensitive drill, emery grinders and a brazing hearth. The tools are all electrically driven, and the manner in which they have been put down reflects credit upon the engineer.

The small store next to the machine shop is used for all the expensive small tools, twist drills, milling cutters, jigs, etc., and to provide that they are not lost each man in the tool shop has a number of brass checks stamped with his name. Say, Jones wants a reamer; he applies to the storekeeper, the tool is issued, and in its place the brass check is put. The storekeeper,

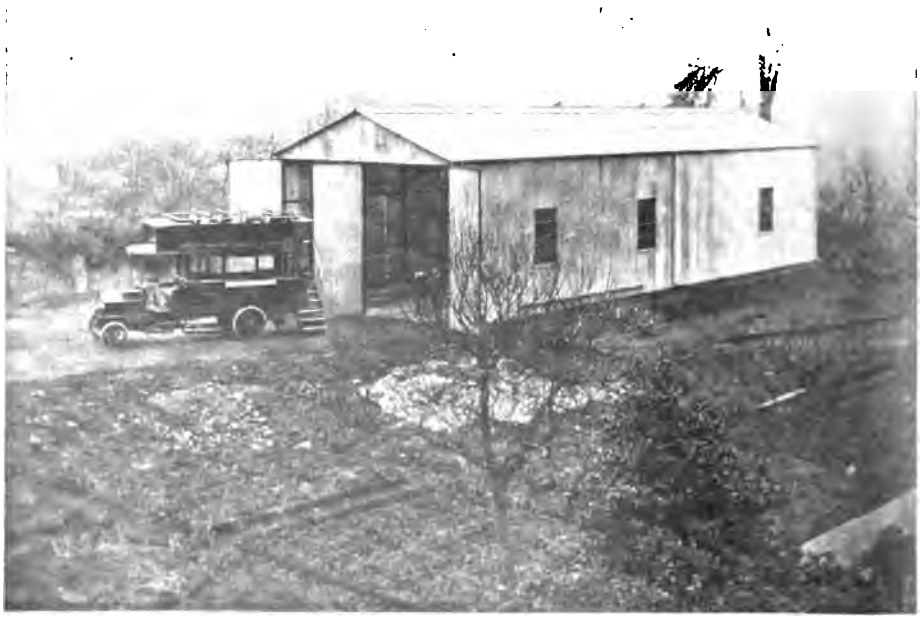


FIG. 7.—BATH OMNIBUS COMPANY'S GARAGE.



FIG. 8.—INTERIOR OF BATH OMNIBUS COMPANY'S GARAGE.

each evening after the men have returned the tools and left the building, is thus enabled by a glance at every shelf or rack to see if any are missing. There is an upper floor over part of the machine shop used for light metal work, such as the repair of radiators, lamps, bonnets and body work, much of the latter being metal. When it is remembered that this expensive tool equipment is only used for the vehicles owned and used by the firm, and that no outside work is undertaken under any circumstances, it can be appreciated that running public service omnibuses needs a considerable amount of organization.

Another country garage at Worthing is worth description, because the arrangements vary so considerably from those usually found in places designed for the same object. Fig. 10 is a plan which shows that of the total length from back to front of 85 feet 6 inches, 64 feet is devoted to the actual storage of the vehicles; the square portion on the right is reserved for future extension, the left hand portion being divided into two long bays divided by a central raised path; the whole space is paved with blue bricks, and the long raised path is most convenient to enable the workmen to carry out their duties on a dry space when the radiators are being emptied or the omnibuses washed down. While convenient in some respects, such long gangways, which are in the nature of railway tracks, necessitate considerable movement of the vehicles, if one has to be moved in the morning out of its due order.

One of the latest of the many omnibus companies formed to work motor vehicles for passenger traffic is the London Power Omnibus Company, Limited, with an authorized capital of $1,000,000. This company has just completed the most extensive omnibus garage yet erected in Great Britain, accommodation being provided for 200 vehicles. A plan is given in Fig. 11. The main buildings and the cleaning yard occupy a space of 460 feet in length by 90 feet wide, and there is a right angled extension at the end which makes the width at that spot 240 feet. The principal feature is the huge running shed, which measures 250x90 feet, and will hold 100 double decked omnibuses, the floor being entirely clear of columns or obstructions of any kind, the roof being a single gable span carried from side to side on steel lattice girders. One end is closed by a brick wall, but the other is practically all doors, to enable the vehicles to be easily run in and out. There are also four large doors in the side of the building. Special attention has been given to the heating and ventilating of the huge garage, the latter a feature of particular importance when it is remembered that very often a large number of the engines will be started up for testing purposes in the morning prior to the commencement of the day's business. Were the exhaust gases not drawn off from the interior of the building by some mechanical means, there might be a possibility of asphyxiating the workmen.

For the ventilation and heating a large boiler house has been installed in the basement containing an American "Ideal" boiler, which has an automatic arrangement to close the damper as soon as the steam pressure approaches 10 pounds, at which the safety valves are set. Along the roof is carried a huge ventilating and heating pipe with branches to the sides, each branch having a valve to separately close it; on the floor a large ventilating fan, driven by a 6 horse power electric motor, drives air into the mouth of the ventilating pipe; the air is drawn over a number of steam pipes in direct communication with the boiler below, any one of the steam pipes being capable of having its suppily cut off so that the temperature can be regulated. The steam will only be needed in winter, and in summer the continuous supply of cool air will be an undoubted advantage; openings are provided at frequent intervals for various upcast shafts to be led thereto which will serve to draw off any exhaust gases from the interior of the shed. The floor is constructed of granolithic pavement, with small channels dividing it into one foot squares, which are all led into a number of drainage sumps.

At night time twenty-six large arc lamps light the interior, around the walls are a large number of plug sockets for electric handlamps, and similar sockets are fitted on the tie beam of every roof truss to enable the special staff of night workmen to

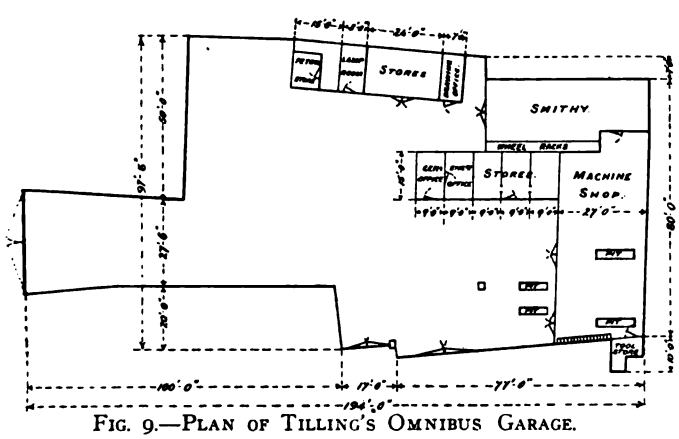


FIG. 9.—PLAN OF TILLING'S OMNIBUS GARAGE.

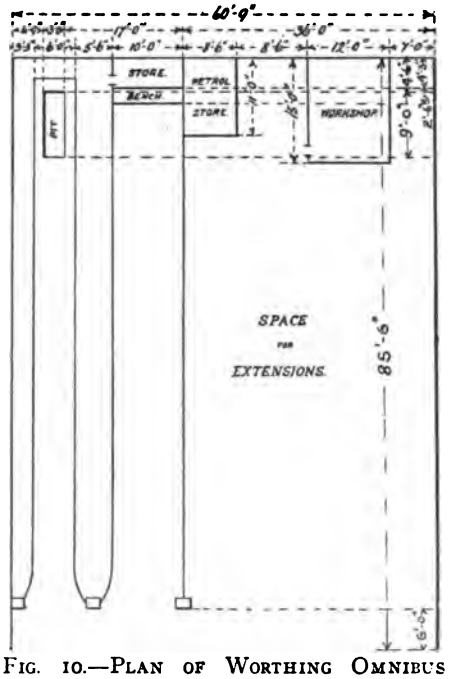


FIG. 10.—PLAN OF WORTHING OMNIBUS GARAGE.

clean and examine the upper part of the vehicles in comfort. The repair shop is at one end of the space occupied and is divided from the garage proper by a cleaning yard 144 feet long. The repair shop measures 60 feet by 90 feet, has six large pits and is partitioned off at one end for the machine shop. Round the side of the cleaning yard are the administration buildings, stores, caretakers' houses and accumulator house; the latter is 90 feet long by 77 feet wide, and is fitted up with a large number of charging boards and resistances for charging the ignition and lighting accumulators, the current for this purpose being supplied by an outside company at a low power rate, which works out about 8 to 9 cents per kilowatt hour. In the cleaning yard, which is paved with the same material as the garage, a number of standpipes are placed round the sides with means for attaching hose pipes, so that a vehicle in any part of the yard can be quickly washed down.

To deal with the tremendous quantity of gasoline which will eventually be needed when all the omnibuses ordered get to work, a special gasoline filling yard forms part of the design, this being found in the right angled extension before mentioned. The company holds a license to store 4,000 gallons, and by the end of 1906 at least half this quantity will be consumed every day. Two large underground tanks, each with a capacity of 2,000 gallons, have been installed, and are filled from tank wagons daily; in one corner of the yard is a circular measuring tank, and by the side of it a hand air pump, which delivers compressed air into one or other of the underground tanks and forces the petrol up into the measuring tank; it then flows by gravity to an underground main having twelve pavement box connections, to which flexible lengths of metallic tubing can be screwed on to direct the petrol into the tanks of twelve omnibuses at a time. One side of the petrol yard is given up to a large messroom for the drivers, together with ample lavatory accommodation. It is essential to keep this yard quite clear, and yet it is necessary that the centre, as well as the sides, shall be brilliantly illuminated at night. To get over this difficulty tall steel standards have been erected at the sides, between which are stretched steel cables to support a number of arc lamps, which can be moved along the supporting cables to any desired position by means of wheel pulleys for each lamp.

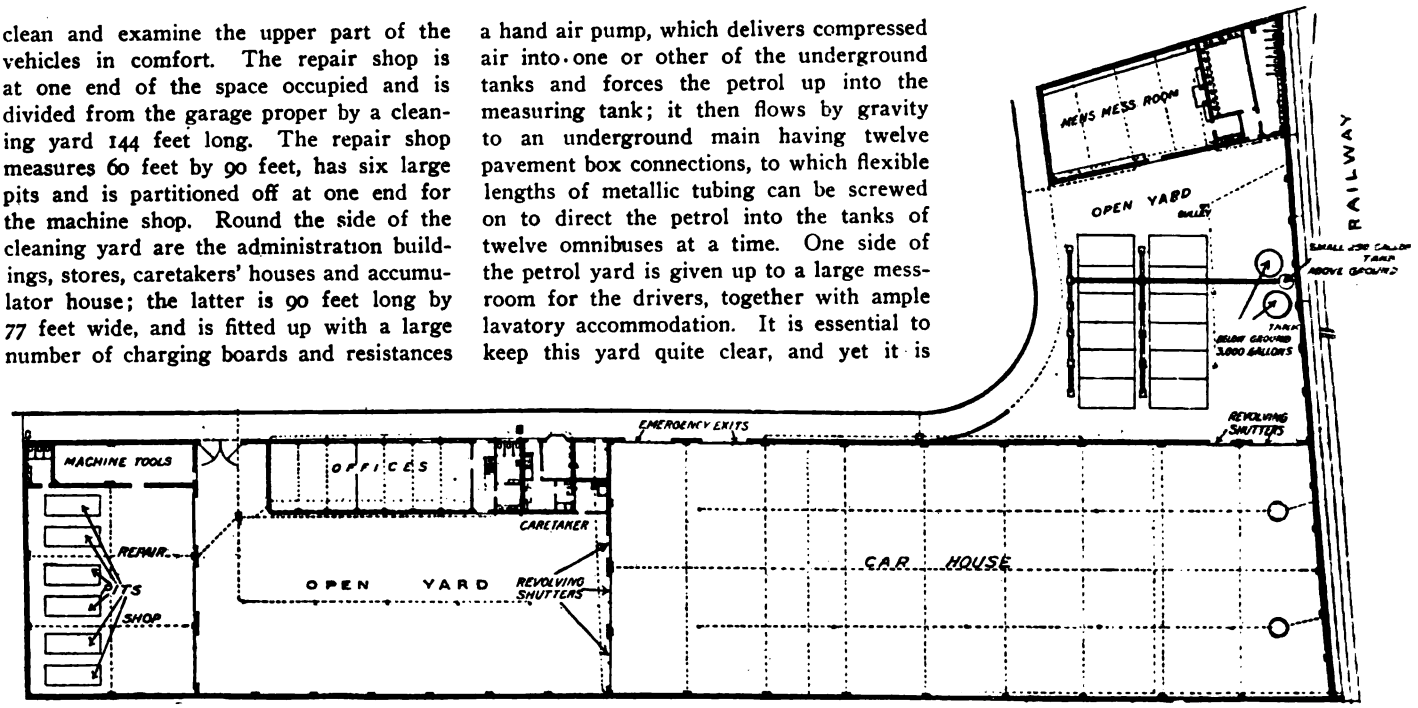
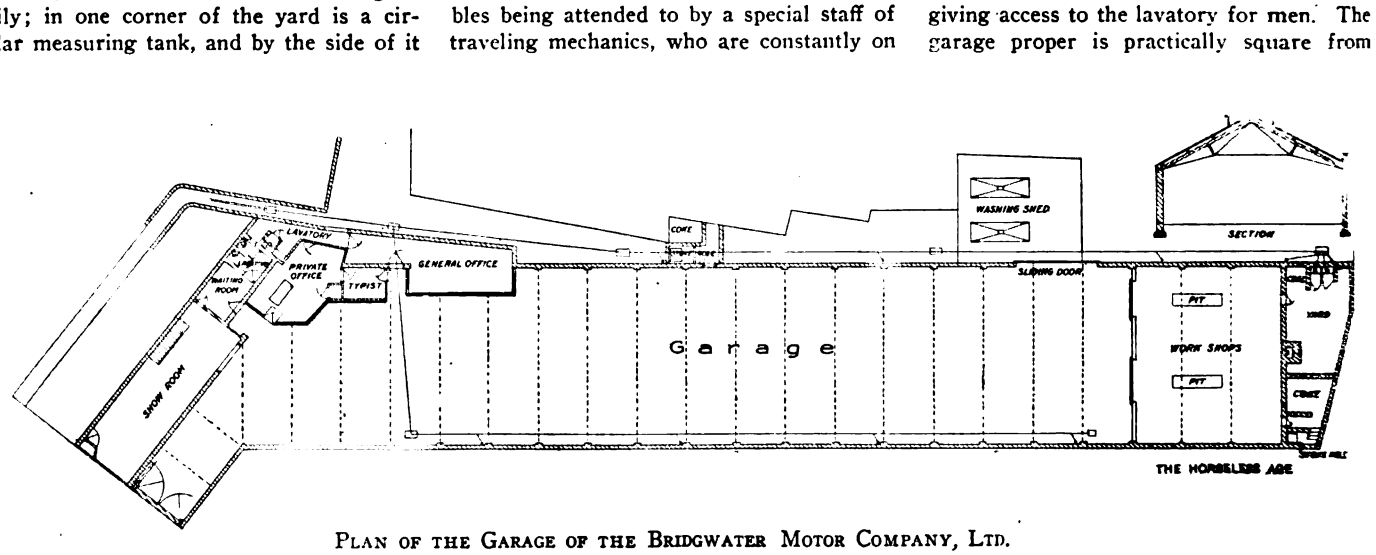


FIG. 11.—PLAN OF GARAGE OF LONDON POWER OMNIBUS COMPANY, LTD.

As in all other public service garages, nearly all the work in respect to cleaning, overhauling, adjustment and small repairs has to be effected between the time when the vehicles cease running, at about 1 to 2 a. m., and the commencement of each day's running, at about 7 a. m., and consequently quite an extensive night gang of mechanics and cleaners have to be employed; in fact, nearly double the staff that would be needed if the work were carried out in normal working hours. The drivers are quite a distinct class, who have only to drive, all adjustments and roadside troubles being attended to by a special staff of traveling mechanics, who are constantly on the move in a special breakdown vehicle over the routes which the omnibuses cover.

TYPICAL PUBLIC GARAGE.

One of the finest garages in Great Britian for privately owned cars is illustrated by the interior view shown in Fig. 12, and is owned by the Bridgwater Motor Company, Limited, in a comparatively small town in the west of England. The length is over 300 feet, and the widest portion at present covered by buildings is 72 feet. Facing the street there is a very fine showroom for new cars measuring 48x16 feet; adjoining this is a handsomely furnished waiting room for ladies with special lavatory accommodation; next the waiting room comes the manager's office, which appears to the immediate left of the photograph, and this projects slightly into the main garage to enable a full view of everything to be obtained. Next to the manager is the typewriter, and then a large office for the clerks. Just here is a separate passageway giving access to the lavatory for men. The garage proper is practically square from



PLAN OF THE GARAGE OF THE BRIDGWATER MOTOR COMPANY, LTD.

end to end; the workshops and pits are at the end farthest from the street, and are divided from the main building by screens extending from side to side and having glazed sliding doors; all the car washing is done in a separate building to which access is gained through a pair of sliding doors close to the workshop. The whole of the building is heated by hot water pipes, the water being heated in boilers contained in a small building by the side of the main garage. Cars for repair can be taken straight into or out of a side street directly to the workshop across a long driveway, which will eventually be built upon. A large amount of space is available for later extension of the garage, and business already calls for the getting out of new plans. This building is a good specimen of what an up to date garage should be, being light and airy, having a fireproof floor, and everything being on one level.

In this description of English garages no attempt has been made to describe special appliances or methods, for the simple reason that they do not exist; except, maybe, the special gasoline storage tanks, everything else has been but an adaptation of methods and means which have been used for horsed vehicles. The future may perhaps develop better processes for dealing with mechanically moved vehicles, and although it may be thought that no advantage is taken by British garage owners of recent inventions, it must not be forgotten that the majority have only been evolved from establishments which have hitherto dealt only with horsed traffic. In one respect only can British garages be said to be really in advance of those elsewhere, and that is as to precautions against fire, as pointed out in an earlier part of this article.

A Modern Italian Garage.

An impressive garage building, which will be fitted out with all modern conveniences, is at present being erected in Turin, Italy, by L. Storero. It is located on the Corso Massimo d'Azeglio, is two stories high and has storage capacity for 100 cars. A large room in the front portion of the building is used as show room, as Sig. Storero also conducts an agency business. The leading make represented is the Fiat, made at Turin, and a large stock of repair parts for these cars is constantly kept on hand. The general office is on the second floor, which is reached by means of an electric elevator. Next to this office there is a waiting room for patrons, very comfortably furnished and with large windows facing the St. Valentine Park. On this floor there is also a bath room.

The garage is lighted electrically and heated on what is referred to as the thermo-siphon system, by hot water. The shop equipment includes a forge with blower driven by an electric motor. A large company, known as the Unione dei Garages has recently been formed in Italy to erect garages of this type in all the other principal cities of the country.

Problems of a Public Garage.

By J. S. V. Bickford.

I have recently had the job of organizing and laying out a small public garage to which I have devoted a considerable amount of thought, so that a few details may be of interest.

The root idea has been to supply cars and keep them in order for their buyers.

From conversation with medical men and others I found that there was a good bit of reluctance on their part to buy a car, because of the difficulty in keeping it in order on the one hand or the expense of a skilled man on the other, and it struck me that if one could only arrange some efficient way of keeping cars in good running order one ought to be able to do a good business in the supply line, and at the same time make quite a little income from the supervision.

What is necessary to keep a car in good running order is that it shall be gone over at regular intervals, and such points as terminals, batteries, etc., be examined. Now if one has a really reliable man to do this work this is easy enough, but even then he will forget a point now and then; but in a public garage it is by no means easy always to get a good man, and I wished to devise some scheme whereby a man of moderate ability might do the work, and which would lend itself to some system whereby the man's work might be checked.

To meet this case I got out a printed list of the parts of a car requiring frequent attention. Anyone who has not done this would be quite surprised to what a length it would run. The list comprised only such parts as might be expected to require attention once a fortnight, and yet ran to close on 150 points. The method I employed was to take first the electric system and follow the low tension current round, noting down each binding screw separately. Then came the high tension system in the same way. I then followed the flow of gas through the engine mentally and noted every point requiring attention, such as the float, petrol jet, valves (whether leaking or not), exhaust joints leaking, etc. By this means I believe that I have obtained a fairly complete list. This list is then printed in four columns on foolscap paper, with a column opposite for pencil "ticks." These forms are bound into books and perforated, each two being numbered alike. This book the inspector takes with him, and a sheet of carbon paper and a pencil. As he examines a point it is ticked off if found right, if not a cross is marked against it, and when it is put right this cross is surrounded with a circle. Anything likely to require attention shortly is noted down separately for future attention. One copy of this list is left with the owner and one we file in the office.

The one great advantage which the system presents is that the man's work can be checked either by myself or by the owner of the car. We recommend our customers to put parts out of adjustment themselves. Thus they may screw down a lubricator so that it will not work, loosen a wire somewhere out of sight or load up the float with a lead washer, so as to make the petrol jet flood, and then sit in the background and see if the man finds it. If he does not they can either "pull his leg" or complain. Probably the former method will be the more effective. A skilled man who has been hired by an amateur for whom he has an overwhelming contempt has his conceit much shaken, and will take great care not to be done a second time. If the owner prefers we come around ourselves before the examination and disarrange matters to our satisfaction, and examine the sheet afterward to see the result.

This system has so far, in about three months, led to four medical men buying cars for us to keep in order for them, and so far, though the aggregate mileage of cars has run close on 2,000 miles, there have been no road failures except one choked petrol jet, and I believe that every one is satisfied. The cost is small, as the time spent on the examination is not usually more than two hours, for which we charge $1.

One of the difficulties which a public garage has to face is the great irregularity of the work. One day three breakdowns and an overhaul will turn up, every one, of course, wanting his car rebuilt and a new engine made very likely while he has his lunch, and then for a month not a soul will appear at the place. To cope with this sort of work at rates which are remunerative to the garage, and not ruinous to the owner, is very difficult, and there are only two ways of which I know which meet the trouble. Either you must buy second hand cars of good make in very bad order, which you can trust will usually only require a thorough overhaul to make them readily salable, and put your men to ovedhauling the stock cars when work is slack, or you must on the other hand run several depots within motor cycling or train distance of one another connected by telephone. There is then a chance that when work is slack at one place it will be brisk at another, and men can be taken from the slack place to the busy one. Of these two the first is the easier to carry out, for second hand cars of good make are usually obtainable, whereas the success of a depot depends entirely on the man in charge, and men with abilities suitable for this work are not plentiful, and managers with the ability to select them are still less plentiful.

If a good business can be done in buying and selling renovated second hand cars a very good repair shop is the result, as a large number of good men can be employed and turned on to an emergency job at a minute's notice, while they can be easily kept employed when times are slack.

One of the first things to which my attention was drawn when I started in this business was the paramount necessity for some thorough scheme for the charging up of materials, and, to a less extent, labor.

The time is much easier to account for than the materials, as each man has to turn in a record of the time for which he is paid; however, if slackness is permitted there is always the chance that time will be charged by the workman to the wrong job, which will be sure to lead to trouble with the customers sooner or later.

The material question is much more serious, and my experience in the first month set me wondering what percentage of the goods of the average store goes out not charged at all; I am very sure it is a heavy tax on the profits. We first tried keeping a book in the shops in which each man entered up any goods served out by him, and a set of slips were kept in the store in which he was supposed to enter the goods when he took them from the store, the idea being that when business extended sufficiently to make it possible a storekeeper would be employed to serve out goods, and would enter these slips himself. The first month or less showed that this was no good, my own memory proving to me that about $20 worth of goods had not been entered at all. I then went into the town and bought a dozen penny reporters' notebooks and served out one to each man, with instructions to carry it in his pocket at all times, no matter how dirty it got. This was much better, and when I had my men adopt the rule of always carrying the slips about, and had worried them into entering things up when they were supplied I could detect very few omissions, and, as a rule, even these appeared on the store slips all right. To insure their entering things I used to watch something being served out from a distance, and then follow the man who had served it out about the place for a few minutes, and if he did not enter it ask if it had been done. Doing this two or three times was enough, and things now appear to be charged fairly consistently. Compare this method with that you will see in use in many small shops. A customer calls for something and is served with it. The man who serves him mentions the fact to the party who is to enter it in the daybook. He is perhaps serving another customer, and calls out "all right" and goes on with his serving. Now from our general knowledge of human nature and memory it is not difficult to deduce that some of these goods will be forgotten. Of course I know that this sort of thing is not the invariable rule, but I believe that an examination into a large number of businesses which do not pay would show a great leakage of this nature.

At this point in our organization we encountered another snag. Each man entered goods he supplied and the customer's name all right, and went on with the slip till it was full. Now it was found that to enter the slips from two men and three boys took the best part of a morning. It was necessary to take item by item and turn from book to book and account to account to enter them, which was very tedious. If one tried to pick out all the items relating to B's account at once the result was that some things were not charged, the line on the slip on which they appeared being overlooked, and the only method was to take and enter them line by line.

Perhaps I should pause here to say that the system of accounts used provides no daybook. A sort of rough ledger is kept for the time and materials used about our own shops and garage, such, for instance, as gasoline or time spent on the shop car, and at the end of the month the totals of the accounts in this book are posted into the ledger. No book of original entry for customers is used, but the invoices are bound into books, with a carbon copy counterfoil, and at the end of the month the totals of these invoices are posted into the ledger direct from these copies (called charge sheets).

If then three or four persons' names appeared on one workman's slip it was necessary to turn the pages of the invoice book backward and forward to find the various accounts, which was very laborious. I therefore modified the instructions, so that each account would appear on a single slip, which materially simplified the work in the office. The slips come in the last thing in the evening, and are dealt with the first thing in the morning. They are first checked over to see that the time recorded agrees with the arrival and departure times of the men, and that the items charged agree with the store sheet.

They are then divided into piles, one pile for each account, and then entered. By this means each account has only to be turned up once, and all the previous day's items added to it at one sitting.

Charge to account of.....

Workman's name..... Date.....

Labor only.

Hours.	Job.

Materials only.

Job.	Quantity.

Always carry this pad with you while at work.

WORKMAN'S SLIP.

The advantage of this system is that every customer's account is always up to the night before by 10 a. m. of the following day, so that if he wishes to take his car out and leave the district he does not have to wait for his bill. At the same time the bookkeeping is reduced to a minimum. The accompanying cut shows the time and material slip now used.

Up to the present not many labor saving appliances have been introduced into the garage proper, the only item so far being a cheap wringer for drying the chamois leathers used in washing automobiles. This was found an absolute necessity, as in a great measure the washing is done by boys, and they have not the strength to thoroughly wring out a leather. What is more, the wringer does not do as much harm to the leather as hand wringing, and does the work much better.

We find that if there is a reasonable amount of time a boy can wash a car with instruction, and a little "hauling over the coals" for scamped work, quite as well as a man, but to clean a car well will take him all day, and will take a man four or five hours by the time he has replenished the tanks, washed, cleaned the engines and polished the metal work, and if there is much metal he will have difficulty in doing it in five hours.

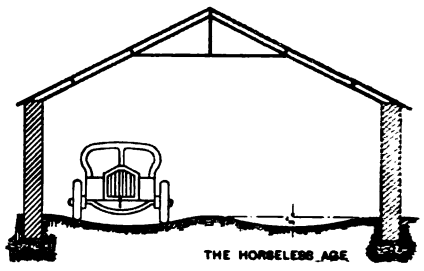


FIG. 1.

It has often struck me that something in the nature of a rotary spoke brush, coupled up to its own hose, would be a great labor saver in carriage washing; about three-quarters of the time necessary for washing goes in cleaning wheels and underbody, and a rotary brush would do a lot to save this work. For removing the grease which is usually found on the wheels of a chain driven car we use copious supplies of soft soap, which takes it off and does not seem to damage the paint work as paraffin oil does.

In the arrangement of the flooring of our garage we have adopted a plan which, as far as I know, is new. The floor is of concrete. Now, as every one knows, it is not good for rubber tires to stand in a puddle of oil, and most cars leak their oil about in rather an unpleasant way. To prevent these leakings getting on to the tires, and to obviate the necessity for tin trays, which are always being driven over and spoilt, we arrange our garage floors in shallow channels sloping toward the door. That is to say, if you took a section parallel to the doors of the house it would be as shown in the rough sketch, Fig. 1. It will be noted that the floor under where the car is standing slopes in toward the fore and aft line of the car forming a shallow trough at right angles to both axles, the car standing straddling the trough, while this trough has a slight run toward the doors of the house. By this means all the grease dropping from the machinery runs away from the tires and

toward the doors. This arrangement also makes the houses easier to wash out with hose and broom.

We keep on the premises a steam wagon capable of doing about 13 miles per hour, for hauling broken down cars to the works, so that we can reach a breakdown in two or three hours at any reasonable distance, and as we have also two gasoline cars capable of maintaining an average of 20 miles per hour, we keep ourselves in a position to render prompt aid in case of accidents.

There is one more point to which I would refer, and in which I believe other garages would find it of advantage to follow our example. We have on order and are expecting daily a set of the usual sizes of artillery wheels, without hubs and not drilled for the hub bolts. These are made up with square spokes, so that they will take any size driving sprocket, and they can also be used for front wheels. If then a car comes along with a broken wheel we can unship its hub, bolt it on to one of our stock wheels, put on its own tire and send it off again. These wheels are not very costly, and if customers prefer they can return them to us when finished with, a small hire being charged. As a wheel usually takes three or four days to obtain this may prove a convenience.

Finally, I would say to public garage proprietors, remember that you have not only got to do good work, you must please your customer. To overhaul a car in the most thorough manner possible and leave a loose ground wire will bring you no credit for your good work, and only curses for your oversight when the engine begins to miss. From a point of one day reputation it would be far better to send out the firing gear in good order and leave the machinery alone than the reverse. Your customer judges the pudding by the eating, i. e., the taste, and it will take him some years before he finds out that, though your pudding tastes nasty, it is better for his digestion than the next man's. What you have to do is to turn out first class internal work for your future's reputation, and make it taste nice, so to speak, by doing a first class superficial job as well. Send a man out with a car running as he has never known it to run before, and he will spread your praises over the country side, and in time he will find out that the job is as good as it seems.

Automobile Auctions in London.

Automobile auctions are being held regularly in London, especially at an establishment called the Motor House, and the vehicles brought under the hammer are often of much interest, either on account of their participation in important contsts or owing to the position of their owners. Thus on a recent occasion there were sold a converted 70 horse power Panhard racer which had served as touring car for the Duke of Manchester and a Mors coupé belonging to the Maharajah of Cooch-Behar.

Garages and Garage Methods in France.

By P. Maisonneuve.

As every driving outfit has need for a shelter—a shed for the vehicle and a stable for the horses—so the automobile must be protected against the weather between the hours of actual use. From this is derived the elementary definition of the term garage—remise (place of shelter) for automobiles. We say elementary definition advisedly, because the garage should be something more than a simple shed; it should be the home of the automobile, where it reposes after its daily work and where its mechanism receives that careful attention without which it would not long withstand the arduous service to which it is subjected. For this reason every garage should serve a double purpose, that of a simple housing and that of a shop for its care and repair.

The garages in France (and other countries as well) may be divided into four classes, according to their purpose and the status of their proprietor. These classes are:

1. Private garages, which serve for housing the cars of private owners.
2. Public garage establishments for vehicles belonging to customers.
3. Commercial garages owned by firms operating a delivery or public transportation service.
4. Hotel garages in the provinces, designed as a housing for cars of tourists staying at the establishment.

PRIVATE GARAGES.

This type of garage exists only in the country, as in Paris automobile owners can do no better than to keep their vehicles at one of the many special establishments, of which we shall have something to say later. It is, therefore, only in the suburbs or in the country where one encounters the true private garage—a simple shed equipped with a few necessary tools in the case of an owner of moderate means; a well equipped shop, with one or more pits, lathes, drill presses, etc., in the case of castles where the cars are numerous. In the latter case the force includes two or three hired drivers and assistants for cleaning and keeping the cars in repair. In a majority of cases the supply of gasoline is kept in one or two steel barrels placed at some distance from the garage in a structure of stone or other non-combustible material. Some owners—but they are few—store their fuel (gasoline) in an underground metallic receptacle, the outlets of which are fitted with metal gauze screens similar to that employed in the Davy miner's lamp. The liquid is pumped from the reservoir by forcing air into the latter.

PUBLIC GARAGES.

With the development of automobiling in France the garage business has grown to extraordinary dimensions, particularly in Paris and its eastern suburbs—Neuilly, Passy, Levallois, etc. In the large provincial cities, like Lyons, Lille, Bordeaux and Nantes, and in the season resorts there are also very important garage establishments.

There is, however, a great difference between the garages in Paris and those in the departments. Although the garages of the capital do not entirely neglect the sale of automobiles and parts, they devote themselves more particularly to the housing and maintenance of cars in general, while the provincial garages make a specialty of the sale and representation of the leading makes of France and foreign countries. On the other hand, the rents being very high in Paris, garage owners find it necessary to employ several stories of a building for the storage of vehicles, as is the case in most of the great European cities. Thus the Bour, Paris-Automobile, Notre-Dame, Friedland and several other garages have two or three large floors serving garage purposes, on the street level, one and two flights up, respectively, the cars being brought to the upper stories either by means of special elevators operated hydraulically or electrically, or by means of a helical incline. At the centre of each floor is arranged a turntable or similar device designed to allow of turning the vehicles arriving from the outside in a direction toward the particular point of the floor where they are always stored.

On the ground floor a large room adjacent to the garage is exclusively reserved for mechanical operations, with pits, electric light and complete tool equipment. In this room, under the supervision of experienced foremen, and sometimes even of engineers, the mechanics employed by the establishmnt attend to all the adjusting and repairs to the mechanical portion of the car. In this connection it may be observed that an interested mechanic may do a lot of repair work even on a car which operates satisfactorily. It must be understood that the majority of owners of vehicles de luxe, generally well to do people, prefer to entrust their chauffeur with the care of keeping their vehicle in condition rather than attending to it personally. However, in general, automobiles are well cared for in these garages. Upon arrival of the car at the garage, after a trip of some extent, it passes through a court reserved for the cleaning of the body and wheels. These parts are first washed by flooding them with water, either by means of a hose or a sponge. A brush has recently been invented which has a hollow handle, to which can be connected a hose from a hydrant, so that water under pressure is let into the brush and issues therefrom through numerous fine perforations around the bristles, with the result that the dirt is automatically washed away at the rate it collects on the brush.

All traces of mud and dust having been removed, the surfaces of the carriage body and wheels are dried by means of absorbent rags, then the metallic parts are cov-

with polishing paste and polished; at the same time the headlights are cleaned exteriorly and recharged with carbide, or, if gas tanks are used, an empty tank is replaced by another full one. The majority of garages in France carry a stock of tanks containing acetylene gas dissolved in acetone, and the use of these tanks does away with the necessity for calcium carbide and its objectionable qualities.

No very large quantities of gasoline are kept at the Paris garages, from 200 to 500 litres at the most, contained in sealed tin cans of 5 and 10 litres capacity. The city administration even thought this quantity too large, and it at one time looked as though garages would be considered as "établissements classés," which is the term used in France for buildings which are dangerous to public health or safety), and in consequence subjected to certain rules of safety and isolation. This would have been disastrous to the garages in Paris, which are all surrounded by inhabited buildings. It must be admitted, to the credit of the garage managers, that fires in this kind of establishments have, up to the present, been extremely rare, owing to the precautions taken in handling the inflammable gasoline and to the absolute prohibition of carrying open lamps around the stored vehicles and fuel tanks. The vapors of gasoline, being heavier than air, have a tendency to collect in the lower part of a room, and if the lamps used are not actually enclosed they are placed at such a height as to bring them above the dangerous zone. The lamps hung under the ceiling are nearly always ordinary electric arc lamps fitted with spark arresters, or enclosed arc lamps of the Bardon or Jandus type, and in a few cases mercury vapor lamps (Cooper Hewitt or Westinghouse). In addition to these powerful lamps electric incandescent lamps are used for directly illuminating any particular vehicle and the accessories contained in the tool board—as often each vehicle is placed in a sort of stall equipped with a sort of cupboard for the use of the mechanic. These lamps are placed at half the height of the ceiling and are sometimes protected by a wire protector.

Among devices recently invented for use in the maintenance of cars mention should be made of an apparatus designed to raise the vehicle off the floor when at rest, thereby saving the tires and preventing the deterioration of the rubber by prolonged contact with the floor of the garage. We refer to the Rivet garage shoe (patin-garage); it consists of two double supports connected at the base and maintained in their relative positions by connecting pieces. One of these devices is required for each wheel. Each support is fitted in interchangeable grips or rests, according to the width of the felloe. By means of a special mechanism these grips take hold of the felloe above the tire, without touching the latter, and raise the vehicle.

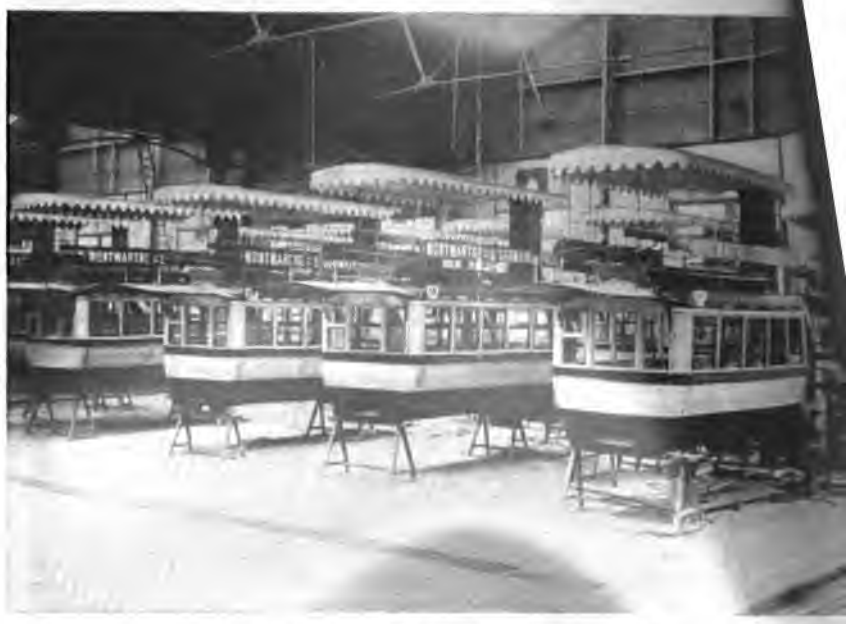
What precedes has reference to gasoline vehicles, which in France are by far the most numerous. Of course, these garages also house and care for steam vehicles if any owner of such a vehicle should demand accommodation, and the repair department is sufficiently well equipped to undertake repairs on a Serpollet, for instance.

There is, however, a type of automobile which in France is found only in Paris—the electrically propelled vehicle. These cars are quite numerous in Paris, where their silent and vibrationless operation is much appreciated. The garages necessary for these vehicles differ materially from those above described. The storage and cleaning are accomplished in the same manner, but the repair department occupies a much less important place, as in the electric vehicle the mechanical portion is not nearly as frail as the storage battery. These electric garages are also equipped with another apparatus, a charging plant for recharging the vehicle batteries. The charging requiring generally only four or five hours, the number of charging stands may be considerably smaller than the number of vehicles cared for, and from six to ten are usually found, according to the importance of the garage. The charging current is either obtained from the mains of the nearest central station, with the interposition of a suitable rheostat, or from a private plant consisting of a dynamo driven by a gas engine. The writer recently witnessed some interesting trials of recharging a storage battery from alternating current circuits; not by the use of a rotary transformer, but by means of a sort of electric valve, the design of which is based on the property of Geissler tubes, according to which they let pass the current in a single direction. The apparatus referred to is a sort of mercury vapor lamp, which, after priming or starting into operation, completely fulfills its purpose; the same process may be equally advantageous for accumulators or ing current circ

These garages Paris are practic some electric v mand, therefore, necessary for tak cumulators.

COMMERCIAL

The use of mot cial houses is still as compared with the commercial automobile America. It required of the Automobile Club duce some few manufac chanical traction a trial several hundred motor use in London, Paris first motor bus line. It that the service will be



GARAGE OF PARIS GENERAL OMNIBUS COMPANY—OMNIBUS BODIES READY TO BE ON CHASSIS.

middle of June, and our illustratio a portion of the garage of the Gene nibus Company, containing a larg ber of completed vehicle bodies awaiting the arrival of their chassi are being built at Havre.

At the present moment commerci mobiles are used in France by le ten firms, and the most important users are the following: The Galer fayette (department store), Pan Levassor delivery wagon; Felix Co. (grocery), large De Dion-Bout tor wagon, Gregoire small cars and tri-cars; Damoy & Co. (grocery) forecarriage delivery wagons; Say (sugar refinery), 4 to 5 ton Purre trucks; Metropolitan Underground Company, the same kind of trucks.

As regards the gasoline automobi ployed by the above mentioned fi least one-fifth of the total number ways be kept at the garage, either t

sary to tak
book to book and accoun
enter them, which was very tedious. If one appliances
to pick out all the items relating to

reserve or for the purpose of repairs. The majority of the garages are outside of Paris or in the outlying districts, in general at points where the firm has already stables and sheds. The buildings employed for storing these vehicles are, therefore, hardly ever specially constructed for garage purposes, already existing buildings being fitted up as well as possible for their new purpose.

In order that automobiles may be used economically—and this is a most important point—they must be operated according to a system, and the strictest precautions must be observed. The garage must be fitted with all the equipment necessary for repairing disabled vehicles without making it necessary to revert to the manufacturers; at least in the case of a piece which cannot be replaced more economically by the factory.

The following is the usual system employed. Each driver in the morning receives a sheet or day book on which he notes down any weaknesses shown by his vehicle during the course of the day's run. Before starting out he carefully examines his vehicle, and if he does not find anything unusual, upon leaving the garage he signs a register especially provided for the purpose. In the evening, between 7 and 10 o'clock, when the vehicle returns the driver gives up his sheet or book, and if no notes have been made thereon the garage force starts in cleaning the vehicle—the body and wheels with water and the interior parts and the mechanism with gasoline. The lubricating oil is emptied out and renewed, the motor tested, and if everything is found in good order the vehicle is driven to the garage or storage room proper, where it remains over night. Here every precaution has been taken against fire. A pile of sand, water nozzles with hose connection to a hydrant and a number of chemical fire extinguishers are provided to immediately combat any impending conflagration. A watchman makes the round of the garage every night, and automatic fire alarms are installed in the halls which operate at the least increase in temperature. If the vehicle returns from its day's trip in need of repairs, the necessary work is done to it either at once, or the following day, according to whether it is possible to finish the work during the night or not.

The supply of gasoline at these garages is never very large, 200 litres at the maximum, and is contained in 10 litre cans. The writer knows, however, of a firm which has an underground reservoir of 2,000 litres capacity, located at some distance from the building, from which the fuel is drawn through a long tube.

In the commercial garages much attention is paid to the pneumatic tire, the cost and maintenance of which form a large item in the expenses of operation. Some of the commercial vehicle owners have entered into a maintenance contract with the firms supplying their tires, while others consider it advantageous to repair their tires themselves by means of the vulcanizing process. In the latter case they have a special tire vulcanizing outfit, heated by steam.

The question of heating garages does not possess the same importance in France as in countries of a more severe climate. The garages in the cities are provided with a system of steam or hot water radiators, but this is more for the comfort of customers and employees than to prevent the freezing of water in the tanks and the cylinder jackets.

HOTEL GARAGES.

Hotel garages in France are usually simple sheds reserved for automobiles, rarely provided with a pit for gaining access to the mechanical portions of the car. All hotels carry supplies of gasoline in cans, and of lubricant. The large hotels in Paris, on the Riviera and in the warm springs resorts are considerably better equipped. They have often in their employ a competent mechanic, who is supplied with the necessary tools for putting in condition vehicles which have been more or less deranged by a long and hard trip. When the service of these mechanics is required it must be paid for at the rate of 40 to 50 cents per hour.

The storage of the cars is nearly always free, but it is likely that during the Grand Prix race of the Automobile Club of France the hotels of Mans and vicinity will not fail to charge well for the storage of cars, as well as for the accommodation of tourists.

Most of the garages in San Francisco having been destroyed by fire, and the automobile having most thoroughly demonstrated its practicability even in great emergencies during the recent earthquake period, it is most likely that a number of model garages will be erected when the city is rebuilt.

Extinguishing Gasoline Fires.

With gasoline the most practicable fuel for motor cars, as well as the most effective cleaning agent, the danger from fire is an ever present menace in the garage. At ordinary temperatures gasoline continually gives off inflammable vapors, and a light at some distance will ignite it through the medium of the vapor. The vapor from one pint of gasoline will make 200 cubic feet of air explosive.

It becomes of the highest importance, therefore, to have everything about the garage, as well as the automobile, as nearly fireproof as possible. Proper ventilation in garages for the escape of this highly explosive vapor is most essential. In spite of the greatest care fires are continually occurring, usually in the garages themselves, although the motor car is occasionally set on fire when out on the road. The question of extinguishing these inevitable gasoline fires in the quickest manner possible becomes of the first importance in every garage.

The British Scientific Association spent years of study and experiment to ascertain the most effective method of extinguishing fire with a minimum of damage to the burning material. The deduction they arrived at was that carbonic acid gas is the greatest fire annihilating agent known to science. No flame can exist in the presence of 16 per cent. of this gas. It acts like a blanket, smothering a fire instantaneously.

Most fire extinguishers made at the present time generate carbonic acid gas in copper tanks exactly as in a soda water fountain. The resulting pressure is utilized to force a stream of gas-charged water onto the flames. A stream of water on a gasoline fire would only cause the flames to spread, but in the chemical extinguisher the water is the means of carrying the carbonic

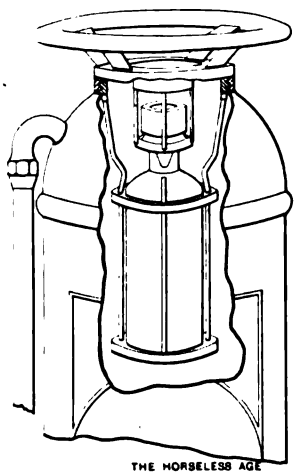


INTERIOR OF GARAGE OF THE BRIDGWATER MOTOR COMPANY, LTD. (SEE PAGE 750.)

acid gas to the flames and spreading it over them.

The gas is usually generated in a 3 gallon copper or brass tank by mixing 4 ounces of sulphuric acid with water in which a pound and a half of bicarbonate of soda has been dissolved. The principal mechanism of the extinguisher is connected with this process of mixing. In some the "upset" method is used, in which the bottle containing the sulphuric acid has a loose stopper, and is set loosely in a metal case at the top of the tank. In order to operate the extinguisher the tank is turned upside-down, whereupon the stopper falls out of the bottle, and the sulphuric acid mixes with the soda water. In others the "break-bottle" method is used, the acid being held in a sealed bottle. The bottle is crushed by a screw device in the head of the extinguisher whenever it is necessary to put the machine in operation. The whole contents of the bottle are at once mixed with the soda solution and immediate high pressure is the result.

A pressure of 100 to 200 pounds per square inch is generated when the carbonic



"Up-set" Type of Fire Extinguisher.

acid gas is released by the action of the sulphuric acid, which will throw a small stream of water 40 to 50 feet. Most of the tanks are tested to withstand a pressure of 350 pounds to the square inch.

In the upset type the stream is controlled by turning the tank right side up again, which causes the stopper to fall back in the bottle and stop the flow of sulphuric acid. In the break-bottle type the stream is sometimes controlled by a shut-off nozzle. The system of control is important, as in cases of emergency the extinguisher which will give the most economical use of the charge will be the most efficient.

An oil or gasoline fire must be handled differently from other fires. A man standing erect and playing a stream from an angle on the floor of the garage will find that the fire will only be extinguished in spots. In order to extinguish the gasoline fire completely it must be "swept" rapidly, bringing the nozzle down parallel to the floor. The carbonic acid gas is thus thrown almost instantaneously over the entire fire.

For this reason hand grenades and so called fire powders are of little use. They generate extinguishing gas when they come in contact with the heat of the flames, and are most effective when the fire is very hot, which is usually true of gasoline fires, but ordinarily they will not cover the entire extent of the flames.

It seems a self-evident proposition that the seamless copper or brass tank for the extinguisher will be the strongest. This is made by brazing together the edges of the copper, instead of making an ordinary lap-fold joint. A spun top also obviates a joint which is found in some types. The question of the strength of the tank is most important, and many men have lost their lives or been seriously injured by the explosion of defective tanks or by those not made to conform to the requirements of the insurance underwriters.

Some of the principal companies making the above types of fire extinguishers are S. F. Hayward & Co., 20 Warren street, New York; the Badger Fire Extinguisher Company, 32 Portland street, Boston; Knight & Thomas, Boston, Mass.; the Miller Chemical Engine Company, 149 East Huron street, Chicago, Ill.; the Metropolitan Fire Extinguisher Company, 1133 Broadway, New York; the United States Extinguisher Manufacturing Company, 134 West Twenty-third street, New York, and the Columbia Fire Extinguisher Company, 407 Broome street, New York.

The Harris Safety Company, 1133 Broadway, New York, use the siphon principle in their extinguisher. A hermetically sealed bottle of sulphuric acid is fixed to the inside surface of the tank, and when this is broken it must permeate the entire soda solution before reaching the siphon tube through which it is discharged. Greater uniformity is claimed for this method.

The Minimax Company, of No. 24 East Twenty-first street, New York, make an extinguisher in which hydrochloric acid is used in place of sulphuric acid. They claim that by the use of this acid the same result can be obtained with a tank half as large—in other words, that twice as much gas is generated by the action of the acid on the soda solution. A small size extinguisher is made expressly for carrying on automobiles. It is kept in a compact steel case with extra charges.

The Little Giant Manufacturing Company, 88 Wall street, New York, make a non-explosive extinguisher which operates on the principle of a squirt gun. It is charged with a non-freezing solution which generates extinguishing gas when it comes in contact with the flames. This is also made in a small size, with a polished oak container especially for carrying on automobiles.

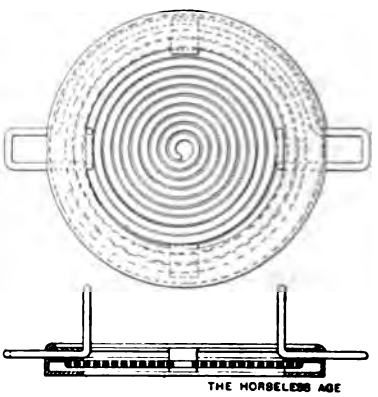
According to a report of the British War Office the Motor Volunteer Corps at present comprises 147 members.

Motorist Smokers' Articles.

The accompanying cut shows a novelty in the way of an automobile accessory that has been patented by Albert Speirs, of New York city, and is now being introduced by him to the trade in Buffalo. It is called the automobile pipe cover and spark arrester, and is designed to ameliorate the woes of smokers who have experienced the annoyance of trying to smoke a pipe while driving against the wind.

The hollow ring fits over the bowl of the pipe, and is held in place by the projecting springs, which are moved for the purpose of adjusting or removing the cover, by pressing together the wires on the sides of the ring. The spiral wire spring in the inside of the ring is fastened to the ring where the outer coil of the spiral touches the ring, leaving the centre of the spiral to be depressed by the finger when it is wished to pack the loose tobacco in the bowl of the pipe.

The whole device is instantly placed in position, or removed, and is adjustable to any pipe. The automobile pipe cover and spark arrester is manufactured by the Al-



Pipe Cover for Motorist's Use.

bert Speirs Manufacturing Company, No. 123 Liberty street, New York.

Another genius is showing a cigar holder with a clamp attachment to enable the user to fasten the cigar holder to the rim of his hat in any convenient position. From the mouthpiece of the cigar holder hangs a thin rubber tube with a suitable mouthpiece at the end. By means of this device a cigar placed in the holder on the user's hat may be smoked through the rubber tube without danger of sparks, ashes or smoke blowing into the eyes.

The Locomobile Company of America has recently erected a new factory garage at its Bridgeport plant. Each side of the building is all doors, there being a door for every car, and the owners think that anyone who puts up a garage in the future and who has plenty of space all around it, will employ this plan, which has everything to recommend it and nothing whatever against it. It will be seen from the descriptions of public garages in this issue that this feature is even now quite popular.

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Devoted to Motor Interests

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The Garage Business.

The automobile garage may properly be regarded as occupying a position in the motor car field analogous to that filled by the public livery stable in the domain of horse drawn transportation.

Its exceedingly rapid growth, as an institution, is an interesting example of the general law that new needs are always met by the evolution of new facilities, fitted to supply these novel wants. Such new facilities are almost always modeled to a discernible extent upon the traditions of the past in the industry to which they appertain. One thus finds that the public garage offers a service quite analogous to the "boarding, baiting and renting stable," so common in horse drawn practice.

A vast amount of capital is now invested in garages, and credit should not be withheld from those enterprising individuals who first embarked in what was admittedly a new, and to a certain extent precarious, line of business. The development and refinement of garage methods has gone on apace and is still progressing rapidly. Especially in matters of organization, personnel and rates for service rendered the garage business may still be said to be susceptible of considerable improvement. The future magnitude of the public garage industry naturally depends to a very great degree upon the extent to which motor vehicles are likely to be "boarded out."

In the large cities there will doubtless be for a long time to come, relatively speaking, very little private stabling of motor cars. Indeed there is comparatively little private stabling of horse drawn vehicles under metropolitan conditions on account of lack of stable space in connection with city dwellings. Considerations of fire hazard have practically prevented metropolitan automobile owners from housing steam or gasoline vehicles on their own premises. Should some source of propulsive energy be generally adopted which shall be devoid of the dangers which characterize the use of gasoline, these conditions may be greatly changed. An automobile requires so little storage space, as compared with an animal drawn equipment, and is so unobjectionable upon sanitary grounds, that if it were not for the fire hazard many self propelled vehicles which are now kept at city garages would have provided for their accommodation small buildings in close connection with the city dwellings of their owners.

In small cities and towns, where conditions are much less crowded, the possibilities of detached automobile stables, in connection with owner's premises, are likely to result in a less general resort to the public garage on the part of the users of self propelled vehicles. Such stables, separated from other buildings, may be so constructed as not to create any exposure fire hazard to neighboring property, and it will not be surprising in the future to find the average residence of the well to do citizen of a small city adjoined, as a matter of course, by a fireproof automobile stable. A vehicle always close at hand, upon one's own premises, if it be not in some way objectionable or dangerous thereby, will always be of more value, in point of availability, than when kept at some distant point.

One consideration which has led many automobile owners to house their cars in public garages has been ignorance as to their care and adjustment. The situation has been similar to that in which a horse owner would be placed if he did not know how to feed or groom his animal, and knew simply how to drive. Such ignorance is being very rapidly dispelled, and it is no uncommon incident for a motor car owner to keep his car at a garage until he understands the rudiments of its management, and then to remove it to his own stable.

Another cause which has decided many an owner in favor of garage storage of his

car has been the frequency with which in the past extensive repairs have become necessary. If, at the end of almost every extended trip, some repair or replacement, requiring the service of a machinist, has been necessitated, it has been very natural for him to determine to house his car where such work could readily be done. Now that repairs have been to a great extent minimized, this consideration is less important than formerly.

Present day automobile touring is analogous to the "coaching" which was an important means of pleasure and business transportation, both in this continent and Europe, up nearly to the middle of the nineteenth century. Every town of importance along the lines of regular travel was equipped with its inn stable, where special attention was paid to the care of the equipages of travelers. To what extent long distance traveling by means of motor cars is going to develop, and whether it is to become a permanent custom, no one can more than conjecture. In any event an important function of the garages in cities and towns is to care for the tourist, and, so long as touring is in vogue, they will enjoy this class of patronage in its entirety.

What the future relations of the public garage to the commercial vehicle are likely to be can hardly yet be foreshadowed. Business concerns who employ motor vehicles in large numbers will probably provide their own stabling and repairing facilities, but the small users of commercial cars, especially in large cities, may be expected to patronize public garages.

In metropolitan communities the garage business is likely to attain a hitherto undreamt of magnitude, in all its various lines, and in small communities it doubtless will achieve very substantial proportions, especially in the repairing and supply lines.

Storing Gasoline in Frame Garages.

According to a recent decision of the Court of Chancery in New Jersey, the storage of gasoline in a frame garage may constitute a nuisance, which may be abated by a court of equity. If this decision is sound it means that garages must be constructed in a way so as to prevent reasonable fear on the part of adjoining property owners, of conflagration resulting from accidental ignition of the gasoline.

The New Jersey case in question is an outgrowth of the controversy which resulted in a decision some weeks ago limiting the amount of gasoline which might be stored in the tanks of automobiles in the garage to one-half pint. This particular decision was taken to the Court of Errors and Appeals, and was set aside, and the defendant was allowed to use a reasonable amount of gasoline for the purposes of carrying on his business. It may be concluded that the Court of Errors and Appeals, if it considered that limiting automobiles in the garage to one-half pint of gasoline was unreasonable, would most certainly consider that the injunction under consideration, restraining the garage keeper from storing any gasoline, is most unreasonable and oppressive.

A proper decision of the controversy depends upon what constitutes a nuisance. When and under what circumstances does the storage of inflammable and combustible material become a serious annoyance, threatening the safety of persons or property? In order to constitute a nuisance which may be abated, the annoyance must be other than fanciful. It must cause a reasonable apprehension of danger, and there must be convincing proof that the conduct of the business objected to will in its tendencies reasonably constitute a danger. And the question whether there exists danger is one of fact to be determined by proof, not of what might possibly happen, but of what would actually happen under ordinary circumstances.

The keeping of a garage is a perfectly lawful business, which cannot be abated without showing facts constituting it a nuisance. The Appellate Division of the Supreme Court of New York has decided in accordance with this view. The New Jersey court, through Vice Chancellor Garrison, has virtually held that a frame garage located adjacent to other buildings does constitute a nuisance. The soundness of this decision must be passed upon by the New Jersey Court of Errors and Appeals, and then by the United States Supreme Court. If the highest court should uphold this injunction, then frame garages will have to be constructed in a different manner; but it would seem that it is more within the province of the Legislature to determine by statute whether or not a garage may be of frame construction than for the judiciary to say how buildings shall be made.

No fires having occurred in the garage which is the subject of the New Jersey decision, and conflagration in other garages of a similar character being of rare occurrence, it would seem that the court was not justified in this case, upon merely speculative evidence, in rendering the decision it did render. A business may not be abated as a nuisance upon merely fanciful grounds. Courts may act only upon proven facts, and the alleged fact that a frame garage is a nuisance has not so far been proved.

Improvements in Dry Cells and Methods of Their Use.

Although the storage battery is rapidly supplanting the dry cell as the source of ignition current on four cylinder cars, its higher initial cost has not yet permitted its general use in the equipment of lower priced one and two cylinder vehicles. In fact, dry cells give reasonably satisfactory service when used upon single and double cylinder cars, on account of the less number of sparks required per unit of distance covered, as compared with that demanded by a four or six cylinder motor The very marked recent tendency toward the use of accumulators has evidently stirred the manufacturers of dry cells to special efforts toward improving their product, and also the manner of applying their cells to ignition service.

It has always been customary for users of dry batteries to equip their cars with two sets of cells, one of which is made use of in ordinary running, and the other kept as a reserve, not to be called into action until the regular running battery has become exhausted. If a car so equipped be used but sparingly it may be a long time before the regular running battery fails, and during this time the reserve set of cells may have become so greatly deteriorated through local action as not to be dependable. It is a well known fact that ordinary dry cells lose their strength quite rapidly, simply through the effects of age, and this deteriorative action seems to be due to the local effect of the liquids used in their fabrication. It appears that if a cell be made up with materials which are actually as well as nominally "dry"—no moisture entering into its construction—local action is minimized, if not practically prevented. Such a battery is stated to be electrically inert until supplied with the requisite amount of water through a filling hole which is provided when it becomes fully active and fresh for service The claim is made that a battery of cells so made up may be carried for a very long

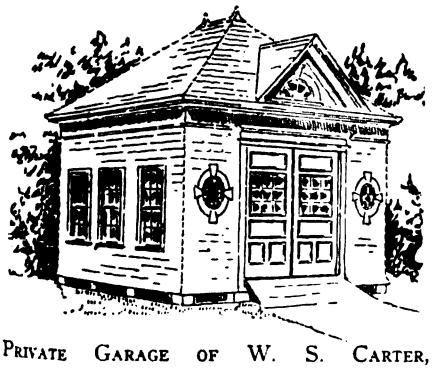
time, as a reserve battery, without danger of its deteriorating, and be capable of being rendered fully active by the simple addition of water at the time when its services become necessary. The use of such a cell should provide against the disappointment so commonly suffered upon finding a reserve battery, upon which full dependence has been placed, too weak, through local action, to be of any service in an emergency.

Many four cylinder cars which normally draw their ignition current from an accumulator carry a set of dry cells as a reserve. These may not be called upon for months, and a set of dry cells of the type just described should prove a safeguard under such conditions.

Another practice in connection with the use of dry cells that is at present being recommended by certain battery manufacturers is the use of the cells, not, as usual, in a simple series of four or five cells, but in multiples of such series. If two such series connected in multiple be used to supply ignition current, the current supplied by each cell will be furnished at only about one-half the rate at which the cells of a single series would be required to supply it. Polarization is less rapid under these less arduous conditions, and it seems to have been found that more than twice the mileage can be made with a multiple of two series of cells than with a simple series.

Among other considerations which are helping to enable the dry cell to hold a place in the automobile industry may be mentioned the greatly decreased current consumption wihch some modern jump spark coils demand, and the better knowledge which is extant as to the adjustment of vibrators—a matter of extreme importance in its bearing upon battery life.

One may be sure that manufacturers of primary cells will exhaust the subject in a search for improved methods before giving up the field to the storage battery.



PRIVATE GARAGE OF W. S. CARTER, LEBANON, N. H.

Randlett & Griffin, Architects, Concord, N. H.

MAINTENANCE AND REPAIRS

Care and Maintenance of Electric Vehicles.

BY ALBERT L. CLOUGH.

The care required by an electric vehicle, exclusive of that demanded by its battery, is very slight as compared with that which must be bestowed upon a gasoline or steam vehicle. Nevertheless, it, like every other mechanism, requires a certain amount of well directed attention in order that it may be maintained in perfect condition. The time and attention called for by a vehicle battery, however, in charging it and keeping the cells in proper working order, is by no means small, and represents the greater portion of the total labor which the maintenance of an electric automobile involves. A few points relative to the care of the vehicle itself will first be enumerated, and then the matter of looking after the battery will be spoken of.

Lubrication of moving parts, their proper adjustment and the security of all holding devices are matters which require attention in the electric vehicle in common with those of other motive powers.

LUBRICATION OF BEARINGS.

The bearings of the motor armature should be most carefully provided with lubrication, as their undue wear may cause the armature, which runs very close to its pole pieces, to strike the latter and cause injury to the armature winding. These bearings may be oiled by chain or ring oilers, operating in oil reservoirs surrounding the bearings, by lubricant absorbed in waste or wicking, held in oil boxes surrounding the bearings, or by other means. If the former method be employed the reservoirs should be kept properly filled with good dynamo oil, which must not be allowed to become dirty or spent through long use. In case the latter mode of lubrication is used the absorbent material should always be saturated with good, rather light, oil. Whatever system of oiling is provided, it should be frequently replenished with the grade of lubricant intended to be supplied to it.

CARE OF COMMUTATOR.

As the voltage used is very low, vehicle motor commutators require but very infrequent attention. The brush tension should be firm and fairly strong, as otherwise there may be a jumping of the brushes at high motor speed, with sparking effects destructive to the commutator surface. If the commutator has a polished, bronze colored surface, and is free from blackening, nothing need be done to it unless the brushes squeak, when the finger wet in oil may be rubbed over the commutator bars. There is no harm, however, in wiping off the commutator occasionally with a piece of fabric which is free from loose threads, using a firm pressure upon the bars and turning the motor meanwhile by pushing the vehicle by hand. If the commutator be found black and rough, the car may be jacked up and the motor started. A piece of medium grade sandpaper may then be used to polish the commutator surface, which should be finished with a piece of dry fabric to remove the abrasive particles, after which a minute quantity of oil may be supplied as described above. After very extensive use the commutator may become so unevenly worn as to require to be trued up in a lathe.

The cable connections to the motor should always be kept tight and the insulation of the cables should not be allowed to become abraded. If the motor is of such construction that dust may gather within it there is no objection to the occasional use of a bellows or the compressed air supply of a garage to blow out copper and carbon particles which may be worn off in commutation and dust particles from the road.

CLEANING CONTROLLER CONTACTS.

The cable connections to the controller should always be kept tight, and it is essential that the controller fingers should make firm connection with the contacts corresponding to the different speeds, as otherwise there may be arcing, which will roughen their surfaces and cause the lever to work hard. If the contacts become burnt they may be smoothed with a file, when the current is cut off by the safety plug, and a minute amount of vaseline rubbed over them to lessen friction. All copper particles or other dust should be blown or wiped off from the controller and its connections, as it might cause a short circuit.

The acid fumes produced by the battery, and the slopping of the electrolyte, which sometimes takes place, is likely to cause a destructive corrosion of all metal parts subjected to their influence. Wherever it can be used asphaltum or tar paint will be found a good preservative, and parts which cannot be so treated should be frequently wiped off.

RUNNING GEAR LUBRICATION.

Lubrication of the front wheel and rear axle bearings and those of the rear wheels, if the car be of the double motor variety, should be attended to from time to time. Non-fluid oil is the lubricant generally used for wheel bearings and fluid oil for the axle bearings. Such an adjustment of the wheel bearings should be secured as will allow of perfect freedom of rotation without any tendency to wobble. Manufacturers' instructions as to adjustment and lubrication should be carefully followed.

In the case of gear driven electrics which have the gears completely housed, an occasional replenishment of the gear case with grease of medium stiffness, with which has been mixed a quantity of flake graphite, will be found effective. If the filling hole in the gear case is small the grease may well be melted and poured in. Where gears are not fully housed more frequent lubrication is required and a mixture of non-fluid oil and graphite should be fre-

quently "slushed" over the gear teeth. The same mixture is effective upon the chains of electrics which employ them. The degree of tightness of chains is important. They should not be so tight as to run hard nor so loose as to be in danger of running off or climbing the sprockets and thus being broken. In adjusting a chain care should be taken that the rear axle is not thrown out of parallelism with the front axle. Sometimes means are provided for adjusting the pitch of gears, and if a gear seems to drive its mate with unnecessary noise the pair may be found so closely pitched that the teeth nearly or quite "bottom." This involves unnecessary wear and a waste of power.

STEERING GEAR AND BRAKES.

The steering gear deserves most careful attention, as its mechanical integrity is a life and death matter. All joints must be frequently lubricated, and all nuts must be kept tight. The gear, at the same time, should operate with perfect freedom. The front wheels should be adjusted to true parallelism or undue tire wear will take place. Brake band leathers should never be allowed to become worn out, and brake adjustments should be frequently proved correct. The only proper test of a brake is to drive the car partly up a steep pitch in the road where there is plenty of backing room, in case it is needed, and then to see whether each brake is able to hold the car from running backward. If not, a better brake adjustment is required. A brake which will hold a car from backing may almost always be depended upon to stop its forward motion under at least as severe conditions. It is not well to depend upon using the reverse for forward braking or the application of a forward speed to prevent the car's running backward, as there is grave danger of stripping the motor pinion, twisting off the armature shaft or doing other serious damage if these expedients are resorted to except in a most cautious manner.

SIGNS OF DISTRESS.

An electric vehicle is normally so quiet in operation that any unusual rattle or other sound is quickly recognized. Such sounds should be traced and their causes removed. Sometimes the squeaking of the spring leaves rubbing one upon the other becomes quite annoying. It may be obviated by the injection of oil between the ends of the leaves, the latter being slightly separated by forcing a screw driver point between them.

There is quite a perceptible difference between the power required to drive an electric vehicle with fully inflated and with partly deflated tires—the advantage resting with the hard tires. Electric vehicle tires should thus be kept sufficiently inflated so that the weight of the car flattens them but very little at the points of contact.

AMMETER READINGS.

The driver of an electric carriage has one advantage over the steam or gasoline car operator, in that he has constantly before him a means for determining the mechanical running condition of his vehicle. The ammeter indications, if studiously observed, will furnish an indication of undue friction in any part of the mechanism. If the operator finds that the ammeter reads higher than usual, when the car is traveling a certain road under certain conditions, he may feel that there is some faulty adjustment or lack of lubrication which requires attention.

CHARGING OUTFIT.

It is here asummed that the charging and other care of the vehicle battery is to be performed by the owner, or under his direction, and that charging facilities are available. The charging switchboard should be provided with an ammeter, and, unless the supply is at a constant voltage, with a voltmeter. In addition to the main switch, rheostat and charging cords, there may well be included an overload and reverse current circuit breaker, the former to limit the current strength sent into the battery and the latter to prevent a discharge of the battery through the charging circuit, in case of low voltage in the latter. If a mercury rectifier is the source of current, these possibilities will be found to be provided for in the regular equipment. If someone is to be at hand during the whole charging period the circuit breakers may be dispensed with.

DETERMINING POLARITY.

In case a vehicle battery is ever charged on the road, at stations which do not make a business of such service, it is well for the operator to know how to distinguish the polarity of the charging leads. If the two wires of the charging circuit are held a slight distance apart in a glass vessel of water and a few drops of acid or a small pinch of salt added to the liquid, bubbles will begin to rise from the two immersed conductors. One will give off gas much more freely than the other. This is the negative and should be attached to the negative charging terminal of the car. The immersed wire, which gives off little gas and blackens rapidly, is, of course, the positive.

WHEN TO RECHARGE.

It is time that the battery received a full charge when its running voltage drops to 1.75 volts per cell. It should on no account be exhausted to a lower voltage than this, and the car voltmeter should be frequently consulted, while one is on the road, so that one may not be "stranded" at a distance from a charging station, with the battery fully exhausted. By "running voltage" is meant the voltage shown by the voltmeter when the car is being driven at full speed over a good level road. It should be remembered that voltage indications derived from the battery when on open circuit are meaningless, so far as its condition as to charge is concerned. A twenty-four cell lead battery is in need of charging when its "running voltage" falls to forty-two volts, and the same may be said of a thirty cell battery at fifty-two volts and a forty cell battery at seventy volts. These figures are necessarily a general average, and if the manufacturers of a particular car or battery quote others particularly applicable to their product they should be followed in preference to the above.

MILEAGE.

In determining when a battery requires recharging the mileage which the car has made since its last charge should be taken into consideration, and a trip odometer, set at zero each time the car is charged, is convenient for this purpose. The condition of the roads traveled should, of course, be considered in estimating the work which has been taken out of the battery. As a rule it is not advisable to recharge a battery unless its charge is at least one-half expended, and the length of charge given it, if only partially exhausted, should be proportioned to the fraction of the charge which is estimated to have been utilized. The charge in ampere-hours to be given a partially discharged battery is often taken as the estimated ampere-hours of discharge, plus 15 or 20 per cent. If one carries an odometer or has some other means of estimating the mileage covered, any noticeable reduction in the distance which the car can travel on a single charge, as time goes on, will become apparent. When such diminution in discharge capacity becomes obvious it is evident that the battery is out of condition, assuming that the car is running at its usual rate of current consumption.

RATE OF CHARGE.

The rate at which a particular battery should be charged is best obtained from the manufacturer's published figures. As a rule, a certain number of amperes (regulated by the charging rheostat) is prescribed for each type of cell. This rate is maintained until the voltmeter shows that a certain voltage rise has taken place—a voltage of about 2.55 volts per cell (current flowing) is frequently the figure named. The current is then reduced to a value about one-half of that previously supplied, which, of course, causes the voltage to drop considerably. This reduced amperage is then maintained until the voltage rises again to, say, 2.55 volts per cell, when the charge is regarded as complete. Some manufacturers prescribe a fixed amperage for the first part of the charge, which is continued until the voltage reaches about 2.55 volts per cell (current flowing), and a diminishing current during the latter part of the charge sufficient to maintain this voltage—the current being cut off when the amperage required to maintain this voltage falls below a prescribed figure.

ACID FUMES AND HEAT.

It is very desirable that the battery compartment of the car should be fully opened during charge, in order that the acid spray and explosive gases generated, particularly during the latter part of the charge, may readily escape. There should be good ven-

ation in the stable where charging is nducted, as otherwise the air may be me too irritating to be breathed with mfort, very corrosive to all metal sur-es, and possibly highly explosive. The mperature of the cells should be carefully itched during the charge, and if they be-me very hot to the touch the current may ll be reduced or the charge may be dis-ntinued long enough to allow the cells resume a safe temperature.

PRECAUTIONS IN CHARGING.

It is a safe plan never at any time to ex-ed the charging rate advised by the man-acturers, but if, owing to lack of time, it very important that the charge be hast-ed, the excess of charging current shoul-applied during the first part of the proc-s only, and never at or near the finish of e charge, which should always be con-ucted according to directions. When arging, always keep in mind the extent to hich the previous charge has been ex-austed, and plan the recharge accordingly. While the car is in operation under ordi-ary conditions of level road the running oltage will be found to be about 2.2 volts er cell until the charge shows signs of ex-austion.

SPILLING OF ELECTROLYTE.

It is of importance that the electrolyte in ll the cells be maintained at the proper eight. There is frequently some loss of iquid by slopping, and some through evap-ration and spraying. Sometimes through ccident a cell may break, its solution be ost, and wet the battery compartment, as ell as dripping upon the running gear and orroding it. Solution spilt into the bat-ery compartment deteriorates the wood-ork, and may cause serious leakage of urrent. The elements of the broken cell re likely to be considerably injured, and he capacity of the battery as a whole is educed. If there is evidence of spilt acid round the cells the source should be de-ermined and the defect remedied. It is ustomary to keep the liquid within the ells at such a height as fully to cover the lements. If the level is reduced by slop-ing or spraying fresh electrolyte of the roper gravity should be added to replace he loss. In case the loss has been occa-ioned by evaporation the proper quantity f distilled water should be added.

SYRINGE AND HYDROMETER.

Every user of an electric vehicle should e provided with a battery syringe and a ydrometer for determining the specific ravity of the electrolyte, and the condition f the liquid in each cell should be occa-ionally tested. The proper density of the iquid, when the cells are fully charged, is sually considered to be about 1,300, or 34° laumé, although some authorities give .250 s. g., or 28° B. If, in testing the harged individual cells, certain ones are ound the liquid of which shows a smaller lensity, it is to be presumed that they are ut of condition for some reason. Low gravity of the solution will often be found coincident with low cell voltage and a white appearance of the plates, which indicates a sulphated condition.

TESTING CELLS.

A low reading voltmeter should be peri-odically employed to ascertain the voltages of the separate cells. The battery should be put on discharge through a rheostat, and the cell voltages then taken. Any cells which show a voltage noticeably below the average should be noted for future treat-ment. Sometimes, however, these "low" cells may be brought up by completely dis-charging the whole battery through a rheo-stat or otherwise, and then immediately sub-jecting it to a moderate overcharge at a reasonable amperage. In fact a slight peri-odical overcharge of a battery is regarded as beneficial rather than otherwise, but, as before stated, habitual overcharging is to be carefully avoided. If, however, any cells which are found to be "low" are short cir-cuited or otherwise seriously deranged the above treatment will afford no permanent cure—the defective cells immediately de-generating into their previous "sick" condi-tion, which is recognizable by low voltage, low gravity of the electrolyte or an ab-normal appearance of the plates.

CLEANING CELLS.

Active material is likely to scale off the plates from the effects of hard service, jar-ring or an excessive rate of charge, and sometimes may collect as sediment in the bottom of the jars. If it collects in suffi-cient quantity it may bridge the positive and negative groups of plates and short circuit the cell, destructively discharging it. Some-times the separators of the opposing groups of plates of a cell become bridged by sedi-ment and a short circuit results. A short circuited cell is prone to heat badly, and lose its voltage and charge rapidly. It is essential that sediment be removed from the jars and the jars thoroughly washed out before much falling of active material has taken place. The elements should be ex-posed to the air as short a time as possible. The connections between cells should be seen to be tight and of good conductivity.

In case a cell appears to be internally short circuited or otherwise defective so that it cannot be brought up to a normal ca-pacity, it is better for the average user to call upon the manufacturer for assistance in rectifying the trouble. Of course, if one wishes, the "low" cells may be removed from the trays and given special, repeated, low rate charges and discharges in order to try to bring up their capacity.

TO PREVENT SULPHATING.

One thing which should carefully be avoided is allowing a battery to remain fully discharged for any length of time, as seri-ous sulphating of the plates will be the re-sult. The battery of any car which is out of regular service should, at intervals of three or four weeks, be discharged through a rheostat, or otherwise, and then given a full fresh charge. Of course, the battery of a car which is out of commission may be dissembled, but this process involves con-siderable labor and the adoption of special precautions in order to avoid injury to the plates. Periodical discharging and charging is not very expensive or troublesome. It tends to reduce the effects of local action, the result of which is lessened capacity.

SUMMARIZED INSTRUCTIONS.

Instructions covering the main points in the care of a vehicle battery may be briefly summarized as follows: Do not discharge the battery too far and do not let it long remain discharged. Do not habitually over-charge it, but let the charge be proportioned to the extent to which energy has been taken from it. Follow instructions as to charging rates. Note the mileage obtaina-ble from a charge, and if it diminishes obvi-ously, ascertain the cause at once. Watch the condition of the individual cells in re-spect to voltage heating, retention of the charge and state of the electrolyte in point of density and quantity. Keep the jars rea-sonably free from sediment, the battery compartment dry and the cell connections tight. When a cell seems incurably "sick" let the manufacturer deal with it.

The Care and Maintenance of Tires.

By Harry B. Haines.

There is perhaps no more important question in connection with automobiling today than the wear and care of tires, and the subject is one potent with possibilities. It is a self-evident fact that the success and pleasure of motor vehicle transportation de-pends to a great extent on the tires, be they pneumatics or solids, and as the so called "wind bags" are used on the majority of cars they are worthy of first attention and consideration.

The two greatest of the tire evils, blow-outs and rim cutting, have to a great ex-tent been obviated by the superior construc-tion and improvement of tires, as well as the employment of better methods in their manufacture and the use of better materials, but even yet the automobilist is not free from these costly and annoying accidents.

The tire item, as is well known, is the greatest expense in automobiling, and it is obvious that the larger and heavier the car and the more power exerted by the engine in driving it, the greater will be the wear on the tires and the consequent cost of keeping the wheels shod. The manufactur-ers figure that the life of a tire should be 3,500 miles under ordinary usage and con-ditions, but it is safe to say that two-thirds of the tires in use fall considerably short of this mileage and are cast into the junk heap or sent back for replacement after they have gone 1,800 to 2,400 miles, and often before that.

Judging the distance that a tire has gone is a rather difficult proposition, and there is many a man driving an auto today who when he seeks a replacement on a tire will swear that it has gone only two or three

one or two thousand. This same man would never think of lying in the transaction of his own business matters, but the idea seems prevalent among automobilists that the tire companies, like the trolley and railroad corporations, are legitimate prey and should be "done" as often and as persistently as possible.

It is argued, on the other hand, that the tire companies get exorbitant prices for their goods, but that is neither here nor there, and the question of replacement may as well be left between the user and the manufacturer for their mutual settlement.

MILEAGE ALLOWANCE SYSTEM.

It is interesting to note in this connection, however, that the manufacturers have ceased to ask the customer how far he has used a rim-cut or blown-out tire that is sent in for replacement on the 3,500 mile part payment basis. In the early days the customer stated his mileage and an allowance was made on his figures, but now, when the tire comes in, if possible the record of its date of sale is looked up, and at any rate it goes into the hands of an expert, who places an approximate mileage figure on it and the adjustment is made with the customer on that basis. This replacement idea is calculated to save the customer some money in keeping tires on his car and also to keep him feeling good toward the manufacturer, but its abuse has resulted in a partial recall of what for a time looked like generosity on the part of the tire people.

Taking it for granted that a man can get but little in the way of allowance on his old tires and must pay the trust prices, the item of cost of tires begins to assume serious proportions. I know that in my own case I have had new 32x4 inch tires blow up after as little as three hundred miles' usage, but in such cases have been generally given a fair allowance on the purchase of new ones.

LIFE OF TIRES.

To figure out what service a tire will give is impossible. To approximate how far it ought to go is easy enough, but no two tires on any two machines of like weight, speed, etc., ever give the same service, even if driven over exactly the same roads and under the same conditions. In making this statement we come to the keynote of the tire situation—the driver of the machine. It is with the man at the wheel that the length of service a set of tires will give rests to a great extent, and one man will drive a set 4,000 miles while another driver will not get half that distance. If the driver is careless and slams his car over bad roads at high speeds it is possible for him without much difficulty to make the tire expense figure up to more than all the other operating expenses of the car combined.

STRAIN OF HIGH SPEED TURNING.

Fifty per cent. of all tires in use are never worn out by natural wear. They go recklessly and no effort is made to shield the tires or to prolong their life and utility. The heaviest strain on the tires comes in rounding a turn, and it is a piece of good luck if nothing unusual happens when a heavy car is swung at high speed around a sharp corner. At these times the canvas layers of the tire are subjected to a terrific and abnormal strain that sooner or later impairs their efficiency and paves the way for a blow-out. This practice further wears off the tire tread or outside cover a great deal more rapidly than when the car is rolling over the roads in a straight line. Sudden swerves of any sort have the same effect on the tires, and the driver who is willing to take the turns slowly will find that the caution so observed will mean a saving in tire expense. In turning a curve at high speed the car is thrown toward the outside of the curve by the centrifugal force, and for the moment the whole weight is resting on the two wheels of that side, the back of the car is thrown round and the rear wheels drag along the ground. The result is additional strain on the fabric and wear on the rubber tread.

WEAR DEPENDENT ON DRIVERS.

In support of this argument it may be stated that it was noticed in a recent prominent race that one of the drivers wore out thirteen casings while another only wore out two. Both cars were alike and both were driven over the same course at about the same speed and both finished well up with the leaders one after the other. Among tire men this great difference in the tire wear on the two cars occasioned no end of comment and was finally attributed to a difference in the manner in which the two men drove their cars. The car that wore out the thirteen casings rounded the curves at the greatest possible speed, so as not to lose a second, and the brakes were applied suddenly and violently at times, locking the rear wheels and causing them to skid along the ground The other driver, when approaching the turns, slackened his speed and applied his brakes some time before reaching the corner, and then progressively, putting them on and releasing them and steadily slackening the momentum until the turn was reached; he then swung around at fair speed and, getting on the straight stretch, opened up his engine and was off again like a flash.

It may be seen from this that it is advisable for the man who would keep his tire expense down to avoid locking the wheels of his car by applying the brakes too suddenly and to avoid rounding turns at high speeds.

EFFECT OF BRAKING ON TIRES.

In considering the ordinary application of brakes it may be said that their adjustment and handling has a great deal to do with tire wear. In most cars the brakes for ordinary use are so arranged that the braking operation is transmitted through the differential and distributed evenly to both

emergency brakes, that are in use not used as their name implies, but are stantly employed, the situation is different.

These generally apply on the in many cases not enough attention to their adjustment, the result being when applied, either through the of dirt or grit, one of the bands tighter than the other. The result one wheel is retarded more violently the other and the entire stopping comes on it, with a consequent increase wear and strain on that tire. Care be taken to see that both of these bind about evenly.

An equalizing device is generally vided for this purpose, but in cars is not the brake wires or rods shou so arranged that the pressure applied the brake handle divides evenly between the two wheels.

EFFECT OF A "FIERCE" CLUTCH.

Equal in its destructive effect to improperly operating brakes is a ping" or faulty clutch. A clutch poorly adjusted, or for lack of oil other cause takes hold too sudden prove destructive to tires. I have seen a driver let his clutch in with gine speeded up, and as a result wheels would spin around twice be car started forward, so violent clutch action. The wear on tires strain under such conditions are ter entire car is subjected to a sudden which centres in the tires and has dency to tear the rubber from the which it often does. This starting even worse than the stopping sh as wear on the tire surface is A car should be started slowly and a jerk. It should be remembered tires are the yielding, elastic and part of the machine, and as such ject to the severest of strains.

DISALIGNMENT OF AXLES.

On many cars no doubt the unev on tires has been noticed, and be seen on which the rubber worn off one side, exposing the This is generally due to improper of the steering gear or steering Great care should be taken to see wheels line properly and that the The derangement of the rear axle ment will also cause excessive and this is commonly met with fitted with chain drive, the adjus which is made by taking up on rods. Care should be taken to each of the rods exactly in make justment, and at all times to wheels properly lined up It is with a bevel gear car to have clips loosen and allow the axle forward a little and put the wheels line, and it is well to give some this.

CAUSES OF ROAD INJURIES.

In dropping into a deep hole, which allows the car to come down hard on the springs, tires are often injured by being cut by mud guard bolts. Care should be taken to see that all such bolts are filed down flat to the level of the under surface of the guard, so that all rough edges are removed, and if the tire rubs against them it will not be injured and torn.

Sharp stones, such as are found on most macadam roads, pieces of glass, metal, nails, tacks, bits of wire, sharp trolley rails or switch frogs and a thousand other enemies await the coming of the rubber tire and hasten its destruction, and it is the duty of the driver to avoid these as far as possible. A constant watch of the road will enable the man at the wheel to so steer his car that he can avoid most of these dangerous obstructions.

When a tire is cut by a bit of glass or a sharp stone, at times the cut extends entirely through the outside rubber and right down to the fabric. The result is that dirt pounds in and water finds its way down to the fabric, rotting it. The tire pounds full of dirt and the way is paved for a blow-out. Although it is a nuisance to do so, it is advisable, in the case of a cut of any size, to have it cleaned out and vulcanized.

PUNCTURES.

In the case of a puncture stop at once. More tires have been ruined by running on them flat than in any other way. Some drivers offer as an excuse for not stopping when a tire has been punctured that they did not know it was flat. It is possible that this might be true, but it is very improbable. As an ordinary thing, if the puncture is in a front tire, it can be noticed at once, as steering is made difficult, and if it is in a rear, the car seems to lose power and skids without apparent cause toward the side on which the punctured tire is located. Running on a tire that is flat not only subjects the casing to rim cutting, but has a tendency to tear the rubber from the fabric, to draw the stay bolts from their shoulders and to drag the valve out of the inner tube. If the tire cannot be repaired for any reason, it is better to remove it from the rim entirely, rather than run on it flat, going along slowly. It is sometimes possible to make a makeshift tire with a piece of rope bound around the wheel. As an ordinary thing most motorists have spare inner tubes and also bindings that in case of a blow-out will hold the tube in until the run home is made.

INFLATION.

The life and efficiency of tires will be greatly increased if they are always kept well pumped up. I have found in my own experience that a tire well pumped up is not so likely to puncture, as it bounces over the road more freely than a half inflated tire, runs on a narrower tread and has a tendency to roll over obstructions such as sharp stones, glass, etc., rather than to dig down into them. The objection to too hard a tire is that in warm weather the air is likely to expand and by its additional pressure cause blow-outs. This is a condition met with more frequently in tropical countries than here, and in Cuba after a short run it is often necessary to stop and let out some of the air in order to relieve the strain on the tire.

It has been found advisable after long runs in the summer to throw cold water on the rear tires of cars in order to cool them off, and this sometimes may prevent a possible blow-out.

INJURIOUS EFFECT OF OIL.

Care should be taken to keep all oil from the tires. It is a well known fact that oil is particularly injurious to tires, and yet I have seen cars in garages time and time again with the tires standing in pools of grease and oil for hours at a time. Oil rots rubber, takes the life out of it and impairs its resiliency, and great care should be taken, particularly when the machine is standing in a garage, to keep the tires free from oil. Oil spattering on them on the road is not half so injurious, as the dust and dirt wipes it off. In some cars the enclosed live axles are filled too full of oil and this works down through the bearings on either side of the wheels and so down the spokes to the tires. All oil should be carefully wiped off the tires, which may be dusted with powdered chalk to absorb all of the lubricant.

DURING PERIODS OF NON-USE.

Apart from the wear and tear of actual usage, rubber tires have three natural enemies, viz., light, heat and oil, and each has its own peculiar effect. When the car is in the garage and is not to be used for some time it is always advisable to jack the wheels up and keep the weight off them. Many owners of cars have special devices for raising the wheels from the floor, and even when leaving their cars over night jack them up. This is no doubt beneficial to the tires and adds to their life and durability, but it is, of course, some little trouble. When the wheels are not jacked up and the tires allowed to stand for any length of time, they should be kept well inflated and the car should be moved from time to time, so that the tire does not flatten as a result of being allowed to stand on the same spot for a considerable length of time.

The contrary is the rule when the wheels are jacked up and the weight is taken off the tires, it being advisable then to deflate them and so take all the pressure off them. One thing should be kept in mind, however, and that is that the car should never be allowed to stand for any length of time, not even for a half hour, on a deflated tire. Rim cutting is sure to result and at times inner tubes are irreparably ruined by carelessness in this respect.

SAFE CARRYING OF TUBES.

Many auto owners are put to expense by the spoiling of spare inner tubes and outer casings as a result of neglect in caring for them until they are ready to be used. The only logical and safe way to carry inner tubes is to roll each one up separately, taking care to see that the valve stem is left on the outside of the roll, and then put them each into a separate bag well provided with French chalk. Each bag should then be so stored away that it will not rub against the other or against any tools, as the tube will be chafed and ruined if it does. Many users are careless enough to carry inner tubes in their tool boxes, where they are chafed by the tools and rotted by the oil. After a tube has been carried a few weeks it is well to take it out of the bag and refold it, as it is likely to fall in holes at the creases if allowed to remain too long in the same position.

TIRE COVER BAGS.

Extra outer shoes should never be carried on the machine unless protected by a dust and water proof covering. To allow rain and dirt to get at them means to have the fabric rotted before it is used. If the tires are stored away in a garage or at home they should be suitably wrapped to keep the dampness and dust from them and should be kept in a dark room, one that is dry and has an even temperature of about 60 to 70 degrees Fahrenheit.

In conclusion it may be said that the man who is willing to give his tires proper care and attention will find that he will not only increase the efficiency and length of their service but will experience less delays en route from tire troubles. Tires are troublesome enough at best without giving them an opportunity to make further annoyance by neglecting them.

Treatment of Storage Batteries as to Use, Charging, Cleaning, Etc.

By Herbert H. Rice.

Advice as to the use of a storage battery may be properly considered as appropriate to instructions to the owner, rather than to the garage man, but the use in operation while in the vehicle may be summed up in a very few words.

Assuming that the battery has been somewhere nearly proportioned by the carriage manufacturer to the work required of it, there is nothing for the user of the vehicle to do about his battery but to let it alone and use the controller as directed by the vehicle manufacturer, the only instructions which affect the battery, as such, being not to start the carriage regularly at high speed, but to accelerate by throwing the controller one notch at a time. The only other but really important warning is not to discharge the battery below its proper discharge point, which is about 1.8 per cell, from which figures the discharge voltage point is easily figured for any given number of cells. This voltage reading must be taken not when the carriage is idle or the power off, but when the carriage is running at its normal speed (not usually the highest) on the level.

As for the garage, the rules for charging

storage batteries vary slightly with different makes of batteries, but in general they are so nearly alike that instructions regarding one lead battery are applicable to all others.

Charge batteries immediately after a complete discharge or after a half or two-thirds discharge. It is deleterious to charge a battery every time the carriage is run for a mile or two, and here some judgment must be used. It is injurious, on the other hand, to allow a battery to remain discharged for any length of time, as sulphation immediately begins in a discharged battery. It is proportional, however, to the extent of the discharge and it is far better, if one is doing regular trips, to charge once a day or every other day, rather than to place the carriage on charge every time it comes in the garage. Of course, garage keepers do not always know how much a carriage has been used and a customer may want it for a long trip the next day. It is well, therefore, that the customer should understand that the greatest battery mileage is obtained by completely discharging and completely charging in all cases, rather than by using a little and stuffing the battery again. The only warning is, do not allow the battery to stand any time completely discharged, nor very long partially discharged.

Many makers of batteries advocate what is a proper overcharge, though this word is ill advised, as overcharging is the very thing to be guarded against. The proper sort of an "overcharge" is nothing more nor less than a very full charge continued at a slow rate for a longer period, for the purpose of breaking down any sulphate there may be.

Garage men should, about every two weeks, give this "overcharge," the exact rate being dependent upon the size of the cells and may be found in the battery instructions which are sent usually with the batteries.

Overcharging itself, by which is meant a raising of the voltage to too high a point and allowing the battery to heat, is injurious in that the active material is thrown off the plates and as they become softened with heat they rapidly disintegrate and require renewing.

The proper general rule for charging is to charge ordinarily up to 2½ volts per cell at the normal charging rate, which depends on the size of the cell, and then cut the rate of charge down to about one-third or one-fourth of the normal rate and let the current remain until the charge has again reached 2½ volts per cell. The acid at all times must remain above the plates. Suggestions have been both seriously and facetiously made for electric alarm bells, to ring when the acid gets below the tops of the plates, but the whole key to battery care is regular inspection.

A battery works on uncomplainingly; makes no noise, and the only evidence of distress is in lack of mileage. There is so little to do to a battery that owners, and garage men, too, neglect that little until complaints are made. This regular inspection consists of looking into the cells to see how high the electrolyte is and replacing any that has been lost by evaporation with distilled or clear rain water. It is not necessary, and in fact it is wrong, to replace this with electrolyte, as in evaporation the water elements only disappear. There are times when from spilling, leakage or because of many additions of water, the acid has become diluted. This is readily determined by the use of a hydrometer, furnished with most carriages, by which the strength of the acid is tested.

Equalizing is a simple matter, and readily done. This same inspection should occasionally take the form of reading the voltage of the individual cells by putting the battery on a further discharge after it has come in from a run. Each cell will then drop to the discharge point in a short time, and that is when the unequal cells are noted by being below the average in voltage. The acid of such cells should be examined, and if there seems to be nothing wrong with the cell it may be charged separately to bring it up to the other cells. If continued trouble ensues the cells should be cut out and the plates lifted out, rinsed and short circuits looked for. There is not likely to be much trouble of this kind until it is nearly time for the battery to be washed. This is like renewing, more in the nature of a repair, and can not be gone into fully here. It is easily done, however, and full instructions may be had from any battery maker. It consists of lifting the elements out of the jars, pouring the acid into some receptacle where it may settle, rinsing the sediment out of the jars, washing the plates under running water, replacing the elements as they were before, preferably with new wood separators, if the battery is so built, as the wood separators disintegrate when exposed to the air; then the battery is filled again with the clear electrolyte and sufficient additional added to cover the plates. If the wood separators have been treated or soaked before they are assembled the battery may be charged at the slow rate and put into use almost immediately, but an equalizing of the cells, if necessary, should take place by a long, slow charge and by attention to any cells which do not come up to the rest.

The joints should, preferably, be lead burned. Facilities for doing so are easily obtainable and much better results may be had than from an attempt to solder, which is apt to give trouble. Never solder a joint which will be in the acid.

When charging a carriage it is advisable to open up the battery compartment, that free circulation of air may be had, to prevent heating and to carry away any acid fumes there may be. No lighted flame should be brought near a battery when charging, as there is a gas given off which is sometimes held in the jar, causing slight explosions sufficient to blow the cover off the jar and perhaps break it.

A card system on every battery, whether the carriage is left at the garage or is only brought there occasionally by the owner, is desirable—the number of the battery, size, number of cells, etc., when it was new, when cleaned, when plates were renewed, dates, should be put on. A weekly glance at these cards will enable the manager of the garage to send a letter to various owners if the carriages are not kept with him, to suggest that their batteries have not been examined for a certain period and it would be safe to have them looked to, to see if washing or renewals were needed. A very small charge, or none at all, should be made for this inspection, for no matter how much is said or written about giving regular although little care to their batteries, customers usually wait until the battery is in actual need of attention, and should be encouraged to frequent inspections.

Various methods of handling electric carriages are successfully used in garages, and these are usually dependent upon the current which is supplied them or which is made by themselves. Switchboards are very attractive, but nearly every carriage is supplied with a meter and a simple rheostat on the wall near each plug is sufficient to regulate the charging in connection with the meter on the carriage. Charging plants may consist simply of inexpensive rheostats, where straight 110 volt D. C. is delivered, or of rotary converters or motor generators to transform the current supplied by the city to a direct current, of mercury arc rectifiers in case of alternating current supply, of generators belted to power or of gas or gasoline engines connected to generators for the individual plants.

To enter into more detail as to the care of storage batteries would hardly be in place here, particularly as the principal battery companies publish most complete instructions, which may be had for the asking, and it may even be said if a man knows what is covered by about ten pages in the battery instruction books he knows absolutely all he needs to know about the charging, care, cleaning, renewing, testing and putting out of commission of storage batteries.

For garage work a hydrometer with bulb attachment for testing the specific gravity makes the work easy. A low reading voltmeter is also essential for a garage, as is a lead burning apparatus. The latter, however, in a garage where there is a small business, may be obtained by using oxygen and hydrogen tanks, as are on sale for stereopticon lanterns. Where very little gas is used for burning these are economical because in an ordinary lead burning apparatus the gas should be made daily, while with the tanks a very little may be used whenever wanted and the valves turned off.

A few of the "Don'ts" quoted from a recent publication of a battery company would be:

"Don't allow the temperature to rise bove 100 degrees F."

"Don't allow the battery to stand totally ischarged."

"Don't unnecessarily wear out the battery nd increase current bills by frequent and eedless charging after short runs."

"Don't fail to locate low cells and corect the trouble."

Care and Operation of Automobile Steam Boilers and Engines.

By Frank S. Hanchett.

In the operation of the steam driven mo- or two essentials must be kept in view. First, that the supply of steam shall always exceed the demand, and, second, that this upply must be used in the most economical nanner. And every move in the direction of maintenance and operation must tend oward these points.

The small amount of room available for he installation of the boiler and engine in he compact automobile of today, and the mperativeness of being able to generate a arge amount of steam in a short space of ime, render it necessary that the fuel employed shall be that which will develop the ighest degree of heat for the smallest mount used, and also that can be stowed in a small space.

Up to date gasoline is the medium which possesses these qualities in the greatest degree, and therefore it is commonly accepted uel. The burner being made on the blowpipe principle, the gasoline is fed to it under air pressure in the same manner as in he plumber's and tinner's furnace or torch, he initial transformation of the gasoline into gas being performed by a pilot light which is but the generating pan of the gasoline stove or torch in a slightly different form.

When the pilot light is lighted for the purpose of raising steam in a cold boiler, no more gasoline should be run into the cup than is absolutely necessary, as gasoline burned in the open produces more or less smoke, which clings to the exposed surfaces of the boiler in the form of a coating of soot, which will, in a measure, insulate the heating surface from the fire, thereby requiring more heat, and, consequently, more fuel to produce the same effect than if the surfaces were clean. This applies more to flue boilers than any other style, and with them it is good practice to clean off the lower flue sheet, and blow out or brush out the flues at frequent intervals.

The gasoline itself must come in for its share of attention, and it will be found to be as good practice to strain the gasoline for the fuel tank of the steam car as that for the tank of the gasoline car. This is due to the fact that the passage through the vaporizer is small, as are also the openings in some styles of burner, and if any particles of solid matter be held in suspension in the gasoline and pass out of the tank with it, clogging of these passages or openings, with an attendant loss of heat and falling off of steam pressure, will result.

Blowing out of burners, such as are generally used with the flue type of boiler, helps to keep them in good condition, and should be done with steam under a good head of pressure. The hottest flame is that which gives the least light, and, in the case of the gasoline flame, this condition is characterized by a pale but intense blue color, which is produced through the perfect vaporization of the gasoline by heat before it is admitted to the burner. Should the flame, when the main boiler is lighted, be yellow, it is a good sign that the gasoline has not been heated enough by the pilot light before being turned on.

Air pipes and storage tanks must be kept tight. Leaks in the former can be found by painting them with soap suds when under pressure, the leaking air making bubbles in the soap suds at the point of escape. In the case of leaking tanks gasoline is usually present in sufficient quantities to be detected. This is a very dangerous condition, and should be remedied as soon as discovered, as it leaves a path open for gas to collect under the body of the car when standing, and if the pilot light is burning or any other fire present, there is apt to be an explosion.

In making joints in the pipes leading from the tank to the burner soap is frequently used on the threads, as it acts as a seal, filling any cavities or faults in the work and making the joint tight. A heavy mixture of plumbago or graphite and oil is also good, and has the added quality of rendering the joint always easy to unscrew when it is necessary to take the piping down. This plumbago mixture is also extremely good for use on gaskets in steam pipe joints, as a gasket anointed with it on both sides will never stick to the metal of the flange or union, no matter how long the joint may have been up.

Cleanliness and care in carrying sufficient air pressure, which can safely be stated should be an average of 50 pounds, together with proper adjustment of air controls when they are present should keep any burner in condition to do its best work.

Steam is generated either in boilers or generators of the flash type, which are the latest form of mechanism employed. Where a boiler is used, much care and attention is necessary in its operation. And the cardinal principle is to know that there is always water enough present to prevent overheating or burning of the crown sheet and flues. In ascertaining this too much dependence must not be placed on the water or gauge glass, as it is sometimes called. The passages leading through the mountings or nuts of these glasses, from the boiler, are in all cases small, and there is a marked tendency on their part to stop up on the smallest provocation. The glass, to be at all accurate, should be blown out daily, and the passages cleaned out with a wire at very frequent intervals. The only true index of the water level is the gauge cocks, which should be used frequently to verify the glass, and should always be known to be in perfect working order. The water glass, however, is an extremely handy adjunct, as when working right it shows the exact level of water, which the gauge cocks, being set some distance apart, will not do. The glass should be renewed at frequent intervals, as the action of the steam wears it thin at the top and causes it to burst, pieces flying to some distance with great force, and sometimes injuring the operator. The writer was once cut rather badly from a piece of a broken glass, though some 6 or 8 feet from the boiler at the time.

Where shut off cocks are used in the top and bottom nuts of the water glass they should not be opened over a turn or a turn and a quarter—the top one being opened the widest, for if the top one be nearly shut and the bottom one open, the glass will register a higher level than is correct—this rather small opening will enable the cocks to be quickly closed in case of the glass breaking, and render the chance of scalding the operator very slight. The cocks should always be in a condition to shut off tightly, as otherwise a glass cannot be renewed while steam is on the boiler.

In a case of water glass renewal where the glass provided happens to be too long, there is a little kink well known to engineers, which can be used with good effect. Having ascertained the proper length of glass needed, take a parlor match, and, wetting the head, draw with it a line at the point where the cut is desired, entirely around the inside of the glass. If the glass is now held with the marked part in the flame of a torch or other fire, it will of itself break at the mark, or at least crack so that a light blow will sever it.

Before starting the fire always make sure that there is water in the boiler, and if no automatic device is provided for the regulation of the fire ascertain, in the case of a strange boiler, that there is a soft or fusible plug in the crown sheet. This plug is either wholly or in part composed of an alloy of lead which, when exposed to the action of the fire with no water on the other side to keep it cool, will melt, allowing any steam or water which may be in the boiler to be discharged on the fire, putting it out and preventing any overheating of the plates.

The most pregnant source of trouble in boilers, leading up to the loss of steaming ability, is from the collection of sediment either in the form of mud or scale. All water contains more or less solid matter, which remains after evaporation. If the water be simply dirty this deposit will be soft mud and can readily be washed out with a hose, which washing should be done often, for if the mud is allowed to remain it will eventually become so thick that the water will be held away from the plates, which will mud-burn or blister and weaken. If the water be hard the deposit will be in layers of lime scale, which forms a non-

conductor of heat and keeps the boiler from making steam freely.

To prevent scaling, a small amount, say one-eighth of a pound, of boiler compound —soda ash being as good as any—should be introduced into the tank each day. This will have the effect of keeping the scale from hardening and it can be washed out. In using boiler compounds there is produced a tendency on the part of the water to foam; this can be kept down by blowing the boiler out once in every 25 or 50 miles, after first filling the boiler full. If a boiler is found to be scaled, the scale can be loosened by introducing a strong solution of sal ammoniac, allowing it to remain from one to two hours, and then thoroughly washing it out. In extreme cases in coil boilers, citric acid has been substituted for sal ammoniac with good results. The acid, however, should be kept circulating by means of a hand pump, and not allowed to lie in the boiler.

Proper feeding, or the feeding of water to a steam boiler, where the pump is under control of the operator, as it always should be, requires a knack that not every one seems able to acquire. For good results the feed should be by independent pump or injector, the theory of pumping being that water should be supplied in equal amount to that evaporated, keeping the pump in action all the time, or, if not possible to do this and hold the steam pressure, as when on a hard hill, the supply should be just a little less than the amount used, being careful to retain at least one gauge of water at all times, and to increase the feed to get the level back over the hill. Old boilers, when forced on hills or other hard work, often start leaking around the flue beads. When this occurs on the road temporary tightness may be secured by introducing about one-half pint of bran into the boiler. If bran is not procurable sugar, baking powder or finely ground rice will all have the same effect. This is not lasting, however, and the flues should be expanded or rolled as soon as possible.

If a boiler is to be laid up for any length of time, the best method of procedure is to fire it up until it has about 5 pounds of steam; then shut off the fire and blow it out dry; also disconnect and drain all the water tanks, piping and pumps. To get economical service as much as possible of the expansion of the steam must be utilized. But to get the maximum of expansion the steam must be dry or superheated. There is space provided for this superheating in all forms of boilers or generators, and this must not be filled with water; if it is the water will be carried over to the engine either under the condition called priming or as saturated steam, which condenses readily, depositing its water in the steam chest and cylinder, where it washes the lubricant from the moving surfaces of the valve and piston, causing undue friction and sometimes abrasion of these parts, and, worse than this, is liable to cause a water hammer and do considerable damage.

Hints on the Care of a Gasoline Motor.

By F. E. Watts.

The gasoline motor is the simplest machine for turning chemical energy into mechanical power, but any machine which performs such a complicated function must be more or less mysterious to the average user, until he has learned that actions on his part invariably bring about given results, and that each apparently incurable trouble which arises has a certain and usually simple remedy.

The following notes upon the care of an engine are intended primarily for the novice, but may possibly also be useful to the more experienced, for the more ways in which a subject is viewed the clearer its true nature appears.

In order that a gasoline engine may run well the following conditions must be fulfilled: It must have (first) a proper mixture supplied at the right time and in sufficient quantity; (second) a source of heat sufficient not merely to ignite but explode this mixture; (third) a working cylinder in which this explosion may take place, which is gas tight, so that the charge may be compressed into a small space and more completely exploded, and also that power may not be lost by the escape of expanding gases past the piston as it moves downward on the power stroke; (fourth) means for transmitting this expansive effort to the flywheel which regulates the inequalities of turning force; (fifth) moving surfaces that are smooth and free fits, and properly lubricated, so that there will not be undue loss from friction; (sixth) means to promptly remove the burned gases from the cylinder as soon as all the energy we can get from them has been obtained; (seventh) some system of cooling the walls of the cylinder sufficiently to enable good lubrication to be maintained.

The care of these different parts will be described under the following headings: Fuel Supply, Ignition, Mechanical Parts, Lubrication and Cooling.

The rules for keeping an engine in good condition may be condensed into one short text: Study minutely the condition and operation of each part when new, and endeavor to keep it as nearly in this condition as wear and the time you can spend will permit. This rule followed with that degree of common sense which is necessary in the application of all rules will produce admirable results.

FUEL SUPPLY.

Observe the adjustment of each part of the carburetor that may be got at without taking anything apart which will disturb adjustments. Mark all these adjustments, if it is at all possible, so that they may be returned to at any time if it is neccessary to do so. Be especially careful to mark the height of gasoline in the float chamber with the car standing level, and note the level at which the gasoline stands from time to time when the carburetor is taken apart, as it should be occasionally for cleaning, and to make sure that the float valve is perfectly tight. Much variation from this level is a sign that the float is out of order and should be examined, or that the valve leaks slightly. If the latter is the case it should be "ground in" with oil and emery, taking care to use very light pressure, as the bearing surface is small. If the carburetor is supplied with a drain, it should be drained at regular intervals, as may be found necessary, to remove the sediment which will always be found no matter how thoroughly the gasoline may be cleansed.

It is advisable to follow the line of pipe or tubing by which the gasoline flows from the tank to the carburetor, for its entire length, carefully inspecting each joint to make sure it is tight, and, if it can be done, soldering each joint except unions. This leaves fewer places to watch and often saves that unequaled annoyance of being caught without gasoline far from a supply.

All gasoline should be as thoroughly strained as possible before it goes into the tank. Straining through chamois skins in a large funnel is advisable if one has the time. In addition, it is convenient to have a large can of gasoline on hand that is known to be perfectly clean, so that the tank can be quickly filled if necessary.

IGNITION.

The ignition system is not now the fruitful source of trouble it was in former years, for more perfectly insulated wires, better made coils and timers and carefully constructed plugs and make and break mechanisms have reduced ignition troubles to a small percentage of what was once the rule. The greatest trouble now is that we do not keep the ignition up to the point where best results are obtained. Cents spent on producing a good spark often save dollars in fuel and add satisfaction in the good performance of the car.

When the car is new, if it is fitted with jump spark, take out the spark plugs and lay them on the top of the cylinders so as to be grounded as in use. Turn the engine till the contact is made and see how quickly a piece of thin paper held between the points of a plug will be ignited. Repeat this test from time to time, as you have opportunity or whenever there seems to be a falling off in the power of the engine; and try to keep the spark nearly as hot as when the car was new by adjustment of the vibrator, cleansing of the spark points or renewal of the battery, if necessary. If supplied with the necessary ammeter it is well to find out the lowest amperage on which your car will work well, and always keep your source of current above this minimum.

Dry cells should be replaced when they fall below your standard. Storage cells should be put in charge of a thoroughly competent man, or preferably sent to the maker when repairs are needed. Mag-

; weak may be remagnetized by any
lectrical repair man.
:s should be frequently inspected for
which can usually be located by
a limp place when you bend the
in your hands. All connections
be tight and brightened where con-
made. Plug points should be kept
and the distance between them
be kept as nearly as possible what
when the plug was new. Timer
s should be bright and smooth, and
irm yet not too heavy contact.
re the make and break system is
all parts should be seen to move
and easily, and any looseness should
: be taken up. These parts are very
nd operate at high speed, so extra
:ions are required to keep them in
adjustment. Their springs should
)t at normal tension, and points
be bright and make good contacts.

MECHANICAL PARTS.

:r this heading come the cylinders,
and rings, connecting rods, crank
and flywheels, cam shafts and

cylinders ordinarily need but little
eyond an occasional scraping in the
:tion chamber to remove carbon de-
and a flushing of the water jacket
r twice a season to clean out any
nt which may be deposited. Rebor-
l refitting pistons is a matter which
ıe maker can deal with to advan-

)n heads should be freed from car-
posit whenever this accumulates to
'eat extent. If any loss of com-
n is observed which is not reme-
/ regrinding the valves, the pistons
be removed and the rings freed in
rooves by a liberal washing in gaso-
Do not remove a ring unless it is
:ry to replace it with a new one;
:e stretched enough when they are
originally. Rings which do not
)right over their entire outer sur-
) not fit the cylinder, and should
laced by new ones from the fac-

t pins, if proper provision has been
for lubrication, seldom give any
. Whenever opportunity offers they
be tested to see that they are
too tight nor too loose, by moving
ınk pin end of the rod back and
engthwise of the crank journal.
k pins, bearings and crank jour-
ıould be set up as tightly as free
g will permit; and great care
always be taken to have the caps
d tightly against the shims, so that
s no chance for play in the cap.
)n as any bushing shows excessive
: should be replaced by a new one;
fore the process of fitting this to
ıft is begun it is well to make sure
he outside is a snug fit in the
l and cap. Some manufacturers

bushings into the journal with oil and emery. After the outside is fitted the bearing surface should be scraped until it fits perfectly on the shaft; adjust it a little looser than you would leave an old bearing, and run under light load carefully until there is no tendency to heat, then give it its final adjustment.

In a well constructed motor these bearings should run several thousand miles without needing attention.

Whenever the motor is taken down for any reason it is always well to go over the crank shaft carefully, testing all bearings as closely as possible to see that they are round, straight, and show no signs of cutting. If it is convenient to do so swing the crank between centres in a lathe, and see if it is out of true. If it is found to be crooked it will be necessary to turn it down somewhat and fit new bushings.

No attention need be given the flywheel, except to note occasionally if it is running true, and to see that its fastenings are tight.

In almost all motors the time of opening and closing of the valves is marked upon the flywheel, and it is well occasionally to go over the timing and see that it actually agrees with the marks on the flywheel. By inserting a very thin piece of paper into the clearance gap in the valve operating rods and having an assistant turn the crank very slowly in the direction in which the motor revolves when running, carefully trying the piece of paper to see when it will just pull out, the points of opening and closing can be exactly located for each valve, and may be adjusted to correspond with those marked on the flywheel.

There is a great saving of fuel in grinding valves frequently, as it makes it more certain that the whole of the fuel is being utilized.

In grinding valves it is a great help to have a light helical spring underneath, of such a diameter as to fit freely around the valve guide, and long enough to give 3 or 4 pounds pressure; this enables the valve to be lifted easily to allow the oil and emery to flow under, and gives a slight pressure to work against, so that it is much easier to judge what pressure you are using in finishing. Valve springs must be kept nearly up to the original tension, or the valve will not follow the cam and power will be lost.

LUBRICATION.

Where oil is supplied by means of a mechanical oiler having sight feeds, it is a good plan to count the number of drops per minute which each of these gives under a normal running speed, and to make a note of it for use in case the adjustment is ever changed; also to note the kind of oil used.

The varieties of oils and greases recommended by the makers should be used, for

experiments along these lines should be cautiously attempted. All oil pipe connections should be regularly inspected, to see that there are no breaks.

In case an oil pump and reservoir are used, and the oil after being made use of once is passed through a screen and then used again, this screen should be looked at from time to time to see if it is broken or needs cleaning.

Where the splash system is used the coil should be drawn from the crank case at regular intervals and replaced by fresh oil.

It is well to remember that one drop of new oil is worth a pint of stale oil for lubricating purposes, that all overflow of oil is worse than mere waste, since it collects dust and dirt, and that each bearing should get as much as can be fed to it without waste.

COOLING.

When your car is new and in perfect running order go over the different parts of the engine carefully and learn how hot each should become, so that you can quickly tell if any part is becoming unduly heated later on.

Also note how fast the water evaporates, so that if this normal evaporation is much increased you will at once note the fact and be able to seek its cause, which may be a failure of the pump to operate, leakage in the cooler or piping, or a stoppage of the circulation at some point. The water used should be as soft as obtainable, and if it is convenient to do so rain water may be used.

If the radiator becomes clogged it may be filled with a caustic soda solution of about 20 per cent. strength by weight. Allow this to remain in the radiator for several hours, then flush with clear water. This solution has a corrosive action on aluminum.

Where rubber hose is used to make connections and has bends in it a good plan is to reinforce it by a brass coil spring which is a good fit inside. This prevents flattening at the bend and cracking, and sometimes is not done even on good cars.

Any small leak which appears should be repaired as promptly as possible, for it quickly grows to a large one, which is much harder to repair, and nothing looks worse nor unfortunately is more common than to see a pool of water under a car which has been standing for some time.

There are a thousand and one other things that need to be done from time to time in taking care of an engine, but it is hoped enough has been said to start the beginner along right lines. A good engine will stand a good deal of neglect and abuse, and still give faithful service, but will well repay all time spent in care and attention.

This means that the water level in the boiler or generator must not be allo

overbalance the fire. In the case of generators the principle on which the water is fed is directly opposed to that of the boiler. Steam is generated in the boiler by boiling the water, the steam rising to the top and collecting there; in the generator the steam is made by practically dropping the water on to the heated inner surface of tubing, the steam going to the bottom of the coil and being superheated and drawn from there. In the boiler when too much steam is being made more water can be pumped in for the purpose of lowering the temperature and decreasing the generation, while in the case of the flash generator less water is fed, and as a less amount of water is dropped into the tubes less steam will be produced. In generators the water feed is governed by an automatic device which cuts off the water supply when the steam pressure rises, and increases the supply when the pressure falls. Under this condition it will be seen that any loss of steam means more water fed, and if more water is delivered by the pumps than the fire can convert into steam, the steam which is produced will be wet and comparatively weak. Therefore the burner must be kept in condition to change enough water into steam to supply any and all demands made by the engine.

All pumps must be kept well packed and check valves carefully fitted or ground in, especially those checks which are on the delivery line between the pump or injector and boiler, as any failure to close on their part may cause a pump to cease working through inability to force against direct boiler pressure, and any sticking or failure to open will prevent water being delivered to the boiler. Scale from hard water will if not watched collect in boiler checks, and in time seal them shut, cases having come to the knowledge of the author where checks were lined up so badly that it became necessary to remove them from the boiler and bore them out.

Too much stress cannot be laid on the matter of keeping the boiler free from dirt and scale, as a dirty boiler means a poor steamer, and consequently an unsatisfactory machine. As only a limited amount of water can be carried it must be used economically, and to that end all steam pipes and parts which might leak and thus waste water must be looked after carefully. Surface condensers where applied must be kept clean by frequent washing out, and oil should be removed from the feed water by flooding and washing the supply tank.

The engine used in the steam automobile has generally two cylinders, either simple or compound, with the shifting link for reversing and cut off purposes, the valve being of the D slide variety. These engines are vertical as a rule, and enclosed, leaving practically nothing of the mechanism exposed but the pistons and valve stems. Where the compound style is used a condenser usually receives the exhaust and converts it into water to be returned to the boiler.

The latest type of engine is provided with a clutch or some similar form of mechanism for the purpose of allowing the engine to be run free. This is done primarily for the reason that in order to get the steam pressure up to the working point the pumps must operate and force water into the tubes, and as these pumps are usually of the cross head variety, the engine must be operated to run them. This running free of the engine allows it to be started and run very slowly with light throttle until the cylinders are warmed up and the water of condensation is fully worked out. This must be done very carefully, for if the piston moves faster than the water can escape from the cylinder a cracked cylinder head will result.

To get the full benefit of the steam pressure in the engine both valves and pistons should be steam tight. Any leakage of steam by these parts means loss of power, and is denoted in the valve by a whistling blow through the exhaust when the engine is started, and which continues as long as the engine is running, increasing and decreasing as heavy or light throttle is used. A blow or leak by the piston is usually caused by worn or broken packing rings and has a hollow sound, which is most apparent when the engine is first started or is being worked slowly. There is another blow which comes from packing rings that fit too tight in their grooves in the piston and fail to expand under pressure. Rings in this case are said to be "follower bound," and the resulting blow has a muffled, sloppy sound, as of water in the cylinder. When this condition occurs the piston should be removed and the rings eased off on the edges until they will move freely in any direction in the grooves. When putting in cylinder packing rings arrange them so that the cuts are separated as widely as possible, for if they are allowed to get in line a blow similar to that from a broken ring will result.

As has been stated, the engines are double acting, using the shifting link for reversing. This link also performs another function, that of a cut off or device for working the steam expansively. When the reverse lever is at the extreme end of the quadrant in either direction, the valve is moving the full length of its stroke, and any halt it makes will be at the end of its travel. Under this condition live steam is admitted to the cylinder, and follows the piston for nearly the whole length of its stroke before it is cut off, or, in other words, before the admission port or opening through which the steam passes from the steam chest to the cylinder is closed by the lap or projecting end of the valve. This gives maximum power at low speeds, but as there is so much steam in the cylinder at the end of the stroke that it can escape but slowly, if any attempt is made to hurry the piston unduly the steam, which is still expanding, does not get out of the cylinder rapidly enough, and produces a back pressure. If, however, the reverse lever is moved toward the centre of the quadrant one or more notches as the speed of the car increases, and this movement or hooking up is continued as long as the speed which is required can be held, the effect, due to the shape of the link, which is the segment of a circle, will be to shorten the valve travel and bring the halt in the centre of the stroke, thus lapping or covering the admission port early, and cutting off the steam at one-third or possibly less of the piston travel, thus admitting live steam that far and then allowing it to expand and drive the piston the rest of the way by the power derived from its expansive properties. At the end of a stroke accomplished in this way there is a comparatively small amount of steam left to escape, and it will do so readily with little or no back pressure.

As it requires a smaller amount of power to keep the car going than to start it, after getting under way power can be sacrificed to speed, and a machine be operated in this manner very economically, as by working the steam expansively a less amount is drawn from the boiler than at full stroke, and the less steam used means the less water evaporated, and consequently a saving in fuel. When a car handled in this manner approaches a hill it should do so at its best speed with wide open throttle, lever cut back, and its steam pressure up. As the foot of the grade is reached the lever should be moved one notch further away from the centre of the quadrant, and this action repeated whenever the car loses speed as long as any notches are left; this will frequently carry the machine over the hard pull of the hill if not too long, without a very great loss of speed, which is an object to be desired especially in the case of the automatically fed generator, for here slow speed of engine means slow speed of pumps, small amount of water supplied and consequent loss of steam, necessitating the use of the hand pump to maintain the working pressure. This manipulation of the cut off or dropping the lever, as it is called, requires some skill on the part of the operator, which can only be gained by practice. But once the ability is acquired the discerning driver will use no other method. High speed locomotives whose engines are constructed on the same lines as those of the steam automobile are invariably operated in this way. In fact, if they were not, it would be impossible for them to get from one water tank or coal chute to another.

In the case of compound engines where the steam is used twice before being finally exhausted, the cut-off cannot be worked as short as in a simple engine where each cylinder gets its supply direct from the boiler, for the steam in the compound must leave the first cylinder with expansion enough in it to operate the piston in the low pressure or second cylinder, and leave that cylinder with more than the atmospheric pressure of 14 and 7-10ths pounds per square inch, or back pressure will result, as the piston will have to push the exhaust steam from

the cylinder. If the condenser used produces vacuum on the exhaust side of the piston this rule will not apply so fully.

The steam automobile should be and is, when properly kept up, the most silent car made. To have a car in this condition, however, every attention must be paid to keeping all moving parts adjusted as snugly as possible, without undue tightness. Crank shaft bearings must be kept lined up and tight, and connecting rod brasses snugly and carefully keyed; this last can only be done if the brasses are filed and fitted properly. In regard to this it can be said that most repair men are prone to make the bearing of the brass on the pin too long and too wide. To be right the bearing should be oval, the length of the oval extending with the curve of the brass and ending at least three-eighths of an inch from the ends of the brass, and leaving from one-quarter to three-eighths of an inch on each side of the bearing where the brass does not touch the pin. A brass fitted like this will stand tighter keying and run cooler under it than one put up in any other way. In keying an engine it is proper to place the crank pin on one or the other of the centres before the key is adjusted, as this is the point where the least strain comes on the pin, and consequently the least wear, so that if the pin is out of round it will, in this position, present its largest diameter to the brasses. To guard against sprung pins it is well after keying to turn the engine over and carefully try the lateral motion of the brass at all points of the circle, for if the pin be sprung the brass is liable to bind and heat at that point.

In packing pistons and valve stems the old packing may be removed quickly and easily when under steam by loosening up the glands, and, after blocking the wheels, opening the throttle suddenly to a good width; this will blow the packing out of the stuffing box, leaving it clean for the new rings. These should be of some graphite treated woven material, cut a trifle short to allow for expansion when heated, otherwise the packing will clamp the rod, causing it to heat and score or cut, besides burning the packing and making it useless. Joints must be broken when two or more rings are put in, or else the packing will leak. After the new rings have been placed in the stuffing box the gland should be drawn down tight and then eased off until only hand fast, then start the engine, and if after a few minutes running any leaks develop gradually screw up the gland until they stop, being careful not to screw it so tight as to make the packing rigid. If the leaks do not stop, taking out one ring and turning it over will sometimes overcome the trouble.

Cylinders should receive lubrication to the extent of four to six drops of oil a minute continuously while the engine is running. Occasional administration of graphite and oil to the valves and cylinders helps greatly to prolong their life and reduce the friction which absorbs so much power. Graphite is good to use on all bearings and gears where they are run in oil, and is especially fine for hot bearings.

Be saving on oil and gasoline, but do not skimp on the former, for next to a poor steamer the greatest bane is a machine which has chronically hot bearings, and lack of oil will produce them.

To sum up, keep a clean burner and boiler, work your steam expansively to economize on fuel and water, lubricate well and frequently, inspect your machine carefully at the end of each trip, tighten up any loose nuts and bolts as soon as discovered, keep all joints in steam and water pipes tight, keep pistons and valve stems packed, watch your keying and you may have a maximum of comfort at a minimum of expense and trouble.

A Few Pointers.

By John A. Seavern.

The care of an automobile is a matter that has not been considered from a theoretical standpoint, as has the care of horses or the vehicles they draw. Any old place was good enough to use as a "garage," and the men who have had charge have, as a rule, been any old man. The automobile has come to stay, and its care is as great a problem, at least, as the care of horses.

There are many questions to be considered, and as the development has been very rapid, their consideration has not been deep. Having devoted much time to the problem, I have come to some general conclusions that may be of use, and as I have just equipped a station a short description of it may serve to illustrate.

I object to the word "garage" and think "station" is more American.

One of the worst features of keeping a car in any public station is that of tools. Every owner that I have talked to has had a tale of woe about tools he has lost. The general run of workmen do not seem to think that it is stealing to take tools out of a car and not put them back. They sometimes take them from the other men in the shop also. Very few of the stations I have been in have any system that prevents this, and as long as the customers do not kick too hard it passes unnoticed. It is a fact, however, that nothing of value is safe, if not watched, in most places where automobiles are cared for. This is all wrong, and can in a measure be prevented.

A workman will be more careful of his own than of what belongs to others, and will not intentionally steal, but in the rush will borrow. Now, if the foreman will see that each man has a "kit" of his own, or one that belongs to the "house" and is charged to him, the necessity for borrowing ceases.

To this end I have had made a number of portable benches, each having a vise and a shelf on which parts of cars may be kept while in process. This bench may be covered when the man to whom it is charged is not at work, as there is nothing there that each man does not have. Each man also has a tool box that he can carry about, and which he may lock up at night in his locker. Any tools needed, that he does not own, are furnished by the "house" and charged to him, and credited at any time when returned in good condition. Tools kept out over a Saturday night are collected for on the next pay day, except on an order from the foreman. It is intended that every man shall have a full kit of his own, and all good men are glad to get good tools at low prices. Troubles over lost tools are very rare.

In most repair shops, when a car is pulled to pieces some of the parts are put to rest on the cushions; this may be good for the parts, but it is tough on the cushions, and a strict rule failing, I have found it wise to have a few cheap cotton covers made, and to have the washer put them on before the car is turned over to the shop men. These covers have saved a lot of trouble.

When any work is being done on the engine the fenders catch it. If all cars were so made that the fenders could be taken off with ease all this would be avoided by taking them off, but as it is we have to have covers for them, too. In fact covers that will fit all the finished parts of the cars are a great saving.

When a car comes in for repairs that will take more than a few hours we have all the loose parts, lamps, mats, and all the cushions, etc., taken to the stock room and put in a locker out of harm's way. This saves breakage and a lot of annoyance; it also removes a lot of temptation.

Very few men know how to push a car, as can be seen by bent fenders, dents in the bodies, etc. There is only one way; take hold of the wheels! That is the way the motor does it, and it takes less power, does not leave any marks (except dirt that will come off) and while it means that only four men can work at a car they are usually able to move the heaviest ones without hurting anything or themselves.

Someone says it is too much trouble to get men to do things in this manner! This is true, with the general run of men, but if care is used in getting the right kind of men, and they are used in the right way, it is not hard, and the results pay.

Caring for automobiles is work that requires close attention, and must be done systematically. Each thing should be checked off as done, and care taken to do all that is needed, as lives may depend upon a very slight mistake. The washer's helper should attend to the kerosene lamps, and see that the wicks are turned down below the top of the tube, thus preventing creeping of the oil, and he should try each lamp to see if it is properly trimmed, a thing that is rarely done. If he attends to the acetylene generator he should be sure that the joints are tight, as I have seen some bad explosions result from carelessness in this

work. Water in the horn will spoil it, and a sure way to prevent this, and also to avoid a lot of other troubles, is to have made a number of waterproof covers that are put on each car as it comes onto the stand, and taken off by the polisher. It is wise to have an inspector, who sees to it that all these things are done and also looks each car over for loose parts, etc., many a repair bill being saved thereby.

Some of the garage keepers who run repair shops take delight in having things go wrong with the cars they care for, as the shop then gets a job. I have known of cases where nuts were loosened so as to get work, but this sort of thing does not pay, and the man who does a little work that he does not get paid for in order that his boarders' cars are in good shape at all times will get the business.

Repairing a car is work that requires thought as well as skill, and often, if the workman would stand and think it over he might save much of the work, but thinking is a lost art with most men, and in some places the man who thinks is not wanted. Of course, we don't want the man who spends all his time thinking about Saturday night and 6 o'clock, but the man who thinks about his work is a valuable help to his employer.

Every proprietor should know his men and keep in touch with them; don't forget that they are apt to get tired, and use them as he likes to be used; work will go better and there will be less trouble and more fun. Good nature is of great importance in getting good work, and a laugh is better than a curse as a driver.

It is safe to say that at least one-third of all the time spent on a repair job is in doing the wrong thing, and some of the "fixing" that is done is very far from right. The workman is a genius who can always hit the right thing first, but some are better than the rest, and these are the ones that are most in demand.

I have found a way that has been very successful, and it is easy to get good results with less cost than is common in repair shops. I have picked out the men who have the genius for finding trouble, and when a car comes in they look it over and diagnose the case; then the best fitted man for that particular job goes to work, and he is followed by another visit of the doctor and so on till the job is done, the doctor being always on the lookout for new symptoms.

It comes down to making the men specialists and works well. It is wiser to put in a new part at a cost of $10 than to spend $15 in labor, and then have an old one that will not last one-half as long as the new one.

Whole books could be filled with the "fool things" that are done every day and called repairs, also on how to run a repair shop, but the buildings cannot help what signs they carry, nor tools who use them, so the fact remains that those who know how don't need the books, and those who don't know won't read them, so, as the skunk said, "What's the use!"

Repair Shop Observations.

By F. H. Bonner.

As considerable difficulty has been experienced by most automobile repair shops in establishing and maintaining a system satisfactory to both dealer and customer, I will attempt in this article to give the results of my observations and practical experience in several up to date shops.

By far the greatest cause of dissatisfaction on the part of automobile owners is the size of the bill for some seemingly insignificant item of repairs. As an instance, a machine comes in to have a clutch leather renewed, which is an easy task and quickly performed by a good mechanic after the clutch is removed from the machine. In many machines, however, either the motor or transmission must be removed before the clutch can be detached, and should the owner not be familiar with the construction of a car (and this is frequently the case), a protest and roast of repair robbers is the result when the bill is presented.

In many cases the dealers are accused of padding or adding to the mechanic's actual time on the work. In order to facilitate the cost keeping of the shop and to satisfy customers, many shops are now equipped with automatic clocks which register when the workman starts and finishes the work. The tickets are saved for the customers' inspection when the bill is presented. I am using one of these clocks at present, with results so satisfactory that we have named it the "peacemaker."

A great mistake of machine owners is in demanding the finish of repairs in a certain specified time, regardless of the amount of work to be performed. I have in mind a large touring car brought in for a general overhauling. The work was to be finished in one week's time. Hurried jobs of this nature require an extra number of men, and few shops can afford to place more than one or two of their best men on a job. These men are needed as leaders in the distribution of work, consequently rush orders, as with the touring car, necessitate the placing of inferior men on the work, to accomplish it in the specified time. The inevitable result is that defects occur that could have been avoided.

Not more than two men should be employed in the taking apart or reassembling of a car; a greater number are not only in each other's way but in the division of responsibility a general tendency toward carelessness is noticeable, and the losing of parts of frequent occurrence. The first attention that should be given a car brought in for repair is the stripping of horn, lamps, extra tires—other detachable parts that are liable to be lost or damaged. In a small room, 10x12 feet, with shelves from floor to ceiling, I have seen stored away in perfect order material from twenty cars undergoing repairs on the floor. This work was done by an intelligent helper, who also attended to the bell, oiled the shafting and machinery, and was responsible for the care of kerosene, gasoline and other inflammable material used in repair shop. An inventory of the owner's goods was taken and signed for by the owner or chauffeur, and could not be taken away unless by the responsible parties.

The next operation is the removal of the body and the storing of it in a convenient place. This place should be of such a temperature that the wood will not shrink. Wooden bodies kept in a warm, dry room, frequently crack, necessitating the renewal of panels. Next the engine must be stripped of controls, pipes and small parts, and then removed from chassis. No up to date shop will permit the mechanic to use a monkey wrench in the loosening or tightening of bolts. The use of socket or end wrenches is quicker and less liable to injure the corners of bolt heads or nuts. The universal joint socket wrench, now in use for bolts and nuts that are otherwise inaccessible, is to be found in all first class repair shops, and supersedes the custom, too prevalent in the past, of loosening nuts by hammer and chisel, which not only destroys the nut but gives the car a second hand appearance.

In removing the motor the old time custom of lifting by five or six men is replaced by the practice of using a stout hook in the ceiling, from which is suspended a chain fall. The better method, however, is the provision of a track running overhead across the shop on which is operated a small steel trolley carrying two chain falls, 2 feet apart, which can be attached to both ends of the motor. By this means the front end of the motor can be elevated, to allow the flywheel to pass under the dashboard.

The motor is lowered to a truck and taken to a bench to be repaired. Before proceeding further with the work, the motor should be taken apart, the crank and cam shaft tested in lathe centres, and their defects remedied by a lathe mechanic, while the transmission and differential are undergoing repair.

The removal of grease and dirt, which accumulates on machinery of a car, is one of the great annoyances of repair men. In some of New York's best garages I have seen parts cleaned in an obscure corner of the repair shop by means of a large pan of gasoline and a brush in the hands of an apprentice. This method is not only dangerous but is liable to cause the forfeiture of insurance, if observed by a fire inspector. Some garages having a steam plant boil the parts in a large tank, in which is fitted a large strainer. When cleaned the strainer containing the parts is withdrawn from the tank.

The best method that has come under my observation is the building of a fireproof room, 6x8 feet, provided with two covered galvanized iron tanks, 2 feet square, 2½ feet high. These are half filled with gasoline, and the parts to be cleaned are

first soaked in one tank and then rinsed in the other. When the gasoline in the first tank becomes too greasy the tank is emptied out and filled with fresh gasoline. The second tank is then employed for the first operation. While the first cost is considerable, this method is the safest and most economical I have ever tried.

An important but frequently a slighted matter in repair shops is jacking. The quick acting auto jack is far superior to the old time screw jack, but is more liable to topple over in case of a sudden jar. Repair shops should be supplied in abundance with wooden stands, made from 4x4 inch stock, cut to a height convenient to use under the axles of machines. On two sides of the upright, at the base, are screwed pieces of 1 inch board, 5 inches high by 9 inches long. A stand of this design placed at both sides of the axle, with bases at right angles, will resist a violent shock without falling.

The Practical Cleansing of Varnished Surfaces.

By T. H. Reardon.

As methods usually are as different and as various as the people that make use of them, the writer felt fully justified in anticipating a wide diversity of opinion when he set out to interview three or four well known parties upon whose judgment and experience he was perfectly willing to rely.

But however much the parties interviewed differed in regard to other matters of general interest in regard to washing vehicles, there was a uniformity of thought and action that was as agreeable as it was surprising.

The first party approached was a private driver. The condition and appearance of the vehicles entrusted to his care needed no comment, their appearance being faultless; hence, only the method was required.

The washing was as follows: Only cold water was used. This was used directly from a hose, at a very moderate pressure, the hose being held in one hand while a sponge was used by means of the other hand. The sponge was used largely with a "sopping" motion, as distinguished from a to and fro "rubbing" motion. It was the regular custom to "souse" the dirt thoroughly with water, and remove all dirt possible in this way before using the sponge. The matter of using tepid water being broached brought out the remark that "tepid water might be used without injury," but that "it never had been."

The matter of using soaps, both "special" and otherwise, was discussed; it was allowed that soap might be used for the running gear, but that it "never had been."

It was suggested that for grease or oil on running gear a little kerosene on a rag would remove it very nicely, and being washed off immediately afterward, it was unobjectionable.

The next party interviewed was a garage proprietor of much experience. He indorsed the foregoing, except that he was in favor of using special soap for running gear, but he was not at all anxious to use soap on the highly finished surface of an "auto" body; he favored a long handled brush, such as are used for window washing, for reaching the different parts of the running gear; the use of such a brush is certainly convenient, and it is entirely free from objection.

Leaving the auto man to his reflections, and taking a course north by northwest, the man seeking "up to date" methods in "vehicle washing" was shortly in the office of a first class livery establishment. The genial proprietor, F. A. Pattison, was at leisure and the object of the call was explained; upon being asked his length of experience in the livery business he replied, 10 years; number of vehicles in his establishment, 90 to 100; a further inquiry as to the quality of his equipment brought forth the remark, "as good as can be found anywhere."

Upon pressing for information in regard to washing vehicles, he said he was not very familiar with that line of work himself, but that he had the best "wagon washer" in the United States, a Mr. White, whom I would find engaged at his specialty. Mr. White was located, and, asked his length of experience, he replied he had done nothing but wash vehicles for five years; he relied on cold water and the sponge; these were used as described in the first part of this article. For grease spots on the vehicle anywhere he applied a soft rag, moistened with kerosene, without rubbing; this removed the grease at once, and it was then "slushed off" with cold water. He was not in favor of either soap or tepid water, except on running gear, where there is always a dull finish. Mr. White uses neither of the above in his regular work, and he has to cater to a very fastidious class of trade.

The final interview was with a man who has had to wash Pullman vestibule cars, his experience in this particular line of work extending over a period of fifteen years. In this class of work two men work together, one man directing the stream of cold water from the hose against the side of the car, while the other man uses a long handled brush, such as is used for window washing. The brush exhibited was a "Wolfe" brush, manufactured in Pittsburg, Pa. The brush was marked "bristles," of which it seemed to be composed. It was a rather soft brush, and seemed to be entirely satisfactory for the class of work for which it was intended. It was learned that tepid water was used in washing car windows at times, especially in winter, this being on account of the difficulty experienced in doing this class of work in winter time. The washing of the highly varnished exterior is usually deferred until weather conditions are favorable to this particular class of work. With windows, however, the case is quite different. It is necessary that they shall have at all times a certain degree of transparency, regardless of the conditions that prevail in the way of weather and temperature. This was the reason given for using tepid water, in the only instance in which it was used in exterior car washing.

No soap was used in this work at all. The cars, it was learned, went to the shop, and were newly varnished once a year; while in the case of other vehicles, it was learned from the different parties that it was customary to varnish twice a year. It seemed to be the general opinion of all the parties interviewed that tepid water (about blood heat—98° Fahr.) might be used without any bad effects; but all were unanimous in saying that water warmer than 98° Fahr. would have a dulling effect on varnish.

The fact that tepid water "might be used" in certain cases, and still was not used, is not without significance. It indicates that the use of tepid water in washing varnished surfaces is not in popular favor with the class of men that understand their business. It has little to sustain it but faith, and "faith without work" is an uncertain factor.

To sum up, the writer feels that personal comment is not required. The methods, briefly outlined, represent the best practice in vehicle cleansing, and the knowledge which this article is intended to convey has come from men who have given their best thought and effort to this particular line of work for periods varying from five to fifteen years.

The writer does not wish to draw the line too hard on good soap; it can be used to advantage on running gears and dull surfaces. It should, however, be used with caution, if at all, on highly finished varnished surfaces, as it may do harm, or, as an old time physician used to remark, "What will cure a hod carrier may kill a tailor."

A sample of garage soap was subjected to a test for free alkali and for insoluble matter, at the same time that a high grade toilet soap was examined in a similar way. The free alkali was even less than in the toilet soap. Of course, it had the characteristic odor of common soap, coloring matter and perfume being omitted. It was, however, an excellent soap, entirely soluble in water, without any sediment. It is put up in long square bars, and has a yellow color. It had no wrapper, and the name of the manufacturer could not be obtained.

Kerosene and Gasoline as Cleansing Agents.

By T. H. Reardon.

In the general routine of garage work effective cleansing operations are second to none in the matter of importance. Owing to the powerful solvent action of kerosene and gasoline on fats and oils, both of these articles are extensively employed in this class of work.

Kerosene has, further, a very disintegrating effect on rust, which is nothing but the hydrated oxide of a metal. Owing to the

difference in the respective costs, and owing further to the difference in volatility, each article has its particular sphere of usefulness. It is the experience of practical garage men that kerosene is more efficacious for removing oil, grease, etc., as well as rust, than its higher priced competitor, gasoline. Owing to its lack of volatility, however, its use is restricted to certain classes of work.

For cleaning the running gear, metal surfaces, etc., kerosene can be used to good advantage. It should be used cautiously, if at all, on highly varnished surfaces, as it has a dulling effect; therefore its use is not recommended for this particular class of work. For cushions, upholstery, articles of clothing, etc., gasoline should be used, as owing to its volatile nature any excess that is used will speedily evaporate, whereas if kerosene were employed it would remain behind.

Where the above described cleansing operations are employed on an extensive scale the recovery of the gasoline in its original state of purity might be deemed of sufficient importance to warrant the installation of apparatus for its recovery and purification. Apparatus for this class of work should be obtained from and installed by parties that handle apparatus for the distillation and refinement of petroleum. A brief outline of the process will be given for the benefit of those that may have such schemes in contemplation.

The gasoline for purification should be placed preferably in a closed iron boiler; the boiler should be heated by a steam coil in its interior, the steam being generated at a distance; on account of the fire risk no fire should be in the vicinity of the distilling apparatus.

The pipe that leads from the boiler should enter the condenser. Here the pipe is formed into a coil of a great many turns; a continuous flow of cold water through the condenser will cause the heated gasoline vapor from the boiler to condense to the liquid form and pass on to the tank that is provided for its reception. A temperature of about 212° Fahr. will expel the gasoline from the boiler; as this temperature will vaporize water also, some of the water will be driven over too, but as steam condenses much easier than gasoline, with a suitable arrangement of the condensing coil nearly all the water will condense and run back to the boiler, while the less easily condensable gasoline will continue on its way. The matter of water passing over to the gasoline tank is no serious objection, anyway; as soon as contents of tank settle the water will occupy the bottom layer and the gasoline the top layer, so by proper taps each can be drawn off separately.

The grease and sediment do not distill over, but remain in the boiler. It was assumed in the remarks above that water was mixed with the gasoline; when this is not the case the remarks referring to water passing over in the distillate are without significance.

Insoluble impurities can be separated from kerosene and gasoline by subsidence and filtration. Water and matter specifically heavier than gasoline will settle to the bottom; this separation should be made before resorting to distillation, and filtering might be advantageously employed also, as this treatment will tend to keep a large amount of foreign matter out of the boiler.

An Automatic Hydraulic Air Pump.

By B. N. F.

Any argument in favor of having a supply of compressed air for the inflation of pneumatic tires wherever automobiles congregate is unnecessary, and I will therefore proceed at once to the description of an automatic hydraulic air pump for filling the storage tank with compressed air and keeping it full. This apparatus was made by a neighboring repair man, is in daily use at his place of business, and appears to answer the purpose for which it was designed perfectly.

To begin with, it should be stated that with the apparatus to be described a good water pressure is necessary, as the resulting air pressure can never equal that of the water which compresses it, friction of the pump and lifting of the weight involved accounting for the difference. This must be mentioned in order that the absent minded man may not go to the trouble of constructing a pump only to find that it will not meet his requirements.

Fig. 1 gives the general arrangement of the several parts. C is the cylinder of the air pump and is also the hydraulic cylinder. The pressure of

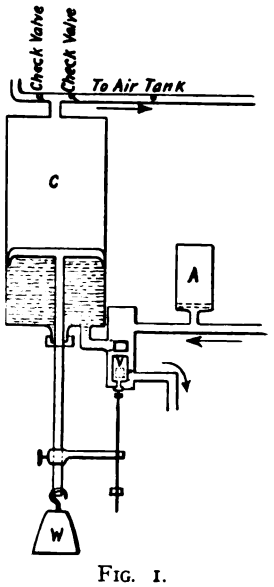


Fig. 1.

the water on the under side of the piston forces the air from the upper part of the cylinder through a check valve and into the storage tank through the pipe P. As the piston nears the end of its upward stroke, an arm projecting from the piston rod strikes a collar on the valve rod and shifts the slide valve V, shutting off the inflow of water and allowing that already in the cylinder to exhaust because of the pull of the weight W. As the piston descends it draws a fresh charge of air into the cylinder, and when near the downward end of the stroke the arm on the piston rod strikes another collar on the valve rod

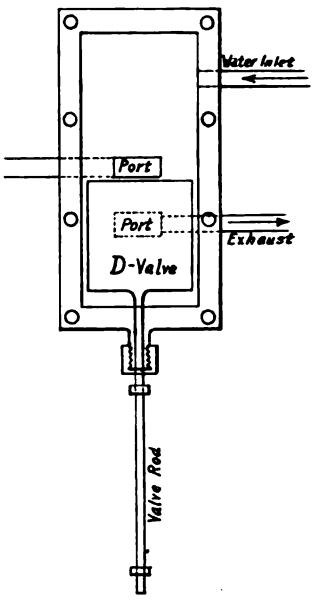


Fig. 2.

and again shifts the valve, closing the exhaust and connecting the cylinder with the water pressure again. The operation described is repeated until the pressure in the tank so nearly balances the water pressure that the pump stops; when the pressure is reduced by the use or leakage of air, the pump resumes work again.

The air chamber A is necessary to promote the quiet and smooth running of the pump. The cylinder is lubricated by putting oil into the elbow on the air inlet pipe. Both check valves should be located as near the cylinder as is practicable, and every other precaution should be observed to reduce the amount of air remaining between the piston and the check valves at the completion of the up stroke. The piston is provided with a cupped leather packing, and if it is well made there is almost no leakage whatever. No particular harm is done by a little leakage past the piston packing, as it only involves the trouble of drawing the water off from the bottom of the air storage tank occasionally. The cylinder should be made of brass, but iron can be used, as is demonstrated by the maker of the pump herein described. The slide valve is the shape of the common "D" valve, which is familiar to all steam engine users.

This air pump is slow in action and not suited to the requirements of a large business, but for the occasional filling of tires, especially those already partially inflated, it is very satisfactory, being automatic in its action and requiring no attention to start or stop it, keeping a definite pressure in the tank and requiring no power plant to operate it.

The water piping may be of half-inch galvanized iron pipe; for the air line quarter-inch plain iron pipe is suitable.

Air, especially when under heavy pressure, is notoriously elusive, and will find its way through exceedingly minute openings, and without the exercise of considerable care and some skill the air pipe is prone to leak more or less. One way to close leaks is to run some asphaltum varnish ("black asphaltum") through the finished line, taking care that the interior of the piping is dry and that there are no pockets into which the asphaltum can drain and thereby obstruct the passage of air.

Another way is to paint the exterior with asphaltum or some quick drying enamel, and allow it to dry before applying air pressure to the system. Either plan is good, as it not only stops the leaks but also prevents the rusting of the pipe, and in case of the external treatment the appearance as well as the utility is improved. Perhaps a combination of both methods would be satisfactory enough to pay for the work involved.

Some Hints on Care and Maintenance.

By S. V. West.

PAINT.

No machine should be allowed to stand with mud on the paint work. If it is, spots will surely form where the clay or alkali mud dried or hardened. If the mud has dried, soak it well before trying to remove it, and then use a gentle, full spray to wash it off. It is well not to wash the machine too often, if there is nothing but dust to remove; if the machine is standing in the garage it should be covered with canvas or tarpaulin. Always keep the car on a cool, dry, shady stand if you want the paint to stay bright. If the paint has been dulled by frequent mud and water, take three parts of gasoline to one part of boiled linseed oil, and, after the paint is thoroughly cleansed, smear a thin coating of the above oil mixture over the surface and let it stand in a dry, shady place for twelve hours. Rather than go to a big expense for repainting, have the painter varnish the painted surface twice a year. Painting costs about $35, while varnishing will cost only about $10.

AUTO TOPS.

For small tops use brown canvas instead of leather. The canvas can be varnished or painted any color to suit, and will not crack and rot in the hot sun so quickly as leather. Then the canvas can be replaced for half the money whenever it becomes necessary. For large machines the canvas tops with mica windows are far superior in a hot climate. Any black top tightly enclosed to keep out dust will be intensely hot. The lighter colored canvas reflects the heat instead of absorbing it; moreover, it is much lighter and stronger in proportion than leather.

TIRE PRESSURE.

The best method of judging the pressure in the tires is by hand. Also by using the jack to lift a wheel. The tire can be inflated so that when the weight of the machine is on the tire the latter should bulge very slightly at the point of contact with the floor. In summer the tires should be a bit lax, to allow for the expansion of the contained air, thereby avoiding possible explosion. Always let out the air before removing the outer casing, or the inner tube will explode.

Selection and Care of Ignition Storage Batteries.

By Hugo C. Gibson.

When deciding to use storage batteries as a source of current for the ignition system of an internal combustion engine, it is most necessary to discriminate between the various makes the market offers, because most manufacturers when thinking of a storage battery for an auto think of reducing dimensions—they had to when the battery drove the car, and the idea sticks. Again, ignition accumulators were first applied commercially to tricycles and bicycles, where it was essential to have little weight, and a small space was available for stowage. The result is that the present day ignition battery is frequently composed of a large number of thin plates, packed as closely as possible, necessitating artificial insulation between them, and this collection of material is forced into as small a box as it will go into, and is expected to do good service, while still it is under worse treatment than its big relative, because it is often pushed away in a corner and forgotten until it has no more energy left in it, and is blamed for "letting its owner down."

The storage battery is a delicate chemical apparatus in a state of tension, and will not stand this treatment, but if reasonably designed and sensibly cared for will give highly satisfactory results. It is probable that the demand for a cheap battery having a high rated capacity fosters the manufacture of unsatisfactory types.

The grids which form the frame of the plates should have interstices so shaped that the paste which forms the active element (and which is pressed in position while soft) cannot fall out. A very usual, cheap and inefficient way of making a grid results in a pellet of paste shaped as shown in Fig. 1, which is very likely to crack across the narrow neck in the centre, due to the expansion and contraction which occur during the charging and discharging operations. An ideal grid would give a pellet shaped as shown in Fig. 2, and there are many really good forms on the market.

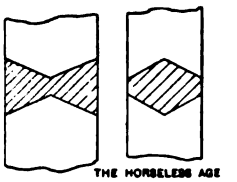


Fig. 1. Fig. 2.

All plates should be of reasonable thickness (not less than 5-16 of an inch) in order to resist buckling strains. The bridges connecting the plates, the lugs between the bridge and the plate, and the terminal column should all be heavy and well burnt. They should be quite capable of resisting the strain resulting from removing a tight terminal nut with a pair of pliers.

The plates should be placed at least one-quarter of an inch apart, the farther the better, up to three-eighths of an inch, and the case should allow of one-half inch clear space below the plates and one-quarter inch all around. The bridges should clear the opposing plates by at least one-quarter inch, and the terminal column should stand well above the top of the case to provide facilities for cleaning, and to minimize current leakage. No heed need be given to any statement that so-and-so's battery will not leak or creep, as it is commercially impossible to make a battery which will be proof against these defects, in the sense that some of the acid which should be inside will surely get out. When the cell is new the acid will escape by spraying during both charge and discharge, and will deposit on the case, and at a later date the acid will creep up the positive terminal column past any packing known. Thus is formed a path for current to flow between the terminal columns. This current starts to "form" the columns just as if they were lead plates in a bath of acid, but the formation only starts, for as soon as any active material is formed the voltage of the whole combination is opposite and equal, and current ceases to flow. If, however, the brass nuts are near the case, any current flowing through them across the acid film will continue, and a nasty paste of copper and alloy sulphates results. In time the nuts get fixed and the stems twisted off in attempting to remove them.

The case must be formed of transparent material, and the best known is celluloid. Transparency is necessary, because the user should be able to look at every plate from each and every side, otherwise he is unable to diagnose the trouble should the battery fall into a decline.

CARE OF THE BATTERY.

First, the terminals of the new battery should be coated with vaseline right down to the case. See that there is no foreign matter in the case; if there is it may be removed by swilling with distilled water. Then fill with acid to about one-eighth of an inch above the top of the plates, acid to be made as follows:

Use absolutely pure sulphuric acid which has been obtained from pure brimstone. Mix it slowly into clean distilled water in a wooden vessel with no metal fastenings on the inside, in the proportion of about one part of acid to five parts of water. Let stand until cool and then make up or dilute to 1.150 specific gravity, unless otherwise

specially directed by the maker of the accumulator.

Immediately after filling start charging, passing such current as the manufacturer recommends; generally at the rate of 4 amperes per square foot of superficial area of the positive plates in any 2 volt cell. Now, do not take any notice of the time taken to charge; simply keep on pumping the current in at a regular rate until at last you see the acid take on a milky appearance. In order to clear up the misunderstanding which frequently exists as to what "milky" means, let it be understood that it is not a large number of bubbles rising from the plates, which condition occurs just before charging is completed, and may easily be produced by forcing too much current through; but it will occur some time after the last described phenomenon, and will be first visible at the top portion of the electrolyte, and the appearance is exactly as if some milk had been mixed with a large proportion of carbonic water. This milky appearance will travel down the bulk of liquid until the whole looks as stated, really milky. The first charge will occupy perhaps 50 per cent. longer than any subsequent one. The battery should now be discharged at the proper rate to the extent of about half its capacity, by any convenient means, and again recharged. Repeat this process three times, and the battery should be ready to work and will give nearly its full rated capacity. It will not give its full capacity until it has been charged and discharged about six times.

Any loss of electrolyte due to spraying, etc., must be made up with distilled water, and when so made the density when fully charged should be about 1.200 to 1.205. If it is above take some electrolyte out and replace it with distilled water, but if below replace with acid of 1.250, until the density of the electrolyte is reduced to 1.200. Success cannot be attained without attention to these details during the first charge.

Always keep the plates covered with electrolyte; if this is not religiously attended to the whitish scale known as sulphate will form at the top edge, and unless at once removed will spread. Sulphating will also occur through allowing the electrolyte to become too weak or the battery to stand too long in a discharged or partially discharged condition.

Owners of batteries should be impressed with the necessity of fully recharging every storage battery at least once in four weeks; or, say, to assist memory, on the same day of every month, whether it has been used or not.

The battery will automatically readjust its chemical condition when standing, or, as it is called, lose its charge, and as soon as the major portion of the plate is in a discharged condition it commences to form sulphate. This condition occurs, roughly speaking, 5 or 6 weeks after the last charge.

Sulphating may be removed by simply putting the battery on charge and passing a very small current through, say one-eighth ampere, for a very long time, perhaps all day every day for a week, or until the sulphate drops off in small flakes and falls to the bottom of the cell, which event may be considerably hastened by the addition of a pinch of common washing soda in each affected cell. After the sulphate has disappeared, empty and wash out each cell with distilled water, refill with new acid of about 1.200 and charge up normally, which latter operation will only take a few minutes.

Always keep the top of the batteries as dry as possible, and the terminals well coated with vaseline; it will probably save them getting fixed, but if a nut will not come off by ordinary means, put a little engine oil on the shank at the top, take some asbestos sheet and cut it so as to fit around the terminal columns and cover the battery case; then apply a red hot iron, painter's blow lamp, or Bunsen burner to the nut. After a few moments the nut will remove easily with the aid of a pair of pliers.

Never attempt to solder bridges or lugs where exposed to acid, as local action will undo the work. Any joining of lead must be burnt, but terminal shanks must be soldered to the column. When doing this work protect the celluloid case, or a drop of hot solder may set it on fire.

To repair celluloid cases, take celluloid sheet, cut to about the size required and drop it in a shallow dish of acetone, then paint the surface of the case with acetone, using a camel's hair brush, and keep on painting and watching the sheet piece; as soon as this is soft take it out and apply it to the case at once. It will make a solid job when dry.

Before charging a battery whose antecedents and condition are unknown it pays to test the electrolyte for density, as it is no satisfaction to find a battery no better after charging than before, and this will be the case if the electrolyte has been meddled with. In some cases in the writer's experience the electrolyte had been spilt and cells filled up with water, and the owner merely stated that he had had them charged at "so and so's" and then they were worse. The reason was that "so and so" did not test the electrolyte.

Care of Tires.

By Chas. E. Duryea.

The weakest and most expensive part of an auto is its pneumatic tires. These cost the owner more per mile than any other part of the vehicle. The garage man cannot prevent this by seeing that the vehicles are equipped with tires of large diameter when they are built, but he can do many things toward lessening the expense by proper care of the tires when they are in his hands. If he will give his customers the best results he must cultivate judgment as to the proper degree of inflation, as to when repairs are needed, as to the nature of the repair, and as to substitution of a new tire for specially hard trips, saving the old for lighter service.

It is quite evident that a vehicle running on smooth roads will not damage a tire as if run on rocky roads, and a weak tire may give many miles of service under favorable conditions when it would be ruined immediately under adverse conditions.

If the tire has a small cut extending into the fabric this may cause no damage apparently, but if neglected the fabric rots and the tire bursts long before it is worn out. Many of these little cuts can be repaired by a portable vulcanizer without removing the tire from the rim, and if so repaired the tire is sound and capable of good service.

Very frequently a weak spot in the fabric, caused by water getting in or possibly by a faulty splice or similar defect, manifests itself by a slight swelling and this the garage man should notice, diagnose and repair, for if neglected the weak spot will grow larger, causing the tire to increase in cross section at this point with correspondingly increased strain on the fabric and the certainty of quick further damage resulting in a burst, which will probably tear a large hole in the air tube as well as in the casing.

Probably the worst abuse chargeable to the garage man is wrong inflation. I have experienced some of this abuse in New York garages as well as elsewhere, and have had the front tires of my phaeton inflated until they felt like wood, although the load carried by them could easily be lifted by one man, so easily lifted, in fact, that in a limited space we frequently picked up the front end and turned the vehicle on its rear wheels in order to turn it around. Under such inflation every weak spot in the tire was needlessly strained and I have had them burst standing still in the garage because of this abuse. For such lack of judgment there is no excuse.

On the other hand, vehicles are constantly sent out with insufficient inflation, with the result that striking a stone or street crossing at speed bumps the rim perceptibly, bends the casing sharply, and often pinches a hole through the air tube. Air tubes that have seen much service frequently show bruises extending part way through and in some instances completely through, to the wonderment of the user who fails to find the expected nail that caused his trouble.

Inflation troubles can be easily avoided by glancing at the tire where it supports the load. If it is too hard it will not show that it is carrying a load. If it is too soft it will look as though carrying too much. If properly inflated it will widen under the load about one-eighth of an inch for each inch of tire sectional diameter.

For example, a 3 inch tire under load should measure about 3⅜ inches at the widest part at the bottom. A 4 inch tire should measure 4½ inches. It may be that these measurements can be improved upon and

that slightly lessening them or increasing them, according to the locality, speed at which the vehicle is driven and similar influences, would be better, but for a general rule these measurements are probably as nearly correct as anything.

This test is safer than any gauge test, for it is quite clear that lightly loaded tires do not need the inflation required by heavily loaded ones. It is also clear that a large tire will carry a load properly with less inflation than a small tire, yet many published tables are given specifying a certain pressure for a certain size tire without taking the load into consideration, which is clearly quite an error.

It is not enough that the garage man should know that the tires are properly inflated, but he should see that they remain so. To insure this, one of the first things to be done when the vehicle comes in should be to examine the tires and see if they need attention, for if repairs are needed they should not be left until the vehicle is wanted, but should be attended to at once, in order that they may be completed by the time the vehicle is to be used. If they need inflating this should be done so that the vehicle may have some time to stand properly inflated before being used, in which event it may be seen whether or not they are holding up properly. It is well known that a small puncture may not leak at all when the pressure gets below a certain point, so that a leaky, half inflated tire may stand all night in that condition and not be appreciably softer next morning. It may be inflated properly when the vehicle starts out, only to leak down almost immediately to its original condition and be damaged, just because the needed inflation was not given long enough before using to permit the leak to be observed. It is also well known that the valves commonly used cannot be depended upon to hold air themselves, but that the flimsy soft rubber gasket provided in the cap and forced against the narrow edge of the valve tube is the actual holding agent in most cases. There is no certainty that this cap can be screwed down tight enough to hold without being cut, roughened or otherwise damaged and therefore no certainty when a tire has been inflated that the valve cap is in condition to hold the inflation. This is another reason why the inflation should be made a sufficient time before using to determine whether or not there is a leak. Of course, this can be determined by testing with a glass of water, the valve tube being at the top of the wheel, so that it may project down into the water and permit escaping bubbles to be seen. Very few people will take this trouble to insure that everything is right, so the practice of inflating the tires properly when the vehicle first comes into the place and then noting their condition when it leaves is the only safe one.

If the garage man is responsible for the pump and repair kit, he should make sure, by frequent testing, that the pump is all right. It is quite common to test a pump by holding one's thumb over the outlet nozzle while a light stroke is made with the other hand. This, in reality, proves but little. What the pump will do at a pressure of a few pounds is of no consequence to a man in trouble on the road. He wants a pump capable of doing its full duty at the pressure required to properly inflate his tire. The only certain way to insure this is to use the pump that is in the vehicle for the purpose of inflating the tires of the vehicle. In the absence of this a sealed or blind valve can be attached to the pump, and then one or more good, strong strokes, as would be required for proper inflation, should be made. This will show whether there are any leaks. Many times a pump will have such a flimsy cup leather that under pressure this leather will reverse and refuse to work. Sometimes the rubber hose will leak at the connections or blow off completely or cause other little troubles not much in themselves, and easily fixed at a garage, but decidedly aggravating when the operator has need for a serviceable pump under unpleasant circumstances on the road. He should also see that there are extra caps and repairs in the repair kit.

The garage man can do much to avoid unnecessary damage by seeing that the floor of his building (and grounds) is free from needless obstacles liable to damage tires as the vehicle is moved about. An overturned jack, for example, may present the sharp, square corner of a metal base, which, if driven over without noticing, would almost certainly do damage. Nails or small tools used in crating or other work should not be allowed to remain on the floor, and the curbstones at the entrance should not have sharp corners.

When the vehicle stands but a short while and under more or less constant inspection, the tires need not be given any special attention. If, however, the vehicle is left on dead storage and kept where the tires are not inspected it is advisable to largely reduce the air pressure and also to jack up the wheels, so that if the air does leak out the tires are not flattened and caused to crack where sharply bent. The vehicle should not be in a damp place, for this is not only bad for the mechanism and wood work but the moisture is absorbed also by the upholstering. The fabric of the tires may also take up some of this moisture, which is detrimental. On the other hand, light and heat are injurious to rubber, and tires last longest in a moderately cool place. If they can be stored in a cool room, not exposed to direct sunlight and kept very lightly inflated, so as to preserve their shape, no other attention need be given nor can anything better be done. Some have advised that the tires be powdered with sulphur, but this is of no value. If a powder of any kind is needed to keep the rubber from sticking to other things talc (French chalk) is the proper substance.

If the tires are left inflated hard the fabric is unnecessarily strained and if perchance there is a wrinkle in the air tube it may crack at this point in time. Partial deflation largely removes these possibilities. If left deflated wrinkles or sharp bends are formed, with the probability that the rubber will crack at these places when put back into its normal position.

Many incorrect ideas are afloat concerning the behavior of rubber and a little understanding of the process of manufacture will correct these errors. Crude rubber is not largely elastic, nor is it so tough and able to resist wear as properly vulcanized stock. The vulcanization consists in causing a small percentage of sulphur, probably 3 or 4, to combine with the rubber by the action of heat, after being properly mixed. If the proper amount of sulphur is mixed with the rubber a long time is required, 5 to 10 hours, to effect proper vulcanization; but if a much larger percentage of sulphur is incorporated the requisite per cent. is taken up by the rubber in a much shorter time (one half hour), the remainder simply existing in the rubber as a practically inert filler, which, like some of the other substances incorporated, renders the rubber harder and more able to resist wear, it being well known that pure gum is not nearly so serviceable in the matter of resisting wear as some of the compounds. Unfortunately, this residue of sulphur remaining intimately mixed throughout the rubber does not remain absolutely inert but continues very slowly to combine with the rubber, thus vulcanizing the product more as time goes by. This vulcanizing effect is particularly noticed if the tire is kept in a hot place and results in the rubber becoming over-hard, less tough and less elastic. So great may be the difference due to the proportion of sulphur that a pure gum bought for the best possible quality may become so hard as to break like a bit of rock or wood in three months, whereas other rubbers not bought for the best have remained in my attic for a half dozen or more years without apparent detriment. In fact, we have been using around our drafting room, for erasing purposes, portions of solid bicycle tires that were removed when pneumatics were fitted 15 years ago, and that rubber, the most satisfactory wearing compound we were able to find at that time, is apparently just as good today.

Rubber being a vegetable matter, of woody nature, contains a certain amount of moisture, more or less, and is more likely to air crack by the evaporation of this moisture if kept in a dry place than if kept in a room having the normal degree of moisture. These air cracks are not deep and do little or no damage.

Rubber is also soluble in many oils, and while gasoline evaporates quickly, leaving the rubber as strong as before, the heavier oils do not evaporate, and so the rubber is easily destroyed because of its lack of strength when in a swollen condition due to the presence of oil. One can easily test this lack of strength by soaking a strip of rubber in gasoline or kerosene and noticing

how it both swells in volume and weakens in strength. The heavier oils, like cylinder oil, have less solvent ability and therefore do the tire much less damage, it being doubtful, in fact, if the best grades of cylinder oil really have any appreciable action at all.

Both oil and water, however, wet the surface and serve to lubricate any cutting edge or puncturing point that may strike the tire, so on this account, if for no other reason, oil and water should be kept off the tires as much as possible. The wise driver will avoid mud holes and wet surfaces for this same reason.

Tire repairing is a large subject and one rather for the repair department than for the garage man, but he can do much good by seeing that the repairs are made when needed or by making such repairs as are not sent to the repair man. The small cut in a tire casing, easily fixed by a portable vulcanizer, has already been mentioned. Many users stop small cuts by cutting a piece of rubber till it fits closely and then cementing the same in place. The weakened spot likely to result in a blow out can be remedied by cementing a piece of canvas on the inner side of the casing. This treatment will also cure for a short while a large puncture or even a small burst pending the time when it can be properly repaired by vulcanization.

Tires should be watched for rim cutting and the cause removed. Generally it will be found that either the tire is run too soft, or that it does not fit the rim, or that the rim is rough. In case it does not fit a little canvas along the portion that is chafing will frequently stop the trouble. If rough, the rim should be smoothed with a file or sand paper and painted or varnished to prevent recurrence.

Constant care is the price of good results with pneumatic tires, but as something cannot be had for nothing, things are usually worth the labor they cost.

Repairing and Vulcanizing Tires.

By E. S. Foljambe.

The art of repairing tires, for it is an art, has progressed lately to such an extent that if attended to in time the life of the average tire can be greatly prolonged.

Tires, the treads of which have been worn off, so that the canvas shows, and even those in which one or more layers of the canvas have also been worn through, can be retreaded, and in some instances 3,000 miles running guaranteed. In any case, the tire is worth retreading provided the skeleton of canvas has not been exposed sufficiently to water to become rotten; for if this condition exists the chances are that after retreading and using for a short period a blow-out will occur near the rim between the portion which has been covered and the uncovered portion of the original tire. This usually takes place long before the new tread shows signs of wear. The process of retreading a tire is in general as follows: First, the tire is carefully examined, numbered and tagged and sent to the department for removing the old tread; and in some instances one or two layers of canvas. This is done by placing the tire over an arm projecting from a bench, and with a short, sharp knife, which is from time to time dipped in a pan of water, a cross cut is made, care being taken not to go through the uninjured layers; the rubber at the edge of this cut is peeled up and gripped by a pair of special pinchers which are held in the left hand, while the right hand of the operator saws the knife along between the rubber and the canvas, cutting off a long, narrow strip. This process is continued around the tire until the entire outer surface of rubber is removed. If the exposed layer of canvas is intact, no more is removed; but if this fabric shows any breaks or is worn through at any point or weak, it is completely removed with the thin layer of rubber which is between it and the next layer of canvas. In cheap repairing only the worst of the outside is removed, and the holes in the under layers are filled up with friction cloth and rubber. The surface is now ready to be cleaned, which is done by placing it against a large buffing wheel. Next layers of a rubber cement preparation, usually rubber dissolved in gasoline, are carefully applied with a soft brush, each coat being carefully allowed to dry before the next is applied. In the meantime the built up layers of canvas and thick rubber for the new tread have been cut to shape and cemented and are now placed over the prepared surface of the tire. A mandrel or core of coiled heavy wire to fit this size tire is now placed on the inside, and the whole tightly wrapped with strips of canvas about 5 inches in width. The tire is now ready for placing in the vulcanizer. A mild uniform heat is supplied by steam, under a pressure of from 35 to 55 pounds, and the tires are allowed to remain from 50 to 60 minutes, according to the nature of the rubber, the heat and pressure. When taken from the vulcanizer the tires are black, but are dusted with a specially prepared soapstone powder which gives them a whitish appearance.

When a tire comes in for repair which has had a blow-out at one particular portion, or which has been cut, the rubber surface is cut away only at this portion and for a short distance around it the canvas often is partially removed and layers of friction cloth, which is canvas coated with rubber preparations and Para rubber, are fitted accurately into their place, and in some instances sewed, care being taken to prick with a bradawl any air bubbles under the Para, which would swell up; then rubber cement is applied and layers of rubber which are to form the surface are accurately cut and rolled into place. The tire is now placed in a sectional vulcanizer which will cover simply an area slightly larger than the damaged surface and allowed to remain under a heat of about 250 degrees until the surface is healed. The matter of temperature is of extreme importance, as when too low the surface is not completely united or vulcanized, and if allowed for any length of time to remain under too great a heat the rubber becomes dry, its life is killed, and this particular spot will soon crack and give way. The mending of any such holes is always a choice of two evils. Even if the hole is small, if allowed to remain unrepaired, sand from the roads will gradually work in between the layers of rubber and canvas, and as the tire successively comes down in contact with the earth this is worked further and further from the opening and completely separates the layers, often forming at a distance of 8 or 10 inches from the original opening a hunch or swelling, which when cut open is found to be full of sand. On the other hand, if the tire is vulcanized this trouble is done away with, but the life of the rubber is always more or less impaired, but this will, of course, not cause trouble as soon as allowing the tire to go unrepaired. Inner tubes are often repaired by simply placing a patch on their outer surface, but when a bad blow-out or a large hole has to be repaired, vulcanizing is resorted to. A patch can be put on by this method on the outside, but the nicest repair is one in which the patch is applied from the inside and vulcanized, so that the outer surface of the tube is left perfectly smooth, but this is much more difficult to accomplish.

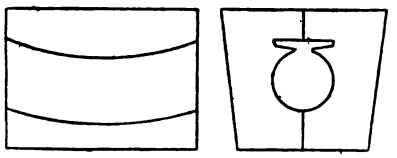
Ordinarily, in the case of bad blow-outs or cuts on the road, when another shoe is not handy, a temporary repair can be made in order to reach a garage, by means of pigskin shoes or protectors, which can be laced over the injured portion, or by wrapping this part with a long strip of flexible rubber tape; or in some instances, if the injury is not over too large a surface, a permanent repair can be made on the road by the use of small portable vulcanizers which can be clamped to the wheel and are heated by an alcohol lamp. The surface which can be covered at one operation by these vulcanizers is approximately two inches, and the heat should be applied from 30 to 40 minutes. In many cases large cuts or holes have been mended in this way by taking the surface in sections. In no case should the tire be run for any distance without the hole in the outer shoe being protected so that the dirt cannot get in. This is necessary not only to prevent the inner tube from being blown out, but to prevent sand from getting in and causing much trouble later on.

Home Tire Repairing and Vulcanizing.

By O. V. H.

A large number of automobile owners have their own repair shops, some of them well equipped to do all the ordinary repairs, with one exception, and that the one most likely to occur, a tire repair. A vulcanizer in a private repair shop is a money saver, for a man with ordinary ability can soon learn to make a repair to an outer casing or inner tube that will save him a lot of time, trouble and expense. A vul-

canizer can be purchased outright, or if one is mechanically inclined and has the necessary tools he can make it. Steam vulcanizers are used in nearly all cases now, as they are easier to regulate than dry heat and not so apt to "cook" or scorch the work. A vulcanizer consists of a cast iron box with one or more channels or grooves in it to receive the molds or forms used in repairing. The box can be made in one piece by using a core box and leaving core supports, which serve for vents in the casting as well, and can afterward be tapped and plugged, or it can be made in two pieces and bolted together with either a ground joint or gasket between. If the casting is cored it should have means provided for cleaning it out, as lime and sediment will form and impair the heating qualities. A gasoline burner is used to generate heat, and a safety valve, a steam gauge and a filling cap should be attached to the vulcanizer, as it is nothing more than a cast iron steam boiler. Of



course, in large repair shops and factories a regular steam boiler is used and steam conveyed to the vulcanizer in a pipe. The pressure used is about 70 pounds per square inch, as this gives the required heat to vulcanize rubber. The molds, which are made of cast iron and in halves, are made the size and shape of a segment of the tire, and of course every size and style of tire requires a different mold. A small cut in an outer casing can be vulcanized on a flat surface, but if the repair is large or the fabric torn, a mold should be used to prevent the tire from getting out of shape. The preparing of a job for vulcanizing is what requires the time, as each layer of cement should be thoroughly dry before the next one is put on, otherwise it will not stick. The cement used is crude rubber, "cut" or dissolved in gasoline. Some claim to have some secret mixture to put in it, but as a Frenchman said to me one day, "I like not ze mystery"; and I have found the above to work as well as any of the high priced solutions done up in fancy cans. To vulcanize an inner tube that has been cut or blown out, clean it around the blowout with sandpaper or emery cloth, or wipe it off with a cloth wet in gasoline, then put powdered soapstone inside the tube at the cut to prevent the cement from sticking the tube together; then apply a coat of cement to the outside of the tube around the edges of the blowout and allow it to dry naturally. Then take a crude rubber patch or a patch with a crude rubber coating on one side, which can be purchased from supply houses, and coat it with cement and allow it to dry. While they are drying unscrew the filler cap on the vulcanizer and pour in water until about half full, then screw in the plug and put gasoline in the burner and light; when steam shows seventy on the gauge regulate the fire to hold it there, and when two or three coats of cement have dried press the patch on the inner tube firmly, working from the centre to the outside; sprinkle a little soapstone on the vulcanizer, put on the tube with the patch next the plate or top of the vulcanizer and lay a weight on it, or tighten the top by means of the lever and weight with which some vulcanizers are fitted, or with a screw for flat work, and let it cure from 30 to 60 minutes and the rubber and cement will be united. To repair an outer casing in which there is a cut that goes through the fabric, grind away the outer rubber down to the fabric and around the cut, apply cement the same as on inner tube inside and out, cut out a patch of friction cloth or prepared canvas the size needed, coat with cement and when dry stick it inside of the casing, after giving it several coats of cement. If the cut is a large one apply the prepared canvas on the outside and build up the required number of layers of fabric, each having been coated thoroughly with cement. Then apply the crude rubber of sufficient size to replace the amount ground off and place in the mold, with an air tube inside the casing; then put the mold in one of the channels provided for it and cure.

It is not the intention in this article to enter into details of intricate tire repairs, but a little practice will soon produce results and in many cases a tire can be saved to months of usefulness by the timely application of the vulcanizer. The air tube is to hold the casing in shape in the mold until it is vulcanized.

Treatment of the Car in Winter.

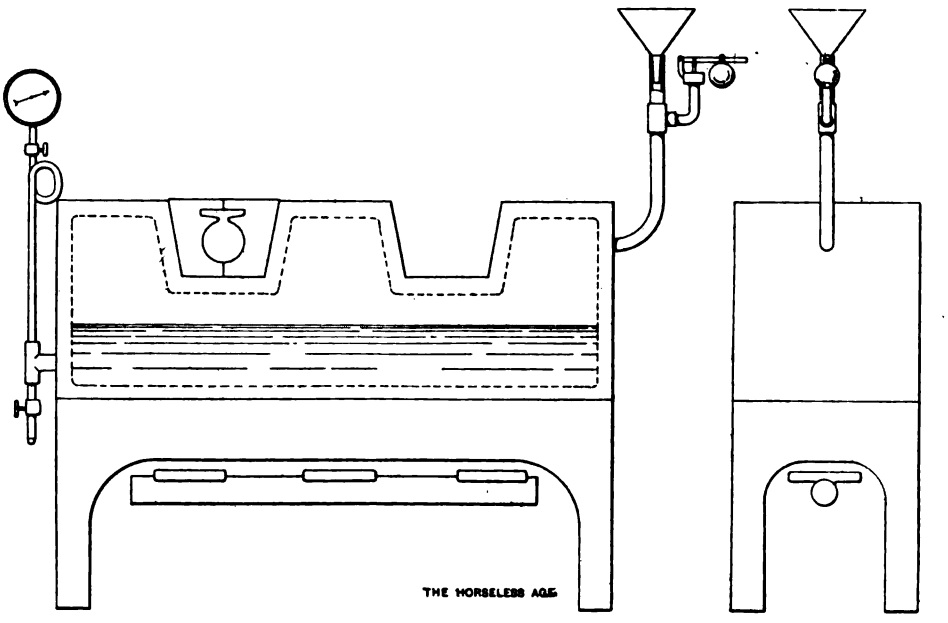
By H. W. Francis.

Comparatively few owners of automobiles care to use them in the severity of the winter months. They are owned for pleasure driving, and he is a rare exception who takes enjoyment in spinning through the air on a sharp winter morning, or plowing through the snow on a bleak afternoon. With the first frosts then the average owner is confronted with the question what to do with, and how to care for his machine, during the long stretch of cold which will intervene before "the robins nest again."

He who is able to pay for the storage and care of his auto in some well appointed garage finds no trouble in solving the question. It is those who are obliged to store their machines in private auto houses, and personally care for them during the long dark days, that find it more difficult to answer the question. The writer belongs to this class, and having had a number of years' experience, may, by telling how he does it, give some other member of the same class a hint or two more or less to his profit.

When the autumn so far advances that he feels that the pleasures for him are passed for the season, he runs his car into its house and sets it upon blocks. He then goes over the body and thoroughly cleans it. For this purpose he has found nothing better than a mixture of equal parts of pure cider vinegar and raw linseed oil. This compound must be well shaken every time any is taken from the bottle, in order that the component parts be always perfectly mixed. It should be applied freely with a soft flannel or cheese cloth, and the parts then rubbed thoroughly with a clean dry piece of the same material. This will not only remove all dirt and grease but will improve the polished surface.

In emptying the water system care is taken that no water remains in the several coils of the radiator, as much damage may result from a neglect in this particular. Air pockets are readily formed in the turns, which hold back the water so that enough



Side and End Elevations of Vulcanizer.

may be retained to freeze and show up a troublesome leak in the spring. This is found to be an opportune time to clean the system, which may be done by running a weak solution of soda through it, following with thorough rinsing with clear water. This will not only cut the dirt and grease which may have accumulated in the pipes but will also clean the jacket walls from rust. The writer also draws off the gasoline from the tank if any remains, for an open light in the presence of gasoline voids his policy, and in the dark days of winter it may be necessary to go into the auto house with a lantern.

These things having been attended to, the wheels are next removed, and, with the tools which are liable to rust, are taken to the furnace cellar, where during the winter there is a comparatively uniform temperature. The tools are put in proper receptacles, and the wheels placed one upon the other in a compact pile, the valves of the tires opened until the pressure in the tires is nearly atmospheric, when they are covered from the light.

The machinery and all iron work of the car is then cleaned, and an examination made in order to note any wear or lost motion, that it may be taken up and needed repairs made before it is time to use the car in the spring. Everything being in order, the battery cells are removed, to be used for bells or automatic gas lighting, for which purposes half used cells will serve for many months. The machine is then covered with a rubber cloth ample enough to completely envelop it. Little further thought is given to it during the winter, except that perhaps once a month a long nosed hand oiler is inserted through the plug hole and a liberal dose of kerosene injected into the cylinder, the piston being cranked several times, forcing the fluid out through the pet cock. This keeps the cylinder walls free from rust, and in splendid condition. The writer speaks of removing the wheels, because he uses single tube tires. If he had clinchers he would probably leave the wheels on the machine and remove the tires only.

Mending Cracked Castings or Cylinders by Brazing.

The Imperial Brazing Company, 329 West 12th street, New York, are employing a brazing process in mending all kinds of broken automobile castings, and are applying the same process to cracked cylinders, which they claim will stand as much if not more pressure after the repair than they would before. The cylinder to be repaired is carefully inspected and the cracks are indicated by red lead; it is then sent to the shop for brazing. The cracks and portions surrounding them are carefully cleaned by the use of dilute muriatic acid, as they are nearly always filled with dirt and oily substances. A liquid solution, called by this company "Brazine," which is a special preparation, the constituents of which are not given out, is then applied to all the surfaces to be brazed. The cylinder is then placed upon an asbestos covered table, and a small furnace of fire brick built around it. A uniform heat is applied by means of a number of gas and air blowers which are arranged so that there will be as little likelihood of the cylinder warping as possible. The heat is continued until the entire cylinder is a light cherry color. A special flux and spelter is then fed into the crack with what is termed a "feeding iron" until the fissure is filled. This, of course, is melted by the heat of the cylinder. In some instances a small dam of fire clay has to be arranged to keep the spelter in the proper place. The cylinder is then allowed to cool gradually, care being taken to prevent cold air drafts from coming in contact with it. The surplus brass is removed by the use of a small emery wheel, and the cylinder is thoroughly cleaned and tested. This testing is done by subjecting it to a hydraulic pressure of 60 pounds to the square inch. The average time consumed in brazing a cylinder is 24 hours, and the charges are based on the extent of the crack and the amount of gas required to braze it. The particular feature upon which this process depends is the use of the "Brazine," which, it is claimed, causes a chemical action upon the surface to be brazed, so that certain of the constituents are turned into a gas and pass off, leaving the surface ready for the brazing.

All kinds of irregular castings can be mended, even such as cast steel gears, which in some instances are in three or four pieces. Lugs on exhaust pipes or flanges through which bolts are to pass and which have broken at the holes are among the most common repairs.

Garage Practice.

By Harry Allen.

An ideal garage should be constructed entirely of fireproof material, with plenty of light, and, if possible, with ventilating means at the top of the room. The floor should slant towards the centre or one end, so that all the water used in the room



Surrounding Cylinders With Fire Brick.



Directing Blowpipe Flame Against Cylinders.

will run to one place, and in the centre of the spot a large drain or sink should be placed, connecting with the sewer, and a fine grate placed over it so that nothing will work through and stop up the sewer pipes. The covering for the sink can be made circular and utilized as a turntable. This plan is very handy, as the car can be turned in any direction without much trouble, and in very little space, which counts in a city garage. The car to be cleaned can be placed upon the grate and given a good washing, and all the waste water will then run off into the sewer. The tanks should never be filled with gasoline or oil while the car is standing upon the turntable, as the overflow would get into the sewer, causing gas to form there and presenting a possibility of dangerous explosions.

After giving the car a thorough washing use a sponge to take off the worst moisture on both the body and upholstery; then rub dry with a piece of chamois. When filling the tanks with gasoline or oil a large tray should be put under the car, so that the drippings fall into it. These pans should have a little sand in them, as the sand absorbs the drippings and can be put in a garbage tank and hauled away. It is a good plan to sprinkle sand or sawdust around the floor before sweeping.

A most useful thing in any garage or repair shop is a pit, one about 4 feet wide and 6 feet long and about 4 feet deep. The advantage of a pit is that a man can stand up in it and do the work under a car, which parts are otherwise more or less inaccessible. A pit should have the walls lined with cement and should have a drain in the bottom so that if any water does get in it will find a way out, thereby keeping the pit dry and clean. The pit should have a door to swing over the opening when not in use, as if it were left uncovered a person might fall into it.

In lieu of a pit, an incline may be built, the car run up on top of the incline and the mechanic get under the car to make any necessary repairs, but of the two a pit is the more desirable.

If a car is to remain in the garage any length of time, a handy appliance to use is a platform with four jacks attached to it, two under each axle, out near the wheels. By means of this platform the car can be raised from the ground to take the weight off the tires, which, of course, tends to preserve them. If a garage is equipped with an air compressor for inflating tires it is very convenient to use the air blast for drying the car after washing.

One of the most useful appliances that can be installed in any garage is an overhead track, with block and tackle for removing the body from a car, which in many instances greatly facilitates repairs on a chassis. Also, in case the engine needs to be taken from the chassis for repairs it can easily be done by means of the trolley.

Gasoline should never be kept in barrels or tanks on the floor of the garage, but should be stored in tanks underground, and pumped into the garage as required. In this manner all danger is avoided and floor space in the garage is economized. The gasoline measures should be scoured out at definite intervals.

A garage should be equipped with a lathe, drill press, small grindstone and other small tools, and with the addition of a small forge the outfit enables the owner, if he be a mechanic, to do any small repairs that may be necessary.

Most garages have their fixed rates for storage by the month, and make an extra charge for keeping the car in running order. Some owners require their chauffeurs to do the cleaning and to attend to small repairs, but when the owner drives his car himself and stores it at a public garage he will be best advised to let the garage man take care of the car. According to a system in use in some garages, as soon as a car comes in it is given a numbered tag by a clerk in the office, is given a good washing and cleaning, and after it has been allowed to dry is gone over thoroughly to see if any repairs or adjustments are necessary. If nothing is found to require attention the bearings are oiled and the oilers and gasoline tank are filled, and the car is then pushed into its regular place in the garage. The man then turns in his card to the clerk, having first noted thereon the time spent on the car, supplies put into it, etc., and the clerk hangs up the tag on a hook. The presence of the tag indicates that the car is ready to go out on the road.

A waiting or lounging room should be a feature of every well equipped public garage, nicely furnished and with daily and automobile papers on file. Most garages at present have a number of cars to hire out by the hour or day, either with or without driver, generally the former. All the larger garages, at least now, are equipped with a "trouble" wagon, or relief wagon, which is sent out after stalled cars to carry them any supplies required, or a repairman, or to tow the disabled car home in case it is impracticable to make repairs on the road. A powerful runabout can easily be converted into a relief wagon by fitting it with a large, specially built box on the back, so made that when open it exposes a small work bench, with the necessary tools in different drawers. The bench should be equipped with a small lathe that can be driven from the vehicle motor. Where a relief wagon of this kind is kept, if a call is received from a car stalled in the country, it can be answered usually very quickly, and in a majority of cases the damage can be remedied on the spot, and if not the damaged car can be towed in.

Whenever a car is brought into the garage the clutch should be disengaged and the gears placed in a neutral position, as the cleaners often push the car around a good deal and forget to take out the clutch, which puts unnecessary strains on the gears; besides, some person might take hold of the starting crank and start up the motor, and in case the gear was in mesh a serious accident might result.

The doors of a garage should open to the outside, as this will avoid trouble in case of fire, and it also saves space, as compared with doors opening inward. Some places are troubled with exhaust gases when the engines are being run in the garage. A very good way of overcoming this trouble is to install a fan near the ceiling to draw the gases from the room.

Hydraulic Elevator Economical for Garage.

The cheapest form of an automobile elevator for a garage where washing is done to a considerable extent is the water elevator. This has the advantage of being absolutely safe, easy of operation and ready at any time, day or night, whether power is on or not. It is, of course, a plunger elevator and the lifting is done by opening a valve into the cylinder underneath the ground and virtually floating the piston with its elevator platform and automobile up to the floors above.

When the valves are closed no weight can move the elevator down, and as the elevator can always be stopped, no matter what the weight may be, there can be no danger.

Where the economy comes in is in using the water over for washing. By connecting the outlet pipe with a tank somewhere over the washstand the elevator when it comes down pushes the water into the tank. This tank is connected with the washstand, the higher, of course the greater pressure, and all the water which is used in the elevator is thereby saved and used for washing. Most all cities have a special rate for elevator service, which is lower than the rate for washing, consequently if the amount of water used for elevator is about equal to the amount used on the washstand, the running of the elevator costs absolutely nothing, and the washing of the carriages costs less than if water is used direct for that purpose. This is not a supposititious case, but is a description of an actual 4,000 pound elevator which is in constant use and costs not one cent a year to run.

Garage Repairs.

By William Martin, M. D.

To every owner of an automobile the subject of repairs is a most vital one, and one which unfortunately presents itself only too frequently to most of us. At regular intervals the engine, etc., must be overhauled and cleaned, even if we are fortunate enough to escape breaks, and we then must decide the question, Shall we send the car to the public garage, or shall the work be done at home? To many, the easiest way is the best way, while with others the best work at the minimum expense is the chief object.

The numerous city garages, conveniently located, offer to the city autoist every

attraction, and it is very convenient to 'phone for a repair man and let the car be taken away, to be returned when repaired, thus saving all annoyance. The limitations of space in the average city property prevent the building of stables for the storing of autos, therefore they must be kept at the garages, necessitating the repairs being made there also. Where there is room for a stable, and the services of an able, honest mechanic can be secured, my opinion is that the best service can be had, at the most reasonable rates, by the work being done at home. Those of us who live in smaller towns, where there are no repair shops, must include in our expenses those of transportation and towing, if the car is sent to the city garage.

One naturally feels that safety lies in the direction of expert workmanship, and to secure this one must go to the city repair shops, where only experienced mechanics are employed. But do they all employ such mechanics? This is a pertinent query. Are they as a unit careful in selecting only such mechanics as are entirely capable and dependable? I fear the answer cannot be in the affirmative. Many autoists with whom I have talked have had the same feeling in this regard, owing to some recent or past experience by which they have lost confidence in the quality of service, and hesitate to place themselves in the way of a repetition.

The rate per hour for work is a little in favor of the smaller town mechanics, which counts considerably in a long job, so if the results are as good we have this factor in favor of home workmanship. The principal argument in favor of home repairs is that it offers the owner a fairly constant supervision of the work being done, a not inconsiderable gain. Honesty is important in all lines of work, and you naturally expect to find this quality in those you employ. When you leave your car in the hands of total strangers, whose interests are only those of a pecuniary kind, you may find this trait and you may not. You are more sure of it in those you do know, at least.

A lax or dishonest foreman or superintendent of a garage may easily make the time charges favor the firm, unless the car owner was constantly on hand. Also, certain parts of the machinery, less accessible, could be left untouched, if the need of their cleaning was not great, and the owner be none the wiser, unless some unforeseen factor brings this neglect to light. There are many sins of omission and commission that can be kept from sight under these conditions, and no doubt such has been the experience of many, from the number of complaints one may hear if the trouble of making inquiry be taken. It is not my intention to make the sweeping statement that all pursue this method, for I am convinced that there are some who deal honestly, but in the past the race for the almighty dollar has blinded some so that this form of dishonesty looks like honesty to them. The fact that some city repair shops do employ mechanics who are not first class can be proven by the defects which show up at some subsequent time, perhaps at the time of a break in the machinery or any other accident.

The slipping of the drill in removing pins which had sheared off in the transmission will chip off a small piece of the plate and weaken it when repaired. This was my recent find on taking the transmission apart to be repaired for a similar accident. The former expert (?) had weakened it materially by this kind of work, and had replaced it without any word to me of it. Had I known it, a new plate secured at the time would have saved the subsequent break. This I call dishonest, yet it was done at a supposedly first class garage.

My experience has been that you cannot depend upon getting your car at the time stated, and to a busy practitioner this is important. You generally receive some excuse for the extension of time, and you are forced to bear it, as protests count for naught. No doubt there are a number of cars undergoing repairs at the same time, and if they are short-handed someone must wait. Those who are on hand to see to it have the advantage over those who live at a distance and cannot see to it that their work is done as promised. This conspires to upset one's mental equilibrium, especially if you are in urgent need of your car for business reasons.

I will cite briefly a more recent experience of mine, to illustrate the point just made. At the close of the present winter I had noticed a gradual leaking of the cooling solution at the head of the cylinder which ordinary measures would not remedy, so I decided to secure the services of a mechanic at home who had at various times helped me out of difficulties. As a new gasket was needed, we concluded it would be wise to look into the condition of the adjoining parts while the cylinder head was off. It was no easy work to remove this, owing to the rusted condition of the bolts, showing that they had not been removed for some time, and giving me the suspicion that the overhauling at the garage some few months previous had not included this work. The gasket was badly worn, showing that it was not a new one, as it should have been at that time, and our inspection of the valves and piston certainly showed a still further neglect. The valves seated badly and had to be reseated, and the rings were not free in their action, and the deposits of carbon were such as to add to our feeling that these parts had not been attended to, as was bargained for at the time I sent the car for the purpose.

To make a long story short, I will say that we decided to go entirely over the machinery and put it in shape, which we did, and it was done in a workmanlike way, and at a figure that was within reason, and in a time that was satisfactory. My bill previously at the garage, for what I supposed was the same work, was almost double, and the result was as above stated—a poor job, and one that had to be done over.

It seems to me that a few experiences like this will make autoists rise in indignation and band together for the much needed reform. It is not my intention to score all because one has deviated from the right, but when one that is rated as first class will do this way, it makes one suspicious of others. Had this garage been one of a lower rating I would have taken chances and kept quiet, as would be most becoming under those circumstances, but it is a test of one's patience to receive such treatment by one classed as of the best. I feel that the carelessness in my case was not intentional, so far as the officials were concerned, but no doubt a lax or careless foreman allowed the mechanics to conceal their neglect, and it was entirely unknown to the proprietors. This does not mitigate the offense, for the victim is the sufferer just the same, but it impels me to call attention to this condition of affairs, with the hope that in the future such treatment may not be known. That we are so treated at times may be in a measure a fault of our own, inasmuch as we usually keep more or less quiet about the experience, feeling it unnecessary to herald it about that we have been "taken in." If clubs or bodies of autoists would, as a whole, consider these individual cases, taking up the subject as one vital to their interests, a pressure could be brought to bear upon the responsible ones, and the much needed reform instituted.

My experience is that an individual protest counts very little in these matters. You are supposed to pay promptly for work done, and it is only through use of your car for a time that defects are found, so when they are detected you find that the responsibility therefor is hard to place. To me, the best way out of it is to leave the case and trust in the future showing up some more honest place.

There is one factor, however, that offers some hope of reform in this matter. This is the increase in the number of garages each year, and the corresponding increase in competition. This will force good work from experienced mechanics, and at a fair figure. It certainly ought to and will force the unscrupulous repair men out of business.

According to a writer in an architectural publication, asphaltum is the base of all effective damp proof compounds, so where there is important work in the waterproofing line to be done it is best to rely upon the original material itself, and not pay for some fancy name or fake the chances of adulteration. Straight asphaltum can be adapted to any work a damp proof compound is claimed to do.

Typical American Garages

The New York Decauville Garage.

The Decauville Garage, located at the corner of Fifty-sixth street and Broadway, New York city, is generally conceded to be the largest and best equipped garage in America, if not in the world. This is a new structure, built on the latest approved plans entirely of steel, concrete and cement, and is as fireproof as it is possible to build. The garage proper consists of a building 75 feet wide by 200 feet in depth, having a basement and first and second floor. In connection with this building, and practically forming a wing, is a four story office and store building which is operated in connection with the garage. The basement is devoted entirely to washing, storage and the electric vehicles; the main floor to storage of machines which are in daily use, and on the upper floor are the recreation and bath rooms and the different departments, such as the forging, tinsmith shop and the machine shop for general repairing.

Upon entering the main floor, which entrance, by the way, has a bar across it and a watchman to prevent fast driving in or out, one is impressed by the enormous length of the building, and the absence of pillars and other obstructions. A single line of nine large steel, concrete covered columns supports the upper floors, which carries the cross-girders, also of steel concealed by concrete and cement to prevent warping in case of fire, each a span of over 50 feet. The ceilings are very high and both ends of the building are practically made of continuous sheets of glass, and a large skylight is located at the centre. The floors are of concrete and kept very clean, while the walls are of glazed white tile, thus giving to the whole a light, clean and airy appearance decidedly unusual in a garage. At the right of the main entrance is a closed-in post office, with at present 260 private mailing boxes expressly for the use of the chauffeurs. Here an attendant is stationed to act as postmaster. The accompanying photo gives a view of the interior, which is fitted with telephones and a special "telautograph," upon which all calls for cars to be delivered by the chauffeurs are received. This instrument receives its message from a similar instrument in the main office, which is operated by a young lady in charge of the central telephone switchboard. All telephone calls by owners for their cars are received by this operator, who immediately communicates by telautograph to the post office, where the attendant notifies the chauffeur if on the main floor; or by a similar telautograph messsage to a receiving instrument in the chauffeurs' recreation room on the second floor, at one of which places the chauffeur is supposed to be while on duty. These messages being written duplicates are retained and filed in the main and post office, while the other written message is given to the chauffeur in person. This system precludes the possibility of mistakes arising from misunderstandings owing to not hearing correctly over a phone, and also gives a means of checking the calls made by the owners for their cars. In the accompanying photograph are shown the central switchboard, telautograph instrument and operator in the office adjacent to the garage proper, and divided from it by windows.



CENTRAL OFFICE WITH TELAUTOGRAPH.

The floor space is divided and numbered, each car being allotted to a space for which the owner is paying rent and which is reserved for that car at all times, so that if the car should be absent for several weeks no other machine would be found in its space upon its return. There are accommodations for 350 machines; the number of each corresponding to the chauffeur's number. On a balcony surrounding the entire first floor and reached by winding iron stairways at the four corners are a series of 400 well ventilated metal lockers, each with two compartments and numbered to correspond with the chauffeur's number, post office box, car and corresponding space number. Instead of having keys these lockers are fitted with special combination locks somewhat similar to those of a safe, which system has been found to save much time and annoyance.

Near the main entrance at the centre, between two of the columns, is swung a cement floored iron balcony, as shown in the accompanying photograph, which also shows some of the lockers at the farther side of the building. Upon this balcony is arranged an International time recording clock and its accompanying racks and cards. A young man in constantly in attendance, who is familiar with the name and number



BALCONY FROM WHICH CARS ARE CHECKED.

of each chauffeur at sight, and whose duty it is to check each driver as a car goes in or out. This is done by placing a card in the clock and pressing a lever, which stamps the day, hour and minute of the departure or arrival. Each one of these cards corresponds to a driver, so that at the end of the week a complete record appears on these cards of the movements of each car. The cards are then mailed to the car owners. In this way it is impossible for drivers to illegally use the machines without being detected. A complete card system is employed which prevents the possibility of a driver obtaining any materials or supplies from the garage stock rooms or store, or in any way receiving a "rake off" on such materials. Upon taking space in the garage each owner is made to draw up a contract in which he clearly states the authority which he wishes allowed to his driver. This record is kept, and no chauffeur is granted anything beyond the authority allowed by his employer, and is required to sign on colored slips for everything which he receives. These slips are returned to the office and filed, and from them are made up the monthly charge to the owner, so that in no case does the money pass through the hands of the chauffeur. Certain classes of materials are signed for on slips of certain colors, which materially aids in their rapid classification in the office.

At the centre of the main floor are located two large A. B. See electric elevators, 20 feet 6 inches long by 8 feet 6 inches in width, each with a capacity of 6,000 pounds. The length of these elevators is at right angles to the length of the garage, and at each side is located a large turntable, from which a car can be run onto either elevator.



GASOLINE PUMP ROOM.

This arrangement is carried out on all three floors, making six turntables for this purpose. These elevators are each provided with latticed folding gratings, so that when the elevator is at another floor the well is protected. They are provided with automatic stops at the basement and top floor, so that they always come to rest on a level with the floor. An automatic arrangement is also fitted to each, which it is claimed will absolutely prevent their falling. At the rear of the main floor are the gasoline and oil pump rooms, the interior of which, both the floors and the walls for two-thirds of their height, are of white glazed, fireproof tiling, the doors being massive affairs of sheet iron. The electric light globes are covered doubly to insure against their breaking. Self-measuring pumps are arranged along one side which deliver gasoline from the buried storage tanks, which have a capacity of 1,500 gallons. The accompanying photograph shows a view of one of these rooms, and also what is known as the gasoline buggy, a device on two large rubber tired wheels and a small third wheel. Sufficient gasoline is placed in this movable tank so that it can be run alongside of any car, either on the floor or in the street, and a measured quantity of gasoline put into its tank. This tank is provided with a gauge, and on this is a device for keeping a record of the gasoline as used. The oil room is arranged practically in the same manner, there being six oil tanks below, each capable of holding five barrels or a total capacity of thirty barrels.



CHAUFFEURS' POST OFFICE.

As will be seen, every precaution is taken against fire. No wood whatever is used in the construction, with perhaps the exception of the post office boxes. On the wall at short intervals, and on opposite sides of each of the central columns, are arranged fire extinguishers and pails of sand, and of course the strictest regulations are enforced in regard to smoking.

The rear of the basement is used for the storage of cars which are taken out very seldom and for washing, there being four sinks with separate drains. This department is lighted by Edison lamps and Cooper Hewitt vapor tubes. On the walls very close to the floor are arranged electric lights with powerful reflectors back of them, which throw their rays directly onto the lower portion and sides of the vehicle being washed. As is usual in most well

regulated garages, each car is immediately washed upon its arrival and carefully dried with chamois skin before being put in its space. The forward part of this basement is devoted to the care and repair of electric vehicles. Space is set apart for their storage, and what is considered to be the finest charging board in the city is arranged at one side and will charge 24 vehicles at once. This board is constructed of marble and polished copper; it is fitted with a special circuit breaker, which instantly breaks the current in case of an overload or accident and saves burning out the fuses. A separate ammeter is provided for each charging plug and a single voltmeter is so arranged at the middle that it can be used in connection with any one of the plugs. Wires run from the board through pipes to all parts of the department, where plugs are arranged on the walls and posts so that cars can be charged at almost any place without moving them. The Edison current is used for lighting, power and charging, and is distributed from another marble copper trimmed board to the different departments, each having its own ammeter. The elevators and exhaust ventilating fans are also driven by this same current. In one corner of the electrical department and separated by a metal screen is the battery department, the entire floor of which is covered with sheet lead, as the acid from the batteries attacks a cement floor. In this department is a special apparatus for burning the extending terminals of the batteries; this consists of a special hydrogen generator of the sulphuric acid and iron filing type, which is capable of blowing a flame of about 12 inches in length, producing an intense heat which will instantly burn off and level the projecting ends of the lead plates. A special tank is also provided in which to wash the batteries. In the floor of the electrical department is arranged a small hydraulic battery lift about 3x5 feet, and operated by a long hand lever at one side of the room. A car can be run over this lift which is then raised beneath its battery, the weight of which it takes from the car while the battery is being unshipped. The lift is then lowered, carrying the battery with it, and the vehicle is pushed off. When not in use the lift is on a level with the floor and is locked so that vehicles can run over it without its sinking. This makes it possible to take a 1,600 pound battery easily and quickly out of a car. At convenient places throughout this garage are stationed small triple pumps on metal stands and driven by small electric motors for the purpose of inflating tires; these stands are on casters and can easily be run alongside the machines, the plug is inserted in a socket and the tires are quickly inflated.

On the second floor is the main repair shop, the machinery of which is driven by a 15 horse power electric motor. The equipment of this shop, a view of which is shown in the accompanying photo, consists of about 6 engine lathes, 1 or 2 hand speed lathes, 2 shapers, 2 Brown & Sharpe milling machines, 1 Cincinnati universal milling machine, 2 special bevel gear shapers, 1 large Brown & Sharpe universal grinder, 6 drill presses, a special keyway cutting machine, 2 Pratt & Whitney screw machines, 1 special spiral oil groove cutting machine, 3 tool grinders and a powerful arbor press. Along the line of front windows are the benches equipped with every facility for hand work. In connection with this is a well equipped tool room fitted with suitable racks and in charge of an attendant, a check system being used by which each workman is supplied with ten checks for obtaining small tools.



PART OF THE MACHINE SHOP.

A time recording clock is also used in this department for checking the time of the workmen and the time put upon the jobs. In connection with this repair department is a blacksmith's room, where axles can be straightened or new parts forged; beyond this is a special tinsmith department, in which all soldering, bending of tubes and metal parts and the repairing of radiators is done. Adjoining this department are a special dressing room, washrooms, with hot and cold shower baths and lavatories for the special use of the shop employees. On this same floor is another repair department, which is provided for the use of chauffeurs who wish to overhaul and repair their own machines. This is entirely distinct from the other department, and each chauffeur is responsible for his own tools and whatever work he does on the machines. In connection with this room are special lavatories, hot and cold baths for the exclusive use of the chauffeurs, and another room fitted with pool, billiard and card tables, automobile literature, cigar stand, etc., which is intended for a recreation or lounging room for the drivers while waiting to be called. In this room the third telautograph before mentioned is installed. Every possible arrangement has been made for the convenience and comfort of both the drivers and employees. Besides the numerous general phones, there being about 36, the use of which is free to the chauffeurs, there are provided on the main floor also several booths for their exclusive use. A large stock room and a room used especially for checking coats, robes, lamps, etc., are provided and in the care of an attendant. There is also in connection with this garage a complete store in which is kept practically everything pertaining to automobiles.

Boston Motor Mart.

The Motor Mart of Boston, Mass., the largest and best equipped garage and salesrooms in that city, was erected this spring by the Eben D. Jordan Estate. The building is a steel concrete, fireproof structure and covers more than 45,000 square feet of land, and in addition to the space devoted to stores, machine shop and offices, has a garage having 60,000 square feet of floor space, with a capacity for 300 automobiles.

It was the management's idea to erect an absolutely fireproof structure, and this was accomplished by the use of steel, concrete and glass. The Motor Mart is three stories high in the garage part and two stories at the front or store part. The main entrance faces Park square and consists of a broad, concrete, double runway. There are over forty sales rooms and stores already occupied. The rooms are excellently lighted,

for the entire front of the building consists of enormous windows. Each of the three floors in the garage is divided into three sections of equal size. The main entrance for cars leads directly into the street floor of the garage. At the end of the main entrance driveway there is a turntable, and at the left is a large plunger automobile elevator connecting all the upper floors. Directly across the garage, at the rear, is another elevator for automobiles, and in front of it another turntable, there being nine turntables in all, located conveniently throughout the building. On the first floor of the garage are the washstands, equipped with four swivel overhead washers. The lockers for chauffeurs are conveniently arranged around the sides of the garage near the machines. Each car stored in the garage has its place and the chauffeur or owner has a locker near at hand.

The tank and pump room is at the rear. This room is equipped with the Bowser system. Three gasoline tanks, of 550 gallon capacity each, one kerosene tank and three lubricating oil tanks are buried underground directly below this room. Each tank is connected with a self measuring pump. Four portable gasoline trucks with a capacity of one barrel each are also used in connection with this tank room.

On the second floor of the garage, which is reached by convenient staircases, besides passenger and automobile elevators, the arrangement is in general similar to that of the floor below. A feature of the second floor and of the floor above are the traveling cranes at the rear, by means of which an automobile may be quickly and safely swung out through the doors and lowered into the street in case of fire.

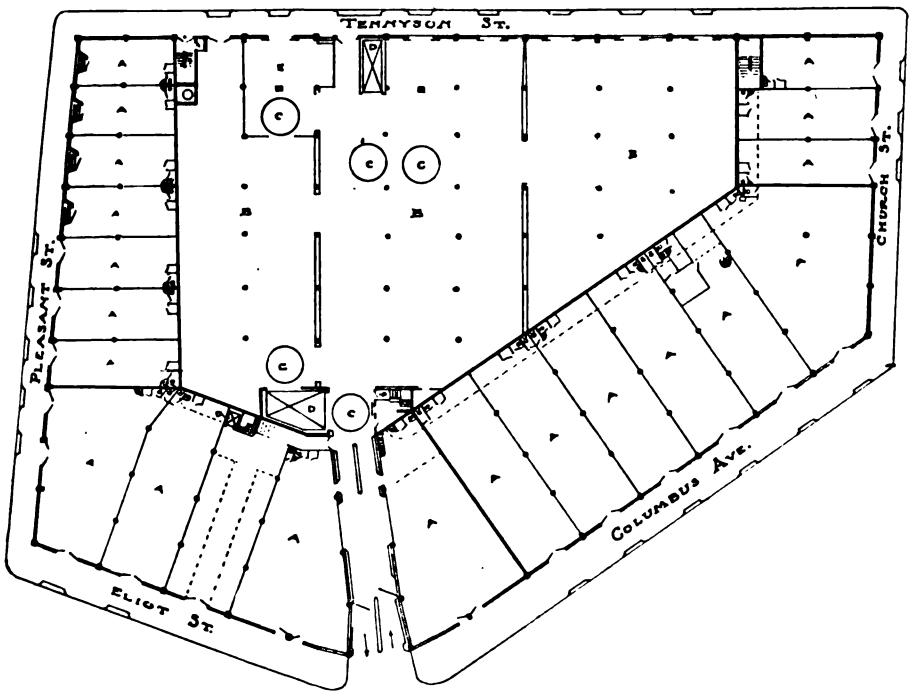
The third floor contains a repair shop, which is enclosed with an iron fence. One of the features of this room is the elevated tables upon which a machine to undergo inspection or repair may be raised. There are also many other conveniences for handling machines not met with in most garages. An electric charging plant is now being installed at the rear of this floor, which the management expects to have in readiness in the course of two weeks. A compressed air plant is also to be installed. The building being entirely of concrete and steel, the only arrangements made for fire protection are hand extinguishers and barrels of sand.

Chauffeurs' lounging rooms, with shower baths and lockers, are provided, and on the second floor front are located the manager's office and ladies' and gentlemen's writing rooms, furnished in unique style; shower baths are also located here for the exclusive use of the patrons. The boiler and engine rooms are in the basement. There are three horizontal water tube boilers and two engines with direct connecting dynamos, which furnish light and power.

This building may be safely called the best one of its kind devoted entirely to automobiles in New England.



INTERIOR VIEW OF THE MOTOR MART
(Showing corrugated iron turntable, concrete covered beams and pillars).



PLAN OF THE MOTOR MART, BOSTON.

Tremont Garage, Boston, Mass.

The Tremont Garage, a two story brick building, is located on Tremont street. The repair shops are on the first floor and the garage on the second, this being entered by a double runway. It has no special apparatus for handling and repairing automobiles other than the usual appliances. It

TREMONT GARAGE.

Name.....

Date.....Car No.....

Tag No.....

Storage.....	
Washing.....	
Polishing.....	
Gasoline.....Gals.	
Waste.....Lbs.	
Oil—Cyl. Gas.....Pts.	
" " Knox..... "	
" " Steam..... "	
" Gear..... "	
" Non-fluid.....Lbs.	
Kerosene.....Pts.	
Carbide.....Can.	

Supplies ordered by.....

Have ready at.....

Delivered to Mr.....

Attendant.....

FORM OF CHARGE SLIP.

RENTAL SLIP AS USED BY TREMONT GARAGE, BOSTON.

No.....

Name.....

Hour.....

Address.....

Time engaged for.....

Car ..... Driver.....

Must be back .....

Time charged for Ordered by

....

REPAIR SLIP AS USED BY TREMONT GARAGE, BOSTON.

IN	OUT	IN	OUT

Name..... Dept.....

Hours required..... Hours worked.....

Short..... Over.....

contains a double washstand with illuminated swivel washer, and six repair pits, which are rented for $1 per day. The gasoline is stored underground, the Bowser system being used. In case of fire each employee is supplied with a hand chemical extinguisher, and barrels of sand are found located at convenient places throughout the building. Inside the entrance to the garage are a supply of office and locker rooms. The superintendent of the floor is stationed in this office, where the following checking system is used. When supplies are purchased, washing or polishing work done, the amount is made out on a small check, as shown on the preceding page, which is stamped with the date and time. These slips are given to the purchaser at the end of each month. The data from these checks are copied on a day slip, and turned over each evening to the bookkeeper. Another check, as illustrated, is used for rental of cars and filed each evening. When a car is sent to the repair shop another form of slip, as illustrated, is sent with it, which is filled out by the workman and filed. Cars are delivered at owners' residences only at owners' risk.

A Providence (R. I.) Garage.

The East Side Auto Station, 200 Meeting street, Providence, R. I., occupies a two story brick building containing 12,000 square feet. The floor on the street level is of concrete, and, with the exception of a small office and the wash rack, is used exclusively for the storing of cars, the upper floor being used for the repair shop, offices, lockers, reading room, etc.

A hydraulic elevator is used to carry cars from one floor to the other. This elevator has no cross beams or weights on top, but is trussed up underneath similar to a bridge. It has a length of 16 feet, consequently is capable of holding the largest of cars. A novel contrivance in the way of a truck is used, which does away with the necessity of having a pit. This truck stands 4 feet in height, has a length of 12 feet and a width of 5 feet. It is built of heavy timbers, bolted and riveted together, having six uprights, under each of which are ball bearing small steel wheels that work on swivels, which allows the moving of the truck to any desired place without much effort. The automobile to be operated upon is first run on to the elevator, which is then raised 4 feet from the floor and on a level with the top of the truck, on both sides of which are boards one foot in width, running the full length of the truck on which the wheels of the car rest. A small V shaped block is placed at the ends of these boards to prevent the car from running over the end, and a board projecting an inch and a half on either side prevents the wheels from slipping over the sides. The cars are pushed onto the truck and it is moved to the location desired. The particular advantages claimed for this arrangement are that it is possible for two or three men to work under the car at the same time without interfering with each other, and also that they can work without the use of artificial light.

Particular pains seem to be taken in this garage to keep everything, from the floor to the ceiling, in a state of cleanliness. The moment that any oil or grease is spilled on the floor a piece of cotton waste is saturated with gasoline and the grease wiped up. Upon the evaporation of the gasoline no spot whatever remains on the concrete. An individual drip pan, reaching the full length of the car is placed under each car, and these pans are also kept clean by the use of cotton waste and gasoline. This waste is used as fuel in the heating boiler of the garage. The washing and polishing is done at night, two washers and two polishers being employed.

For the recharging of batteries on electric cars there is a twelve switch charging board, having a separate meter and rheostat for each car. The cost of recharging is 10 cents per kilowatt-hour, and a rate of $15 a month is charged for storing and washing and polishing. This applies to pleasure cars only; no commercial vehicles being stored at the place, there is no price for them fixed as yet. The rate charged for the monthly storage of runabouts and small touring cars of either the steam or gasoline types, including washing, polishing of wood and brass work, cleaning, filling of radiators, etc., is $15. For large touring cars the rate is $20. For transients a nightly rate for storage, washing, etc., is $1.25 for small cars, and $1.75 for large cars. Nightly storage not including washing, etc., is 50 and 75 cents. In the case of cars that are called for and delivered within a half mile of the station an additional charge of $5 a month is made, and where the distance is within a mile an additional $7 is charged. Private lockers for both owners and chauffeurs are rented for 75 cents a month.

A neatly furnished room, containing rockers, easy chairs, table and reading matter, with adjoining closet and toilet facilities, is at the disposal of the customers and their guests. The chauffeurs are not allowed in this room.

The rates charged for supplies are as follows: Gasoline, 20 cents per gallon; gas engine oil, 80 cents per gallon; lubricating oil, 60 cents per gallon; steam cylinder oil, 75 cents per gallon. Labor on cars is charged for at the rate of 60 cents per hour and overtime at 80 cents.

No one is allowed to sit in the cars or to start the motors except the owner and chauffeur in charge, unless it be that some repairs have been made and it is necessary to test the motor. When it is time to place a car on the wash rack the same is pushed to the rack, and afterward it is returned to its place by the same method. This prevents any unskilled washer from handling any of the working parts and getting them out of order.

Numerous fire extinguishers of several different makes are placed on the walls within easy reach, to be used if occasion demands, and smoking is strictly prohibited in all parts of the building. The heating in winter is done by steam, with their own plant, the pipes being ranged around the walls, 3 feet from the floor. In winter all cars that are out of commission are jacked up, and small wooden horses are placed under the front and rear axles to keep the tires from the floor. Numerous arc lights and clusters of incandescent lamps are used for lighting purposes. A short line of necessary supplies, such as inner tubes, spark plugs, etc., is carried—more as an accommodation to customers than as a money making proposition, the writer was told.

The Summer Hotel Garage.

By Harold H. Brown.

The problems involved in the design of a garage for a summer hotel are quite different from those presented by a garage to be used the year round. As the place is to be used only during the warmer months it will be unnecessary to make any provision for heating. Then, again, the cost of the land is not usually so great as to be much of a factor when the question of ample floor space and the cost of building is being considered. Further, the season being comparatively short, and the garage being generally erected more for the accommodation of the guests of the hotel than as a separate money making establishment, one is hardly justified in making much of an outlay for elaborate repair facilities, especially if the place is situated within a reasonable distance of a good repair shop.

As the only appreciable source of revenue of such a garage is the charge for storage, and a secondary one the sale of oil and gasoline, in order to show profit, or, at any rate, to keep the loss as small as possible, the expenses must be kept as low as possible. The only expense besides the cost of lighting is the wages of help. Provided the place is properly designed so as to facilitate entrance and exit, a



MASSACHUSETTS SUMMER HOTEL GARAGE.

washer and general all around automobile man will be ample to take care of the average summer hotel garage, which will generally not be called upon to accommodate more than ten or a dozen machines.

The garage in the illustration, which belongs to a summer hotel on the North Shore of Massachusetts (Ocean House, Swampscott), is a good example of this type, and it furnishes, also, a good illustration of how peculiarities of the available land may be taken advantage of. The land on which the garage is situated slopes away from the main road, toward which the garage faces, to a brook which runs parallel to the main road. Owing to this fact it was necessary to either mount the building and its approaches on piles or to do considerable filling in; the latter course was resorted to as giving the advantage that the entire platform in front could, if necessary, be used as a washing stand, the natural slope of the land toward the brook providing ample drainage.

The depth of the garage is ample to take the longest touring car, with a good clearance both behind and in front. Two runabouts may be put in the space occupied by a touring car. As will be seen from the illustration, there are ten doors, which practically allows an entrance for each car. Half of the doors are hung on the inside of the wall, and the other half on the outside of the wall. By this means any five of the doors may be opened at the same time. The illustration gives a good idea of this feature. The front platform extends the entire front of the garage, and is 24 feet from front to back. The runway proper to the platform is 12 feet wide, but in the last 20 feet flares to 24 feet. This gives ample room, so that with possibly the exception of the doors on the extreme ends a machine may enter or leave the garage without "backing and filling." As the floor of the garage and the front platform are on the same level, it is easy to move the machines to or from the front right hand corner of the platform where the washing is done. Owing to the fact that in the neighboring city of Lynn, less than 2 miles away, there are ample repair facilities, and also because the season lasts somewhat less than three months, it was not thought advisable to provide any elaborate repair facilities. However, a bench and a couple of vises are provided, as well as a few hand tools, in the right hand corner of the building. A rotary transformer for charging electric vehicles is situated in the left hand corner. It might be remarked here that this was installed by the Edison Electric Illuminating Company, of Boston, free of charge to the proprietors of the hotel. This company have installed a number of these plants in the towns surrounding Boston in order to popularize the electric vehicle, their only income from this source being a percentage of the price of charging a vehicle.

A half dozen large lockers are provided for the permanent boarders. Owing to the nearness of the hotel it was not deemed necessary to provide any facilities in the way of dressing or recreation rooms.

A Springfield (Mass.) Garage.

A modern washing stand forms an interesting feature of the Cooley House Garage of the Springfield Automobile Company at 40 Liberty street, Springfield, Mass. On this washing stand there are three tanks, the largest of them being used for furnishing hot water, and the other two for supplying compressed air. The large tank holds about 100 gallons. The washing stand is of the overhead kind, and the tank is in a horizontal position, located along the wall near the ceiling. It is filled with copper coils, and steam going through these coils keeps the water at whatever temperature is desired. The other tanks stand a few feet from the floor, one on either side of the washing stand. One hundred and twenty pounds of water pressure can be used in one, and from this a supply of 100 pounds of air pressure can always be obtained. The work of inflating tires is thereby greatly simplified and made an easy matter.

The gasoline at this garage is stored in underground tanks outside the building, and two pumps are used to draw it. There is a separate compartment, adjoining the washing stand, for oil storage, containing five cans of 100 gallons each. A blacksmith outfit, with forge, is contained in the repair shop, in the rear of the garage, the repair shop having also two repair pits, each 4 feet wide and 5 feet high. The



SPRINGFIELD AUTOMOBILE COMPANY'S GARAGE, SHOWING WASHSTAND.

building is a monitor affair, with 100 feet front and 11,000 square feet floor space on the ground floor. The front doors are so arranged that cars enter by one and leave by the other. The floor of the garage is of cement.

Somerville (Mass.) Auto Company's Garage.

The Somerville Automobile Company, of Somerville, Mass., have recently erected a garage on Broadway, of that city. It is a one story frame building, covered entirely with sheet metal. It is of sufficient size to accommodate twenty cars, and also contains a small repair shop. The building is well lighted, ventilated, and is heated by the hot water system. The floor is of concrete throughout, with a large washstand in the rear, which is equipped with modern washing appliances. The building also contains offices, lockers and waiting rooms.

In constructing this garage the matter of fire protection was very carefully considered, and on account of the building being constructed of wood it was covered both inside and out with heavy sheet metal. Therefore but little if any woodwork is exposed. Thus, if a fire started among the cars there would be no danger of the building being destroyed. Hand chemicals and hose are also provided. The gasoline is stored under ground, some 25 feet from the building, and a pump is enclosed in a sheet iron shed attached to the front of the building facing the main street. This shed is marked with the word "Gasoline" in large red letters, thus notifying the police or firemen in case of accident or fire. The heating apparatus is located in a small room in the rear of the building, fully covered with sheet iron and equipped with fire doors. The garage is lighted throughout with electricity, no kerosene or gas being used. A night watchman is also employed, so that all possible precautions are taken against fire.

The management employ repair men who can be hired at a flat rate of 60 cents per hour. From 50 cents to $1 per car is charged for washing, and for live storage $16 for two cylinder cars and $18 for four cylinder cars per month. This rate includes washing and polishing. No cars are delivered to the owners' residences. The dead storage rate is $5 per month.

Garage Facilities in Troy and Albany, N. Y.

By Elmore F. Elmore.

It is really somewhat early for a complete description of the garage facilities of this vicinity, owing to the rapid growth of the business, as the facilities of Albany will probably be trebled before the lapse of three months, and logically the principal modern devices will be installed in the buildings now in course of construction. One peculiar feature of the present situation is the refusal of those catering to motorists' needs to treat the storage battery at all seriously. In none of the present buildings are there facilities for charging them, and owners of cars fitted with such batteries are compelled to rely either upon electrical companies or upon stores owning electric trucks. As the latter's facilities are necessarily largely in requisition by their own vehicles the charging of gasoline car storage batteries is frequently incomplete and unsatisfactory. With one exception the new garages appear to have no definite plans for installing charging facilities. I speak of this at length because it suggests that there is occasion for replacing storage batteries by some more practical source of current, in view of their dependence upon charging facilities which are often limited in large communities, while wholly wanting elsewhere. The price for charging varies from fifty to seventy-five cents and a dollar.

METHODS OF CLEANING.

The method of washing exhibits no novelty, the facilities being limited, even in the best garages, to a cement floor depressed and drained at the centre, and a hose attached to a swivel traveling on a circular frame, thereby enabling the water to be applied to any part of the machine with equal facility, and dispensing with the delay and slovenliness which often attended the older method. I have seen no methods of cleaning by power or buffing machines, either in use or contemplated. In fact, the only application of power to any process in connection with the maintenance of automobiles is a tire pump of three cylinders, actuated by an electric motor, which the Albany Garage Company expects to install during the succeeding months.

STORAGE OF LIQUID SUPPLIES.

The methods of storing gasoline and oil likewise exhibit no new features. In one of the largest garages the gasoline is kept in a large receptacle in a sub-cellar, whence it is brought in cans to the main floor. But in several of the newer buildings it is kept in Bowser self-measuring tanks, the tanks being buried in the ground beneath the floor of the garage, while a pump at a convenient height above the floor—sometimes in an ante room large enough for the admission of a car—enables the service tanks to be filled conveniently and rapidly. Similar tanks are used for the storage of oil. The charge for gasoline is eighteen cents for regular customers and twenty for transients, while oil is $1 in one gallon cans and 75 cents in bulk.

REPAIR SHOPS.

Of course, every garage makes some pretensions of maintaining a repair shop, but the equipment is in each case very limited, and this is equally true of the only garage I know of which houses commercial vehicles. Fortunately, however, in several of the large garages of Troy and Albany reasonably complete machine shops will soon be installed on the second floor. A well known manufacturer of automobile specialties in Albany is now completing a joint salesroom and machine shop which will be the most complete in the vicinity. Already a half dozen large modern machines are installed, and when completed it will be equipped with extra heavy millers, shapers, universal grinders, lathes, drill presses, power saws, air compressor, and the like. The plant will be driven by a gas engine of the manufacturer's own design. The front portion of the building will be 40x100 feet and two stories high, continued by a 60x100 feet four story building joined thereto at right angles. The forward part of the lower floor will be devoted to a showroom, while the rear will be an assembling room and machine shop. The upper floors will be reserved for the building of commercial cars and specialties. In connection with machine shops, I may mention that the universal charge in this vicinity for labor is 50 cents per hour.

FIRE PROTECTION.

This building is fairly illustrative of the prevailing methods of fire protection. It is "a slow burner," but not strictly fireproof. Nearly all buildings have concrete floors, which are safe, easily cleaned and reflect light fairly well. White water paint on the woodwork increases the light, and though worthless if subjected to high temperatures, slightly minimizes the danger from a sudden blaze. But there is generally little exposed woodwork. In a large one story garage on Central avenue the ceiling is composed of sections of sheet steel. In some cases asphalt roofs add protection against exterior conflagration, and in the Central avenue garage the offices, of frame construction, on either side of the main entrance, are separated from the garage proper by walls covered with asphalt from floor to ceiling.

The new garage on Howard street is a more advanced type, the frame consisting of steel girders and columns, to be covered with concrete. Wire lath is employed throughout, and other elements of modern fireproofing practice are incorporated. In the majority of garages a number of fire extinguishers are either disposed in an accessible central space, or distributed throughout the building. In addition to these the New Albany Auto Garage Company will erect around the walls numerous shelves, well provided with pails of sand. But the dangers of fire are less in these well equipped garges than formerly—stoves, even in remote places, have disappeared, and all modern garages are heated by pipes from furnace, steam or hot water boiler in the cellar, or in compartments virtually separated from that portion of the building where gasoline is habitually handled.

LIGHTING AND VENTILATION.

There is little to be said on the subject of lighting and ventilation. Of course, all garages have portable electric lights, but rely as far as possible on a multitude of windows. On second floors skylights are extensively used, both for lighting and

ventilating purposes. In one garage in Albany a ventilating shaft of large diameter, just off the centre of the building, extends from the ceiling of the automobile room to the roof, where it is closed by skylights controlled by cords, thus affording both light and rapid ventilation for the first floor, where gases are likely to accumulate.

NOVEL HOISTING APPLIANCES.

There are few elevators in operation, though several garages expect to install them in the near future. The only one which I observed was constructed as follows: Two large drums connected by a shaft were mounted high above the opening of the second floor. The drums are revolved by means of a very large belt pulley, acting upon one of them through the medium of four gears, the motion being twice reduced. The belt pulley is operated by a hand actuated cable, and is maintained at rest in any position by a brake which is clamped against it by a large screw terminating in a sprocket. A link chain extending to the lower floor, by revolving the sprocket, applies the brake. One end of the rope wound upon the drum passes within its periphery, and is there secured, while its other end is attached to one corner of the elevator. Another rope, similarly fastened within the drum and wound thereon, extends over a pulley to the second corner of the elevator. Upon the second drum is wound a cable, one end of which is secured to the third corner, while the other is attached to a frame containing weight bars and running in a guide. The second rope upon this drum is, of course, a duplicate of the second on the first drum.

PITS.

The pits in the new garage on Central avenue (of which there will be three) will be constructed of concrete. But one of the best pits I have seen is at Robinson's. It is simply an opening in the floor, with broad flat stairs descending very gradually to the cellar. Either side of the opening is protected by stringers about 6 inches in height, and joined to these stringers and extending along the floor in the direction whence the car approaches are two other stringers, meeting in a point. This effectually obviates the danger of an approaching car, by any slight deviation of its wheels, dropping into the pit. The flooring on either side of the opening is strengthened with broad iron plates to sustain the weight on the wheels.

CONVENIENCES FOR PATRONS.

Few of the garages make much provision for customers or chauffeurs. However, in one large building, in addition to wash rooms furnished on both the first and second floors, a large room is also provided containing lockers of about four times the ordinary capacity, thereby providing a place where many of the valuable accessories, robes and the like, ordinarily kept in an automobile, may be safely stored and locked.

No portable cranes were observed in actual use. However, one of two kinds will be used in one of the new buildings. A steel girder, supported on columns, extending across the building and affording a track for a traveling hoist will probably be adopted; the alternative is a device which is both interesting and novel. The crane will be attached to a horizontal frame carried at a considerable height by two side pillars supported on wheels at a distance from one another greater than the width of a gasoline car. This huge mechanism has the advantage of a girder crane, in that it can be moved over a car in any part of the shop, and can dispose of its body or engine in any available space.

The rates for storage vary with the size of the vehicle, from ten to twelve and fifteen dollars a month.

COMMERCIAL VEHICLE METHODS.

Proceeding now to methods of keeping commercial cars, they are usually comparatively chaotic. If a truck has occasion to stand a half hour the driver is supposed to devote this time to care and repair, but it is not obvious that the best results are obtainable in this way. Trucks certainly do not receive the best of care, and probably this accounts for their high expense; for instance, I know of one make which made an excellent record in the Glidden tour, and the prototype of which here does the work of three teams, yet its owner informs me that he has been unable to discover any saving effected by its substitution for horses, and this, too, in its first year of service, when the repair account should be small. In fact, none of those in charge of shipping departments are prepared to claim for them any economic superiority over horse drawn vehicles. An added reason for their present low financial efficiency is that the operator is frequently chosen on account of other than mechanical qualifications; for example, the man must be a "good shipper," understand the methods of freight houses, bills of lading, obtaining cars with dispatch, etc., hence mechanical skill and care are often sacrificed, and the repair bills thereby increased.

The method adopted by one of the largest and most successful business houses in Albany is worthy of consideration as an example of the care now received by commercial vehicles. Each machine has its own driver. The gasoline is stored in a building separate from the barn, to eliminate danger from fire. The driver is responsible for the care of his machine and for keeping it thoroughly clean. He is required to arrive at the barn at 7 in the morning and be prepared to take a load of goods at 8. This provides an hour at the best period of the day to keep the machine in order. If the car is dirty at the end of the day, it is to be cleaned that night, irrespective of the time that it returns to the barn. But, to compensate for these extra hours, the driver is allowed a half holiday on Saturday, and is not called upon to receive a load of goods before 1 o'clock on Monday. Thus the man is not overworked, but is required and given the necessary time to keep the machine in reasonably clean condition and good repair.

Buffalo Garages.

MOTOR VEHICLE COMPANY'S GARAGE.

The garage of the Buffalo Motor Vehicle Company, conducted by Messrs. McNaughtan & Du Broy, at 1133 Main street, is now in the hands of workmen, who are carrying out the plans of the company for alterations, which when completed will, it is claimed, place this garage among the best of its class.

The building now occupied by McNaughtan & Du Broy, part of which is used for garage purposes, is a modern brick, four stories in front and three stories in the rear, 56x200 feet in dimensions, standing on a lot 330 feet in depth. It is planned to build on the vacant space in the rear, leaving a space of 30 feet between the two structures, which will give a driveway through the garage from Main street to Best street. The new building will be three stories in height and 52x100 feet in dimen-



WM. HAMLIN'S PRIVATE GARAGE.



INTERIOR OF WM. HAMLIN'S PRIVATE GARAGE.

ions. The lower floor of the new building vill be equipped for the care of gasoline nd steam cars, and the repair and machine hops will be located on the upper floors. The main floor of the front building will be he display and stock room, over which will e the paint shop and woodworking and rimming departments. An incline from the rear driveway will lead into the basement, which will be equipped as an electric garage. Two 35 horse power Westinghouse gas engines will be installed, and two 55 kilowatt generators. The facilities for charging and washing cars will include the latest improvements, with pits for underslung batteries.

THE AUBURN AVENUE AUTOMOBILE STATION, conducted by James L. White, 419 Auburn avenue, is among the more recent additions to the list of Buffalo's garages. This plant is now being remodeled to bring it up to date. The garage will accommodate about fifty vehicles, and maintains repair shop and livery. The building is of frame construction, two stories in height, 115x31 feet inside, with two entrances, affording a driveway through from front to rear. The charge for storing cars and caretaking is from $8 to $25 a month, including delivery. Repair labor is charged for at the rate of 50 cents an hour. The charge for livery service varies with the number of passengers, the usual rate being $4 for the first hour for four passengers, and $3 an hour thereafter.

GEORGE N. PIERCE GARAGE.

The garage of the George N. Pierce Company occupies a large one story brick building in the rear of the company's new showrooms on Main street, near the Teck Theatre. The garage will accommodate from eighty to ninety cars, and has exceptional facilities for doing all kinds of work. The water system installed in this plant to facilitate the washing of automobiles merits special notice. Water pipes extend entirely around the inner walls of the garage, at a convenient height from the floor, with faucets for hose connections at frequent intervals. The floor is of concrete, sloping toward gutters that empty into drains. The shops are completely equipped with the best devices, and a large force of competent workmen is kept constantly employed. The garage is open day and night. No arbitrary scale of charges for service is maintained, the charge for storing and cleaning cars running from $15 to $25 a month. The driveway leading into the garage is from Edward street, in the rear of the display rooms. The front entrance is through the company's showrooms, which open into an intervening space that has been prettily laid out as a park with attractive flower beds. This little park separates the garage from the main building.

WM. HAMLIN'S PRIVATE GARAGE.

One of the finest private garages in the State has recently been erected and equipped by William Hamlin, of Buffalo, in connection with his residence at No. 1058 Delaware avenue. It is a large one story brick building, with a capacity for eight cars, and was equipped with every modern facility for the care of the automobiles which are maintained exclusively for Mr. Hamlin's family use. A 10 horse power Westinghouse gas engine set generates a current of 65 amperes used for charging the electric cars and to keep up the electric light system, and a storage battery of fifty-six cells is maintained for emergency use when the dynamo is not in operation. Hot water pipes supply heat; the building is lighted by windows in the front and rear, and perfectly ventilated. Under the space occupied by each car is a dripping pan opening into a drain in the concrete floor, and at one end of the large room is a repair pit. The entire front of the building may be opened by means of six wide double doors, that open into a spacious asphalt paved enclosed court, in which there is abundant room for turning cars.

UTICA STREET AUTOMOBILE STATION.

This garage is housed in a new two story brick building of fireproof construction, lighted on all sides by windows, and is equipped with complete machine shops, in which, besides repair work, a specialty is made of rebuilding cars to conform to the ideas of owners. In connection with the garage a motor livery is conducted, cars being rented out with drivers in charge. The charge for this service is usually $4 the first hour and $3.50 for subsequent hours. Two devices in use at this garage to facilitate handling cars merit special notice. Instead of repair pits W. F. Polson, the proprietor, has introduced a system for elevating cars from the floor by means of a crane and suitable adjuncts, and suspending them in a position that will be convenient for the workman and facilitate access to all parts of the mechanism. A



UTICA STREET AUTO STATION, BUFFALO, INTERIOR VIEW.

novel cleaning device has been in use at this garage for some time, and is now the subject of an application for patent by Mr. Polson, who designed it. This device consists of an arrangement for spraying a vapor of compressed air and kerosene under high pressure wherever grease is to be removed. It is claimed to have proved very efficient both for cleaning machinery and paint. The kerosene is fed from a tank under a pressure of 60 to 70 pounds, and the air under 120 pounds pressure. The flow of both may be readily regulated, and the resulting stream of vapor is directed upon the parts to be cleaned by a nozzle at the end of a flexible pipe.

All the gasoline used at this garage is stored outside the building. The oil is kept in tight receptacles on the upper floor, and is piped to the various parts of the plant where it is needed.

The regular charge for storage, cleaning, etc., is $18 a month for each car, but this figure varies according to the car and the responsibility assumed. Ordinarily this charge includes delivery and return of cars by competent drivers, and all incidental expenses except cost of repairs and fuel.

O. K. MACHINE WORKS GARAGE.

The O. K. Machine Works and Garage at No. 889 Main street has a plant for the care of gasoline and steam cars only. The garage affords storage room for from forty to fifty vehicles, and the machine shops and repair rooms in connection comprise the necessary facilities for rebuilding automobiles. Among the new features in use here is a device for straightening axles, for which an application for patent is now pending.

This garage has adopted the plan of guaranteeing all repair work at a price fixed in advance. The usual charge for storage, cleaning, etc., is from $10 to $20 a month for small cars, and $20 to $30 a month for the larger cars. The charge for labor in making repairs is figured on a basis of 50 cents an hour. Overnight boarding for tourists' cars $1, and washing usually $1. A reception room for visitors and patrons of the garage is maintained, and a stock of automobile supplies of all kinds is kept on hand at all times.

Syracuse Garages.

AMOS PIERCE GARAGE.

The Amos Pierce Automobile Company has been making extensive alterations in its garage, giving it more and better arranged room on the ground floor. Cars can now enter at the front, go clear through without obstruction and leave by the rear door. One of the improvements is a portable buffing machine, designed on original lines. There are plug connections along the side of the north wall and a small motor with plug is pushed from one machine to another. The motor has connected to it a flexible shaft with a buffer attached. The cost of the contrivance was only about $50 and the labor of polishing is reduced two-thirds.

The repair pit used by this company consists of an excavation in the floor with a box let down into it, in which men stand. This pit is three by four and one-half feet in dimensions, and is equipped with a portable light and a vise, which does away with the necessity of getting out of the pit until the job is completed. When not in use the pit is covered, leaving a smooth floor.

The repair department is equipped with lathes, drill presses, a shaper, emery wheel and a compressed air pump for pumping up the tires. Connections are made with this air pump on every floor, so that tires can be inflated with the least possible trouble. The company bought a big pump, connected it with a line shaft so that it is run along with the other machinery, storing the air into a tank with a capacity of 150 pound pressure.

The gasoline is kept outside of the building in a large tank, which is filled from the tank wagon of the Standard Oil Company, and from which it is drawn by a Bowser pump inside the garage.

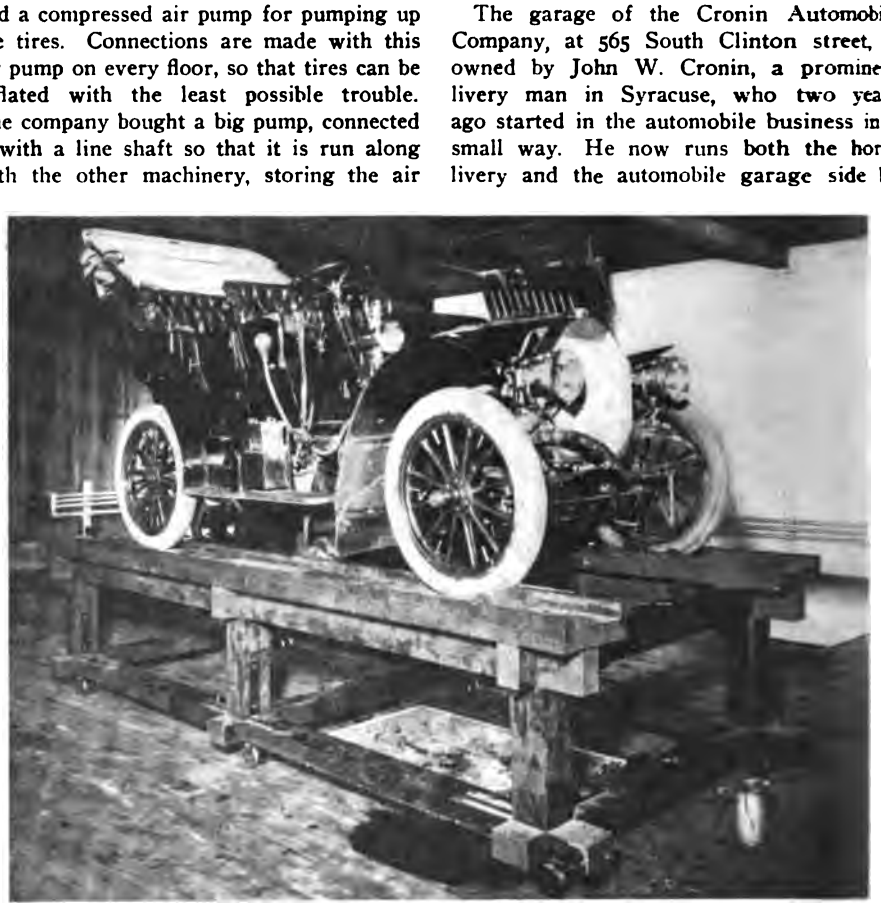
The system of checking the machines for rental is especially effective. When the car leaves the building the driver takes a card provided for that purpose, writes in the name of the renter, kind of machine and any other information that he may desire. This card he inserts in a time clock made by the International Time Recording Company of Rochester, which is stamped with the correct time of day. Upon his return the card is again inserted and stamped. This causes an indisputable record of the time the car was out. From this card, if the customer is known and has an account, a charge is made on the books; if the customer has no account the bill is rendered and paid on the spot.

The rates at the Amos Pierce Company's garage are as follows: Storage including washing, polishing, etc., $15 to $25 a month, according to the size of the car; washing and polishing, $1; gasoline 20 cents per gallon; oil, 60 cents per gallon; labor, 60 cents an hour; dead storage, $5 a month; charging batteries, 10 cents a kilowatt hour. The place is equipped throughout with hand fire extinguishers and sand pails.

CRONIN GARAGE.

The garage of the Cronin Automobile Company, at 565 South Clinton street, is owned by John W. Cronin, a prominent livery man in Syracuse, who two years ago started in the automobile business in a small way. He now runs both the horse livery and the automobile garage side by side. The garage is 100x200 feet, built of wood and located north of the brick building where horses and carriages are kept. In case of fire in the garage, the brick building would not be injured, as the windows of the latter are equipped with tin covered contrivances which would be pulled shut. This prevents the flames getting in at the windows. In the garage itself are kept fire extinguishers and pails of sand. One of the novel characteristics of this garage is the fact that the whole floor slants slightly, so that the car can be washed in any part of the building and the water will run off, the floor being of cement. Up to this time there has been no repair shop in connection with the establishment, but one is now being equipped and the company will hereafter be in shape to do all kinds of repairing.

A novel contrivance is being made to take the place of the repair pit, which Mr. Cronin believes is not healthy for men to work in after it has become saturated with oil and gasoline. Instead of the pit, a pl-



CRONIN'S SUBSTITUTE FOR A PIT.

form is built 4 feet high, large enough to permit the largest car to be run upon it. This platform has no centre and is on wheels, so that it can be moved to any part of the floor. Mr. Cronin expects to put in a portable buffing machine. In connection with his livery business he operates a painting, trimming and upholstery department, which is pressed into service by the automobile department when needed. Gasoline is stored in a 180 gallon tank outside in the ground, and is pumped in by a Bowser pump. The oil is kept inside in steel tanks.

The system of checking machines here consists of writing on a card the date, name of the one who runs it, the number of the car, style, the time out, and amount to be collected. The charge for storing, polishing, washing and oiling a touring car with 106 inch wheel base is $25 a month. For runabouts the charge is $10 to $15 a month. The price for storing dead runabouts, $5; dead touring cars, $10 a month, depending on the size. The garage is heated by steam pipes around the wall and lighted by electricity. Almost the entire front is glass, giving plenty of light in the day time.

SYRACUSE M. C. C. GARAGE.

The Syracuse Motor Car Company has just moved into a four story building at Nos. 511-513 South Clinton street. Upon the first floor are the offices; on the second, the showrooms; on the third is the repair shop, and on the fourth the paint shop. The basement is used for storage. There is a front and a rear entrance on the ground floor with a cement washstand. The building is equipped with a large elevator. The repair shop has a pit similar to that of the Amos Pierce Company, and is equipped with lathes, drills, planers and other machines run by an electric motor. The charges are the same as in the other garages. Fire extinguishers and sand pails are used. A separate room has been fitted off for a waiting room for ladies.

MUNICIPAL GARAGE.

The municipal garage, where the automobile police patrol and runabout are stored, was formerly a horse barn, but has been fitted up with a cement floor, which slants to the centre from all sides. Upstairs is a charging plant with a 10 horse power motor generator. There is also a repair shop on the second floor.

Washington Garages.

While the streets of Washington are admirably suited to the use of the automobile, and there are hundreds of cars in daily use to prove this fact, a canvass of the garages proved disappointing. They are all doing business, and, generally, a good business, but not with the keen incentive of competition seen in the Northern cities. The majority content themselves with following fixed methods, without much endeavor toward improvement in labor saving devices and machinery. Undoubtedly this is partially due to the fluctuations in the business in that city. In the winter time, when Congress is in session, all is hurry and bustle; in the summer, when Congress adjourns, everything adjourns with it. People disappear, houses close, streets are deserted, and, of course, the automobile trade is affected accordingly.

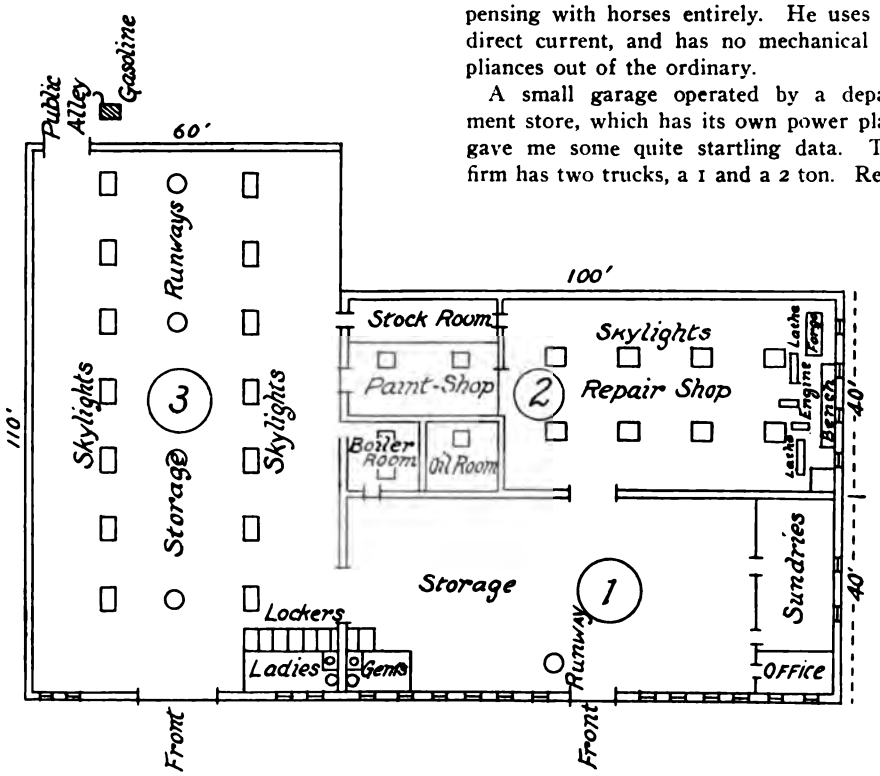
Garages in Washington are institutions of evolution, with few exceptions. When it became apparent that repair shops and storage rooms would be needed for automobiles, buildings were selected best suited for the purpose and located most convenient to the trade. Bicycle stores, wagon shops, stables and stores were utilized, and the business has grown upon and around these places as a rule. Since then a few buildings have been specially put up for garages. One of them is a splendid building on Fourteenth street, occupied by the National Automobile Company. This place is well planned and fitted, but deserves no special comment, except, possibly, as to the admirable manner in which it is conducted. It is a two story brick structure, with double doors at each end and large windows wherever possible. Repair and stock rooms are on the second floor. The business has really outgrown the building.

The Pope Manufacturing Company have a well regulated salesroom and garage under the management of C. R. Hough, but more space would be very desirable here. With the shop in the basement and the salesroom on the first floor, the management finds itself crowded, and must have relief soon. Undoubtedly this company has the best salesroom display in the city.

As an illustration of the rapid growth of the garage business in the national capital, and also to show some rather good features, the writer will describe the "U Street Garage." The first part of this building was erected in 1903. It was 100x40 feet, one story brick. It was so far away from the other garages and the business centre of the city that it was freely predicted the young man interested would "starve to death"; but he did not. The business prospered and grew beyond his accommodations, so that in the latter part of the year 1904 he was compelled to build an addition of 100x40 feet. Last winter it became evident that this was not enough to accommodate his constantly increasing business, and another addition was planned and has recently been finished, this time 110x60 feet. The enclosed sketch shows the general plan.

A garage operated by an express company presented the most orderly and businesslike appearance of any I was permitted to inspect. Here one man directs the movement of every machine as it arrives in the garage; there is no confusion, no questions—everyone knows what to do and how to do it. Charging is attended to by an expert, readings are taken hourly, a careful record of each truck is kept. At no very remote date this company will have some valuable data on hand. The agent was perfectly frank with me, gave all the data he had, but the question of cost of operation is still unsettled. Depreciation and repairs are not yet known, and he does not care to be responsible for a statement until he is sure it will not create any false hopes. He knows the cost of electricity, for he buys it. He does not know what the repair bills, tire bills and depreciation will be, as these cannot be determined in a year's experience. However, he is so well satisfied with his experience so far that he contemplates adding more trucks and dispensing with horses entirely. He uses the direct current, and has no mechanical appliances out of the ordinary.

A small garage operated by a department store, which has its own power plant, gave me some quite startling data. This firm has two trucks, a 1 and a 2 ton. Read-



PLAN OF U STREET GARAGE, WASHINGTON, D. C.

ings during charging are taken hourly, and cost of daily runs is computed from these. The daily cost of current for the 1 ton truck varies from 11 to 27 cents; for the 2 ton from 31 to 35 cents a day. They claim it costs them 2¼ cents per kilowatt-hour for the current.

GENERAL INFORMATION.

A careful canvass of all of the more important garages in Washington shows that the prevailing prices are about the same, and average as follows: Gasoline. 20 cents per gallon; labor, 50 cents per hour; lubricating oil, $1 per gallon; electric charging, 10 cents per kilowatt-hour; storage, dead, for runabouts, $5 per month; for large cars, $7.50; storage, live, for runabouts, $12; for large cars, $20; limousines, $30 to $35. A flat rate for electric runabouts of $30 to $35 per month is offered for complete accommodation, which includes charging, cleaning and minor repairs, as well as one delivery a day.

Washing machines by overhead trolley is the general practice. One garage man refused to tell me how he cleaned his machines. An inspection disclosed that his cleaners used the hose and the usual method of wiping. A clever chauffeur in a private garage told me he never used water on his machines unless they were muddy, but that he wiped them with a mixture of gasoline and sweet oil (four parts of former to one of latter). He assured me that the sweet oil prevented gasoline from injuring the finish. His limousine looked well, but the finish seemed a little dull to me.

Few repair pits are used. The machines are generally jacked up and the repairmen crawl under them to do their work. The best arrangement I saw was in a garage where the repair shop was on the second floor. A wire cage was suspended from the floor, making an ideal repair pit.

One garage man with limited accommodations uses casters for moving his machines, and says he could not get along without them. No especial hoisting arrangements were noticed, the block and tackle being generally used. Gasoline is universally stored underground outside.

The machine shops attached to the garages are mostly very elementary; a drill, a lathe, a forge and an emery wheel generally complete the list of tools and appliances. Lighting is generally by electricity, heating by steam; fire protection by hand extinguishers, generally of the underwriters' type.



VIEW IN COEY'S GARAGE.

Lockers are generally provided for owners and chauffeurs. In some cases an attempt is made to charge for them, although generally the garage keepers are glad to have them used to prevent loss of private property. An air compressor for tires is generally used. Floors are kept clean by sawdust and sweeping. One garage man, whose floors looked unusually clean, always puts a drip pan under a machine as soon as it arrives. An all night service is kept up at nearly all of the garages. Emergency service can be had at any time of the day or night.

The insurance rates I could not learn much about. One insurance agent informed me that his companies would not take a risk on a garage. I found the stock in one garage insured for $25,000, but the agent did not know what rate was paid, as [illegible] policies were written at the home o[illegible] Another garage man told me he would not give a cent to be insured, as he considered his business perfectly safe from fire.

The garages make no special effort to secure commercial vehicles, and, with the exception of the Willard Auto Company, where the trucks of an express company are kept, there are none in them. One garage man said he would pay more attention to the truck business if he could find a truck that was any good. Another, who has sold a few light delivery wagons, said the business was greatly injured because the owners employed such cheap help to operate the machines.

Nearly all garage men showed apathy when asked if they did not think the future success of the automobile industry rested on the success of the commercial vehicle. They seem to be content to let "well enough" alone, and not bother about the future. Let them beware, a flying machine has been invented.



COEY'S GARAGE, PORTABLE BUFFING MACHINE.

A commercial vehicle contest is to be held in France June 7 to 13, in connection with the Tourcoing exhibition.

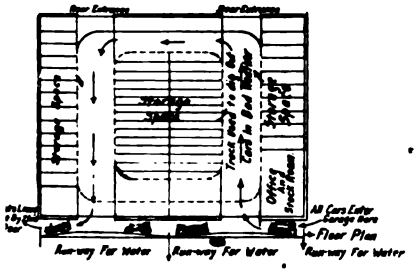
Chicago Garages.

COEY'S GARAGE.

Coey's garage, located at 1710-1718 Indiana nue, has a floor surface of 18,000 square , and storage capacity for 100 cars. It ne story high and built entirely of brick concrete, thus making the building fire- of. The entire front of the building f plate glass, and there are nine 5x14 skylights, making this one of the best ted garages in Chicago.

he cement floor is simply an immense h rack. Each car is washed in its own e, the floor being built with a slight e so that the water may run off. The of the individual stands is 16x20 feet. h space being an individual wash rack s away with pushing cars on and off wash rack, and avoids all danger of in- to lamps, etc.

he garage is provided with ten iron wire s, fitted with lock and key, for the ate use of customers. Each cage and e has an electric drop light, and is pro- d with a 15x20x72 inch steel locker for storage of clothes, etc.



COEY'S GARAGE FLOOR PLAN.

he garage has its own heating plant. ible coil radiators are set around the ding at a fixed distance apart, so as to insure an even temperature. The temperature is kept at 70 degrees in the winter time, so as not to injure the paint on cars stored. There is an indoor track for trying out cars on rainy days, where one can run his car at a speed of 15 miles per hour. All cars must enter at the right and leave by the left entrance.

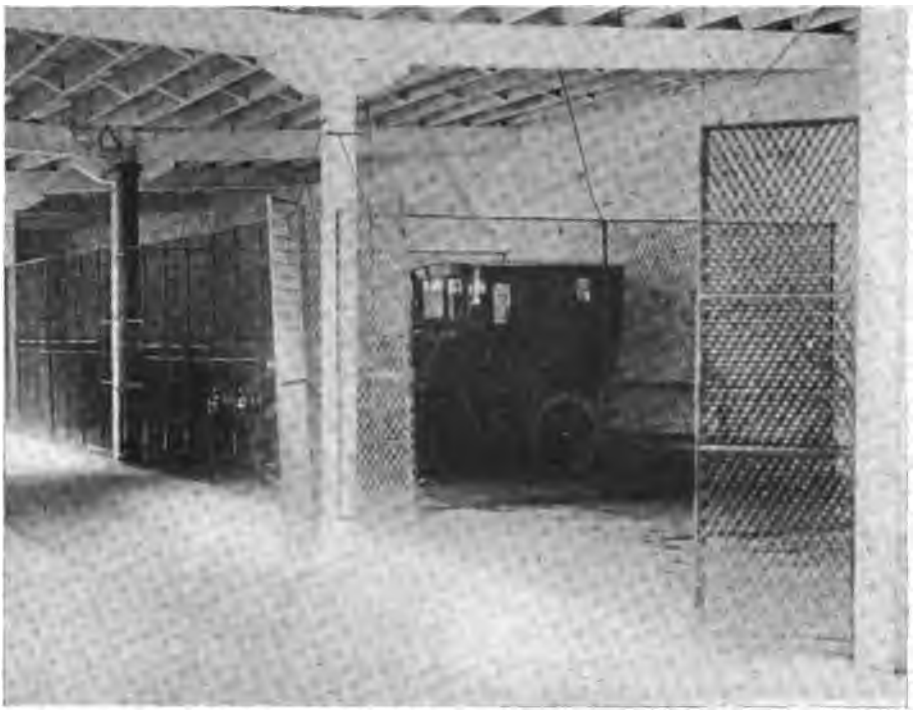
The schedule of rates maintained at this establishment is as follows: Live storage, $25 to $30 per month, depending on the type of car, including washing and polishing once each day; private cages, $2.50 per month extra. Dead storage, $5 to $7 per month, depending on the type of car. Transient storage, $1.50 per day including washing and polishing. Each car is inspected each morning, to make sure that it is absolutely clean. All upholstering is cleaned each day. A one-half horse power, 110 volt portable buffing machine is used in cleaning cars. The rates charged for gasoline are 18 cents a gallon to regular customers and 20 cents a gallon to transients. Gear case oil is 50 cents a gallon, cylinder oil 60 to 75 cents a gallon.

Customers are provided with coupon books for gasoline. Each coupon is good for 1 gallon of gasoline. On receipt of gasoline the chauffeur presents his book and coupons are taken up according to the amount of gasoline purchased. The coupons are numbered on the back and are billed to customers holding that number, thus keeping an accurate account of all gasoline purchased. The same system is used in the sale of lubricating oils. No oil or gasoline is put into the cars except in the presence of the customer or chauffeur.

The garage employs ten men, four on the day shift and six on the night. They have different men for each class of work, such as cleaning, polishing lamps, cleaning inside of car, brass polishing, etc. The building is equipped with galvanized iron cans for the dirty waste, etc.



RAMBLER GARAGE, SHOWING REPAIR SHOP.



COEY'S GARAGE, SHOWING INDIVIDUAL STALLS.

THE RAMBLER GARAGE.

The Rambler Garage, located at 1820 Sheridan road, Chicago, consists of a building 60x130 feet, three stories high, of brick and concrete construction, and has a capacity for storing about 200 cars. The garage is equipped with a 25 horse power

Fairbank-Morse gasoline engine direct connected to a 15 kilowatt, 125 volt dynamo furnishing current for driving the machine tools in the repair shop, lighting, and charging storage batteries, as well as for operating an electric elevator of 2 tons capacity. At night time the current for operating the machine shop and elevator is furnished by a 90 volt storage battery.

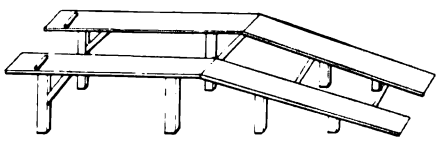
The engines of cars are cleaned by means of compressed air under a pressure of 200 pounds per square inch. Gasoline is stored in an underground tank of 584 gallons capacity, to the rear of the garage, and is pumped into the building by means of a Bowser outfit. Bowser lubricating oil cabinets are also provided.

The machine shop is equipped with lathes, drill presses, emery and buffing wheels, forge and shaper. In this department are employed twelve repair men during the day and seven on night shifts. In connection with the garage an unusually large stock room is maintained, which is said to contain at all times all the parts necessary for building seven complete Rambler cars.

All cars are checked on entering and leaving the garage, by means of cards. The rates for live storage are from $25 to $30 per month, including washing and polishing once daily, while the rates for dead storage are from $5 to $7. The charge for a single washing and polishing is from $1 to $1.50, depending upon the condition of the car. Three grades of lubricating oil are kept in stock, and sold at 60 cents, 75 cents and $1 per gallon respectively. Gasoline of 76° test is sold at 18 cents per gallon. The charge for repair work is at the rate of 60 cents per hour. Storage batteries are recharged at from 75 cents to $1, depending upon the length of the charge.

For fire protection, each post or support in the building is provided with a Manville fire extinguisher, and on each floor there are also three Babcock chemical extinguishers. The garage is heated by steam from its own plant, the radiators being arranged overhead.

The building contains a salesroom and reception room for the convenience of customers, and every regular customer has the use of a private locker with key, for storing clothing, etc. The shop is provided with a pressure tank containing air under a pressure of 200 pounds per square inch. The compressed air is used for inflating



Special Repair Stand of Rambler Garage.

tires and for cleaning. There are iron cans into which the dirty cotton waste is thrown, and these cans are emptied out every day to prevent danger of fire from spontaneous ignition. The garage at present has a force of thirty-five men, including office employees. The adjoining vacant lot, with a frontage of 50 feet, has been purchased, with the object of enlarging the present quarters.

Among the special equipment of this garage is a repair stand built to take the place of a pit. The car is run up on the stand against the stops, which enables the machinist to get at any portion of the mechanism beneath the car. This repair stand is located on the second floor of the building, and does away with the necessity of having a pit. The stand is 3 feet high by 5 feet wide by 10 feet long, and is built of planks 2½x10 inches.

A Philadelphia Garage.

The Bellevue-Stratford Public Garage is one of the best in Philadelphia. It is located on Locust street, just west of Broad street, having a rear entrance to Walnut street.

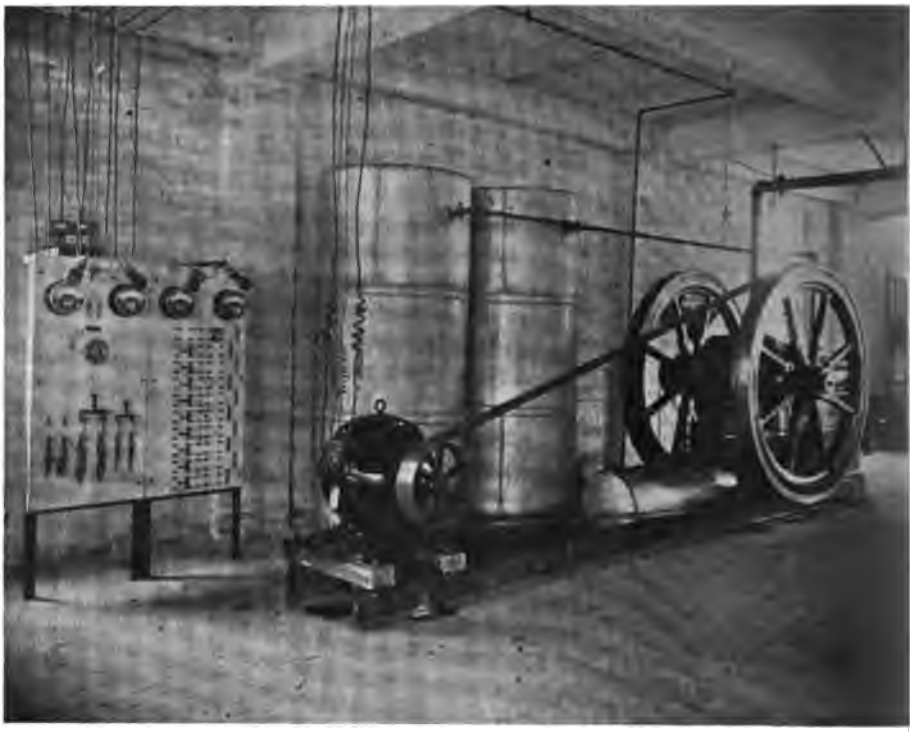
The building is a four story fireproof structure, with triple floors, the upper and lower layers of which are hardwood, with cement between. Iron posts are used, and the window casings are of metal. In case of fire there are a line of hose and a number of extinguishers on every floor. Electric lights and steam heat are provided. This garage is free from that objectionable odor so common in places where autos are kept. It is well ventilated and clean. In addition to the machine shop on the fourth floor there is a work bench on every floor for the chauffeurs who repair their own cars.

The garage is equipped with a 10 foot 6 inch turntable, four pits, a portable crane, a charging board, a washing machine and a 150 gallon underground gasoline tank. On every floor there are an air pipe for inflating tires and a compressed air connection for cleaning cars.

There is a supply room, where extra parts are kept, and also a package room. For the convenience of chauffeurs there are reading, card and bath rooms well furnished. There are separate apartments for the owners. A time clock is used to check the arrival and departure of the cars. The capacity of this garage is sixty-five cars.

Bridgeport Garages.

This city, on the line taken by automobilists in traveling from New York to Boston, necessarily has a great demand for transient garage accommodations. From New York to Bridgeport is usually the first stage in the popular trip to the Hub and it is the custom of motorists to stop over in Bridgeport for any repairs or incidentals they may require. There are some eight garages in the city devoted to public and commercial work. Three of these are on or in the vicinity of Fairfield avenue, that long and beautifully shaded thoroughfare between Bridgeport and historic Fairfield over which all motorists pass in going from Bridgeport to New York. A fourth garage is being erected on the avenue by the Bridgeport Automobile Company, of which J. D. Carpenter is president. The building is located at 382 Fairfield avenue, about two and one-half blocks from the centre of the city, and nearer the business section by half a dozen blocks than any other garage. The building is nearing completion, in fact the owners expect to occupy it by the 1st of June.



Rambler Garage, Gas Engine-Electric Plant.

This garage is somewhat unique in that it is fronted by two stores, one of which will be used by the Bridgeport Automobile Company as a showroom, and the other will be leased. The garage proper extends to the rear, and is 100 feet long and 50 feet in width. The floor and walls are of concrete and the roof is of the steel truss variety. The building is conceded to be fireproof. It contains a turntable conveniently located to accommodate a car of 118 inches wheel base. The garage is equipped with an isolated electric light plant with storage battery, and is capable of caring for and properly charging any electric vehicle.

In connection with the garage there will be a complete repair shop. An office and a ladies' and chauffeurs' room are included in the plans. These apartments will be completely isolated from the garage proper. In the showroom fronting on Fairfield avenue will be space for three cars, and ample room for displaying a complete line of sundries.

Compressed air portable buffing machines will be used, also the Bowser outfits for oil and gasoline. The hot water heating system will be used throughout. Rates charged will be in proportion to the general rates charged all over the city. Storage over night and washing, $1.50; oil, $1 per gallon and gasoline 20 cents per gallon; labor, 60 cents per hour. For charging batteries 35 cents to $2 is demanded, according to the size of the battery.

The transient garage trade has never before been so large as this season. The number of motorists passing through Bridgeport to other destinations, especially on Sundays, is increasing continuously.

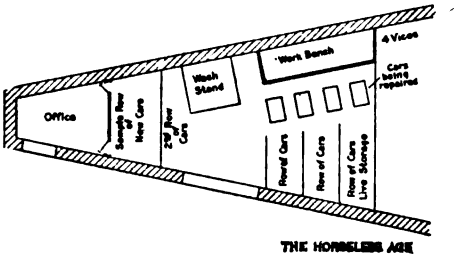
A Hartford Garage.

The garage of the Miner Garage Company, of Hartford, is one of the best equipped in the State of Connecticut. It is centrally located at High and Allyn streets, and has a frontage of 110 feet on the latter thoroughfare. Large entrance and exit doors are so arranged as to permit a vehicle to enter and leave the garage without turning around. A special feature is the care of motor trucks, of which quite a number are in use at Hartford. Electric runabouts are also quite numerous in Hartford, the streets being well paved.

The main floor is of cement, and is provided with washstands sufficient to accommodate three cars at once. On the second floor are 100 lockers, for the use of customers, and an electric charging plant with a capacity of charging twelve cars at the same time. An overhead trolley is provided for lifting engines and gearing from cars which are being repaired over the pit. An electric elevator with a platform, 12x10 feet in size, carries cars from one floor to the other. The offices, ladies' and gentlemen's reception rooms, smoking room and consulting room, all handsomely furnished, are to be found on the first floor.

Cincinnati Garages.

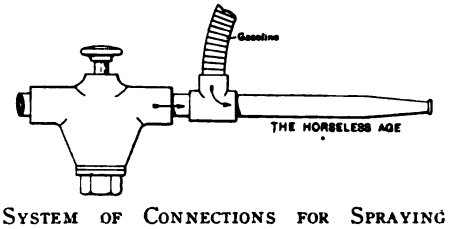
While Cincinnati cannot boast of any very fine garages or motor marts, there are a considerable number of them scattered in the eastern downtown district. This allows of a great saving of time, as those who ride daily to their offices can leave their cars at their nearest garage. At present, some garages are located near the banks and skyscraper buildings, others near the court house, while some are on the hill



PLAN OF GARAGE.

tops, where cars are left at night by owners who have no private garage facilities. In such cases the car is delivered and called for on request. As yet Cincinnati cannot boast of any building specially constructed for garage purposes. The garages are installed in former horse auction stables, ancient hotel buildings, old storage warehouses, former wagon and bus repair shops, etc. The best accommodations the chauffeurs get is a place to change clothes, to wash up, etc., there being no baths or lockers for clothes; if they have anything of value it must be left at the office. The pay of chauffeurs ranges from $50 per month and board to $150 per month, minus the meal ticket. Most of them are subject to call any time, day or night, Sundays included. On the whole, the only ambition the chauffeur has is to drive a new car every year. Chauffeurs want to be up to date, and to hear most of them talk you'd think they had their employer working for them.

Conditions in Cincinnati in regard to the

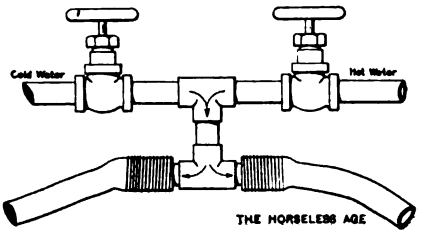


SYSTEM OF CONNECTIONS FOR SPRAYING GASOLINE FOR CLEANING.

patronage the various garages receive are perhaps the same as in other places. For instance, the man who once rode his own wheel and now drives his auto, goes to the garage where the proprietor drifted into the business from the bicycle business; the "rounder" takes his car to the garage where the manager is quite a rounder himself, while the temperate class go to a place whose owner has a reputation for sobriety. The city can boast of eight garages considered first class, while a lot of places are now opening where only repairing is done, the owners not having the capital to handle new cars. There are also a few curbstone selling agents who keep their cars in a public garage and go after the prospective customer instead of having a place for him to come to. All of the garages are crowded, sales are plentiful, and there is plenty of repair work. One of the best is described as follows:

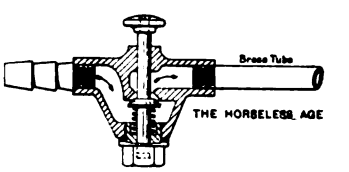
The building is triangular, of flatiron shape, three stories and basement. The power equipment and machinery are installed in the basement, the second floor is used for the storage of cars, tops, etc., and the third floor for miscellaneous storage, while the first floor is used for offices, salesroom, live storage, washing stand, work benches and repair department.

There is plenty of light on all sides, and an entrance from one street only. When a driver comes in, if he desires his car to be washed, he drives onto the wash rack, where two men work on his car, one on each side. The lamps are removed, a rubber cap is put over the end of the horn to



WASHING HOSE CONNECTIONS.

keep the water out, and a combination of asbestos and rubber apron is put over the engine, magnet and other parts likely to be harmed by the water. Steam pipes and hot water pipes from a boiler in the cellar run along the wall. With the hot and cold water jets any temperature of water can be had. While the mud, etc., is soaking, the oily parts, rear axle, steering knuckles, wheels, etc., are sponged off with a weak soap water, kept in a barrel on the second floor with a hose and faucet to draw from. A steam pipe enters this barrel of soap water, which can be brought to any temperature desired. Grease can be removed much better with warm water. With two men working on a car it can be washed in short order and placed in storage ready for the next one. Washstands are usually made with sewer connection in the centre, which is the lowest point. This stand consists of a wooden frame about 12x4 feet around the sides and ends, tapering down

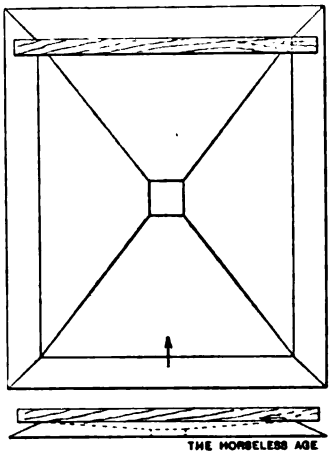


COMPRESSED AIR CONTROL BUTTON.

to the floor. A layer of cinders is packed around, leaving about two inches for a good cement, which requires a few days to

harden. The cave should be made so as to leave 3 feet or more all around the car, and the sloping sides should be covered with perforated rubber matting, to keep those who step on it from slipping and also to prevent the wheels from slipping. Where the stand is close to the wall a block should be secured on it a sufficient distance away from the wall to prevent the cars from crashing into the wall and smashing the lamps.

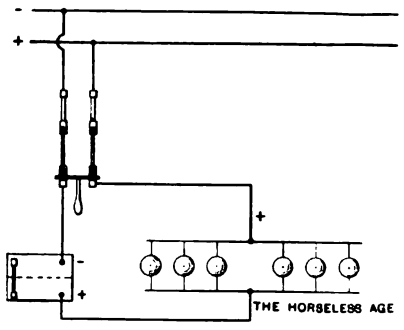
The stand should be placed where there is plenty of light. There should be shelves



WASHSTAND.

close by on the wall for placing lamps, extra tires when removed, etc. To be able to wash cars as fast as they come in saves much extra work, etc. A charge of $1 is made for washing big cars, 50 cents for runabouts, unless the machine is stored by the month, in which case the owner is entitled to a washing and polishing every day, and storing day or night, for $15 per month.

For cleaning the cushions from dust, compressed air is used, which is also employed for inflating the tires. This air is derived from an air compressor which maintains a pressure of 80 pounds in a tank



ARRANGEMENT FOR CHARGING IGNITION STORAGE BATTERIES.

with walls one-half inch thick. A small compressor or air pump is used, driven by a belt running over a tight or loose pulley on the shaft and driving a spur pinion meshing into a large gear with a crank pin, from which a connecting rod runs to an air pump with a hollow piston like that of a gasoline engine, a couple of check valves at the bottom, etc. The cylinder is made with a water jacket.

The air is carried through iron pipes provided with a special valve at the ends. To release the air one presses on a button, and for filling the tires one puts the hose connection on end of the brass tubing. This arrangement is unsurpassed for cleaning the dust from tufts in cushions, and for use on the repair bench to clean out crank cases, spark plugs, etc. When used with gasoline or benzine all parts can be cleaned thoroughly. When thus used a tee is screwed into a valve overhead and a cock is provided to regulate the pressure. By means of the air blast carbon can be removed from cylinders after having been scraped loose. When scraping boxes all

DAY AND NIGHT GARAGE.

A. M.					H.		H.	P. M.				
5	4	3	2	1	1	Name..... Date.....	1	1	2	3	4	5
5	4	3	2	1	2		2	1	2	3	4	5
5	4	3	2	1	3		3	1	2	3	4	5
5	4	3	2	1	4		4	1	2	3	4	5
5	4	3	2	1	5		5	1	2	3	4	5
5	4	3	2	1	6		6	1	2	3	4	5
5	4	3	2	1	7		7	1	2	3	4	5
5	4	3	2	1	8		8	1	2	3	4	5
5	4	3	2	1	9	Car No.	9	1	2	3	4	5
5	4	3	2	1	10		10	1	2	3	4	5
5	4	3	2	1	11		11	1	2	3	4	5
5	4	3	2	1	12		12	1	2	3	4	5

Record of arrival and departure.

Remarks.

.....

.....

Names.	Gasoline.	Cyl. Oil.	Gear Case Oil.	Wash.	Labor.	Remarks.
A.....						
B.....						
C.....						
D.....						
E.....						

CHECK SLIP.

traces of cuttings can be removed; oil pipes can be cleaned out; in fact, there are operations innumerable in the garage for which this compressed air can be used.

Cars are checked as they enter or leave by a day slip. It is punched by a man at the door when the car arrives and when it leaves. The cards are kept on a rack, and are given to owners of cars upon request. A space is reserved for a few general remarks, stating any unusual condition of car lamps or—chauffeur. When the car comes in a hole is punched under the hour and minute, and the same when the car goes out. On these cards records are also made of the gasoline and oil supplied, repairs, etc. On the back of the time cards are printed the rules of the garage and charges for repairs.

Well executed repair work takes time, and cannot be hurried beyond a certain point. Such work at this garage is charged for at the rate of 60 cents an hour. Whenever possible, approximate estimates are given if desired. It is usually necessary to test the car before commencing any repair work, and always after completing it. No repair ordered by a chauffeur is commenced unless a written statement from the owner is submitted. Written orders avoid the possibility of future misunderstandings and discussions. Customers are requested to communicate with the garage promptly on receiving any bills that appear to contain mistakes. Storage batteries are charged from a 110 volt circuit, and the electrolyte is bought at a drug house already prepared. Paraffine is used liberally to prevent corrosion of the contacts.

Pittsburg Garages.

Up to the present season Pittsburg had relatively few garages, considering the size of the city and the wealth of the community. At the close of the 1905 automobile year there were only about a half dozen concerns doing business, and some of these were not rushed at that. At the present time there are, however, at least a dozen garages in Pittsburg proper, and about half that number in the suburbs, and all of them appear to be in a very prosperous condition.

The Automobile Dealers' Association of Pittsburg is composed of the ten leading garages in the city, who have adopted uniform rates of storage, and now work together in the greatest harmony, though, of course, in open competition. There are a few other dealers in Pittsburg who have refused to join the association, but it will probably only be a question of time until all will come in. The rates adopted by the association are as follows: Limousine or semi-limousine cars, storage per week, $7 live and $3.50 dead; touring cars, $6 live and $3.50 dead; runabouts, $5 live and $2.50 dead. These prices include washing and polishing. Limousine or semi-limousine cars will be washed and polished for $1.50; touring cars for $1.25, and runabout $1, each time.

Of the various garages in Pittsburg, Banker Brothers Company, the Standard Automobile Company and the Keystone Automobile Company are the pioneers, and they have grown year after year until they are now much the larger in comparison to the rest of the dealers. The Atlas Automobile Company, which makes a specialty of handling second hand cars, outgrew its present quarters on Penn avenue long ago, and has in course of construction on Center avenue a modern brick garage which, when completed, will have a storage capacity for over 500 cars, and will be complete in every respect.

Another company which has found its present quarters inadequate is the Hiland Automobile Company on Beatty street. They have now in course of erection on Centre street a two story brick garage with a floor

space of 88x115 feet. The basement of this garage will contain a fully equipped machine shop, with a 50 horse power plant to operate it. On the ground floor, and between the two main entrances, will be the general business offices of the company, the cars being stored in the rear. The cars will also be washed and cleaned at the rear of this floor. On the second floor the plans call for a reception room, the private offices of the company and a very complete stock room.

The Banker Brothers & Co. garage at Baum and Beatty streets is one of the oldest garages in America, and has grown in about the same proportion as the automobile industry in the United States during the last few years. This garage, in fact, is a small automobile factory in itself, and Banker Brothers & Co. build a small electric automobile for juvenile use. They have a total floor space of 50,000 square feet, divided into basement, main floor and second floor. In the basement we find the power plant, consisting of a large gas engine, which runs the generator, which in turn furnishes energy to run the different departments of the garage. In the basement we also find a battery room, where storage cells are kept, and a special tire room. This room is kept under lock and key, and is provided for the convenience of the patrons who have no garage at home yet wish to keep a few tires on hand in case of blowouts or the like. The room is kept in complete darkness, and is only accessible to those having tires stored therein. This is a very convenient feature, and one that is appreciated.

On the first floor, at one end of the garage, is the salesroom, where the latest models of cars sold are shown to prospective purchasers. A stock of horns, lamps and the like is also kept in this room. Passing out of the salesroom we come to the electric department, where forty to fifty electrics are stored, cleaned and polished, a washing stand being at one end.

Bankers Brothers have an electric charging board of sufficient size to charge twenty electrics at one time. In connection with their electrical department they have a complete testing apparatus for testing out induction coils; they also manufacture storage batteries for gas engine ignition.

Passing on we come to another large room, where forty to fifty large touring cars are stored, washed and polished, and at the other end of the building is a third department, where the gasoline cars of all makes are provided for.

Thus on the first floor there is room for about 200 cars, to take care of which seven pits and four overhead washers are used. All water is drawn from an artesian well, with an automatic cut-off when the tanks are full.

On the second floor are the machine shops, the tire vulcanizing room, the stock room, body building room, top manufacturing room, painting and varnishing room, not to mention the private and public offices of the company and its officials. The machine shops contain five lathes, three drill presses, a milling machine, shapers, grinders, brazing and forging apparatus; in fact, everything necessary to turn out any part of a car. In the tire repair department is placed one of the largest vulcanizers in the country, it having a capacity of nineteen tires. Retreating and general tire repairs are done by competent men. Banker Brothers & Co. make a specialty of building automobile bodies in accordance with customers' ideas, and for this purpose have established a very complete body building department, where all classes of bodies, from the finest limousine down to the ordinary runabout, are constructed from the raw material and put through the various processes of painting and varnishing and upholstering. There is also a separate department which makes nothing but tops.

There has never been a fire at the Banker garage, and even if one started it would probably be out in very short order. Portable extinguishers are hung in all conspicuous places, and a complete fire hose system covers the entire building. Then the employees have a fire drill, and each one knows what he has to do should a fire break out. A fire whistle has been installed, different blasts from which tell the employees just in what part of the garage the fire happens to be, and when the whistle blows every employee in the garage stops work and hastens to the spot the whistle indicates. Drills are frequently held.

The Keystone Automobile Company have a very commodious garage on Centre avenue, opposite Banker Brothers. This is one of the oldest Pittsburg garages, the firm having been known formerly as the Pittsburg Automobile Company, but in 1904 the garage was greatly improved and enlarged, and the name changed to the Keystone Automobile Company.

Of course, this garage has its own power plant, consisting of a 50 and a 60 horse power gas engine. As at the Banker Brothers establishment the machine shop is very fully equipped, and any automobile on the market can be satisfactorily taken care of. When a car is taken cut of the garage a card is made out, giving the time the machine was taken out, by whom and the various accessories on the machine when taken out. When the car is returned the time is recorded on the card, also by whom it was returned, and the various accessories taken out are checked off. These cards are sent by mail at regular intervals to the owner of the car, who can thus easily see if his chauffeur has been using the car without his permission.

The Standard Automobile Company's garage is now a strictly gasoline garage, as electrics have been given up entirely to make room for the constantly increasing gasoline car business. The Standard Company has a duplicate power plant, so that if anything goes wrong with one unit the other can be used, and no interruption of work will occur. The establishment also has several features which are not found in general in Pittsburg garages, such as a separate blacksmith shop, where forging, welding and all kinds of blacksmithing are done; they also have a special oil house, where all kinds of oils are stored. Then there are special departments where only one make of car is repaired in its own special room, and by the same mechanics. Thus the men working day after day on practically the same machines become well acquainted with them.

A DELIVERY WAGON SERVICE.

Jos. Horne & Co., the large dry goods dealers in Pittsburg, some years ago bought three steam wagons from a Buffalo concern and put them in their package delivery service. Pittsburg has some rough streets, also a few hills, and it was not long until the steam wagons began to give way at one place or another; they were then entirely rebuilt by the company itself and served well for several years. However, they proved to be very expensive to maintain, everything considered, so last year a gasoline wagon was taken on three months' trial. This machine did its work so well during that time that it was purchased, and shortly afterward another one just like it was added, and the two were put into service. Two more machines were added the first of May, and two more have been ordered for early delivery. The Jos. Horne Company have passed the experimental point, and the fact that they are ordering wagon after wagon is a pretty strong indication that the motor wagon is here to stay. Now they contemplate putting motor wagons to work hauling heavy furniture; that is, provided they can find a machine which they think will stand up to the work. Tires were experimented with, and many makes given a thorough trial, with the result that a solid American made tire, which gave far better service than most of the rest, was permanently adopted, and no other will be used.

In connection with their machine shop the Horne Company has a 4 horse power gas engine, which furnishes power for a 15 inch lathe, a 16 inch shaper, 12 inch and 20 inch drill presses and a grinder. With these machines all ordinary repairs are made, and the wagons are kept in fine shape.

The motor wagons have been tried on almost every delivery route in the city, but at present they cover the outlying districts only, one wagon for Wilkinsburg, one for Brushton, one for Bloomfield, and one for the North Highland district. They start out at 8 a. m. and 2 p. m., the duration of each trip being about three hours. This arrangement gives the mechanic at the garage plenty of time to look over the machines during the noon hour and to make any necessary adjustments. The drivers are instructed to telephone the garage if anything serious happens to any of the machines while on a trip. Then a runabout is sent to the scene of the trouble in charge of the shop mechanic, and if the trouble is

too serious to fix on the spot a reserve wagon is ordered out to replace the one broken down. With this system it is not necessary to have experienced mechanics as chauffeurs, and a saving in wages is thereby effected. Likewise it prevents promiscuous tinkering with the mechanism, and the regular mechanic, having made all the adjustments himself, knows each machine and where to find the trouble, should any turn up. Of course, the driver, after some experience running the wagons, soon learns how to make slight adjustments himself, and does so on the road; but he is forbidden to touch the more serious cases of trouble that turn up. The old steamers are not in active service any longer, but they are kept in good running condition, and serve as emergency wagons; when a few more gasoline wagons are put in commission the steamers will probably be sold. The secret of Horne success is that they never overload their vehicles; in fact, the reverse is the case, for it is seldom that any of the motor deliveries carries more than half of its rated capacity. They also realize that a motor vehicle is somewhat more delicate than a horse and wagon, and demands intelligent care. They are aware, too, that tires, bearings and the like are subject to wear and will not last forever. Finally, they have a good man in charge of their motor wagons, a mechanic, not a stable overseer, and he is producing results.

Cleveland Garages.

THE STANDARD GARAGE.

The Standard Automobile Company, Huron road, Cleveland, operates a garage 75x100 feet and four stories high. The building is constructed of brick and steel, with wood floors, which are kept bright by means of soap, lye and scrubs. This garage is one of the largest in Cleveland, having a total floor space of about 45,000 square feet. The force of employees comprises two washers, two charging board men, two floor men, two brass polishers, eighteen repair men (including foreman and assistant), one stock room man, five painters, one bookkeeper, one telephone girl and two salesmen, and the establishment is under the direction of a manager and an assistant manager.

On the first floor under the office balcony there is an office and desk room for the floor manager and guests, and in the rear of this office is a cupboard containing parts and supplies for sale. The manager's office is in the balcony, and is enclosed by glass on all four sides, so that he can, from his desk, observe the coming and going of vehicles and everything that transpires in the main garage department. There is a telephone between all departments and the balcony office.

The machinery in the repair department consists of one universal milling machine, two lathes, one drill press, one hacksaw, one shaper and a complete line of small tools. An electric motor in the machine shop is used both for driving the machinery and for operating an air pump for compressing air into a storage tank. A pipe from this tank leads to the main garage, where the air is used for inflating tires.

The stock room is in charge of a stock room man, who is under bond, and no others are admitted to this room. In connection with this stock room a card system is employed, which enables the management to readily determine at any moment the amount of stock on hand. Material is delivered from this stock room only against a written order. Hanging from a board in the stock room are a large number of numbered brass checks, each number representing one employee. When a man asks for a small tool, a check bearing his number is given with the tool, and must be returned with it. There is a definite total number of these checks for each employee, and since only one tool can be obtained on a single check, the man in charge of the stock room can at any time tell the number of tools taken out by any employee by simply counting the number of checks with his number in the stock room.

In the carpenter shop one expert body maker is regularly employed. The charging equipment is sufficient to take care of thirty-six electric vehicles at the same time. Lubricating oil is stored in brick vaults underneath the main floor, and the gasoline tank is located underground across the alley from the building.

When a car arrives at the garage needing repairs, the floor man ascertains from the owner what the trouble is and what repairs are required, or, in case the owner cannot give definite information on this point, the superintendent is called to make a diagnosis of the case. After he has finished with this the exact nature of the work to be done to the car is written out on a numbered card, and this card is signed by the owner. A duplicate of the repair order is made out, one copy being inserted in the repair book, where the order is entered under the same number as is borne by the card, the original card is attached to the car, and the latter is passed to the repair shop. The other duplicate of the order is given to the foreman of the repair shop. Every operation on the car is noted down on a card, which, when the repair is completed, contains a record of all the labor expended on it and the material used on the job, and from this card in the office the charge to be made is calculated in accordance with the regular schedule for repair work. No estimates are given for any repair work. Neither are vehicles washed or oiled for a certain lump sum, the time occupied in the work being the basis of all charges. The manager of the garage claims that by adopting this system disputes over charges are almost entirely obviated, and he claims this system to be the only rational one, as it is evidently inconsistent to charge the same amount for washing a car only slightly covered with dust and one that is covered with hard clay.

Following is a list of garage charges:

LIVE STORAGE.

Large touring cars of 100 inch wheel base or more—6 hours, 30 cents; 12 hours, 50 cents; 24 hours, $1; by the month, $20.

Small touring cars with a wheel base of less than 100 inches—6 hours, 25 cents; 12 hours, 40 cents; 24 hours, 80 cents; by the month, $14.

Runabouts—6 hours, 20 cents; 12 hours, 30 cents; 24 hours, 60 cents; by the month, $8.

Runabouts with 100 inch wheel base or more—Same as touring cars.

OTHER RATES.

Deliveries—Time per hour, 60 cents; nights and Sundays, 90 cents.

Chauffeur—Time per hour, 75 cents; nights and Sundays, 90 cents.

Washing and Brass Polishing (including material)—Per hour, 75 cents; Sundays, 90 cents.

Repairs—Materials per list. Time per hour, 60 cents; nights and Sundays, 90 cents.

CHARGES FOR PAINTING.

Large touring cars—Painting, $65; refinishing, $50; varnishing, $35.

Small touring cars—Painting, $55; refinishing, $40; varnishing, $25.

Runabouts—Painting, $40; refinishing, $25; varnishing, $15.

In painting, all the old paint is burned off and the car is given fourteen coats, with varnish. In refinishing, the old paint is burned off wherever necessary, and these places are given a priming coat, a coat of color, and varnished. In varnishing, the surface is touched up and varnished two coats and the varnish rubbed.

THE WHITE GARAGE.

The White garage at Cleveland, Ohio, is centrally located, and one of the best equipped in that city. It is a four story brick building, with handsome stone trimmings, 195 feet in length and 95 feet wide, and covers 18,525 square feet. Although not exclusively devoted to steamers, the greater part of the vehicles cared for there are of that type. The first floor is devoted to the garage business and the other three to storage. All floors are reached by elevator. Access to the street from the first floor is by means of double doors at either side. The greater part of this floor is occupied by steamers belonging to regular patrons, with a few transients, and the offices are located in the centre. Space is reserved for all regular patrons, with the name of the owner nailed upon the wall. No car is allowed to go out except in charge of the owner or his known employee, or upon the written order of the owner.

The charge for both live and dead storage is $10 per month, or 50 cents per day. The charge for washing all vehicles is $1.50 apiece. Repair work is done by the hour at 50 cents during business hours, and 75 cents for nights and Sundays. A

iarge of 25 cents to $1 is made for send-
g cars to various parts of the city, the
tter being the maximum charge and in-
uding points 7 miles from the centre.

In the rear of the garage a one story
mporary repair shop is erected, and is a
odel for one of its size, being exceed-
gly well lighted by windows overhead
id on three sides of the building. The
achinery equipment consists of two lathes,
ne drill press, two emery wheels, and a
ne-tenth ton capacity screw press ("hand
ower," with movable head, which admits
f work on any auto construction, no mat-
r what size, by carrying the screw plate
istantly to the point where pressure is
equired). A 7½ horse power motor oper-
tes the machinery, and a White generator
used for testing all engines. Two porta-
le cranes, an overhead crane and two pits
omplete the equipment.

Detroit Garages.

A new concern in Detroit, known as the
tandard Auto Company, has just built a
arage and repair shop, with many unique
eatures. Large steel frames supporting the
oof do away with cumbersome pillars, and
ake turntables unnecessary. The place is
f such large dimensions that all the busi-
ess is done on one floor without over-
rowding. The building is arranged with
ooms for the convenience of patrons and
rospective buyers, and with a large office
n the central part. The building is heated
n winter from the Central Heating Com-
any's plant, 2 miles away. Thirty pounds
f air pressure will be kept in pipes which
ill run to the front of the building, so
hat air may be convenient for anyone
hose tires need inflating. The ventilation
n this garage is excellent, there being nu-
erous windows at the top which let in
ure air during the warm summer days.

The repair shop is equipped with mod-
rn tools and appliances; it has electric
rive oil pumps of modern type, and a re-
air pit, with a drainage system in con-
ection. A stockroom is near, in which all
f the parts of the three different machines
old in the garage are kept, making it pos-
ible for replacements to be made imme-
iately. The lighting is carried out by
neans of powerful gas lamps in th sales-
oom, and electric lamps, with dark shades
o arranged that they can be carried to
ny part of the machine, are used in the
ear.

The established rates among garage own-
rs in Detroit are as follows:

Rate for storage per month, live....	$30.00
Rate for storage per month, dead...	10.00
Gasoline per gallon.....	.17
Cylinder oil per gallon.....	.75
Gear case and transmission oil per gallon	.50
Labor per hour.....	.60
Ignition batteries.....	.70

The Cadillac Motor Car Company has a
garage on Jefferson avenue with a novel
as well as useful arrangement. A large
elevator runs from floor to floor in the



REPAIR SHOP OF STANDARD AUTO COMPANY, DETROIT.

building, and at the landing on the first floor a big post obstructed the pathway, but a large turntable has been built directly in front of the entrance, so that a machine may turn in any direction with very little loss of time.

J. P. Schneider has converted a stairway between the first and second floors of his repair shop into a runway for automobiles by so arranging large beams that the automobile will run down, resting upon them. In this way he does away with an elevator.

When it was found that an ordinary gas light placed in front of the establishment was not sufficient to light the garage of Benjamin Webster, throwing its rays into the street instead of into the garage, a new type of light was installed with a heavy green shade attached to the side facing the street. This causes the light to come in with full force and illuminates the sales-room so brilliantly that one can read a newspaper 100 feet away.

The Soules Motor Company have recently opened a commodious garage 50 feet wide by 160 feet deep. The place is fitted with five charging stands for electric vehicles, and special attention is given to commercial vehicles. The system of checking the use of automobiles is very good. Every time the driver takes a machine away it is recorded; every time machines are repaired or stored a record is made, the names of the men taking the machines are known, and every detail of the work is recorded, which conduces to system and order.

The Auto Express Company has a garage for commercial vehicles which is run



INTERIOR VIEW OF STANDARD AUTO COMPANY'S GARAGE, DETROIT.

on a well worked out system. In order to give an adequate description of the place it will be necessary to first describe the course of a machine during the day. Early in the morning a large number of the motor delivery wagons leave the garage and proceed to the big stores, where they secure the parcels to be delivered, a truck being sent to carry the more cumbersome articles. Then the machines return with their loads to the garage, where they unload the merchandise on one large, long table extending almost half the depth of the building. Here the men distribute it to the tables of the individual machines, while the drivers are in the rear filling up the delivery vehicles with a long hose extending from a tank which is surrounded by a wire cage. The machines are then adjusted if necessary by a few men who devote their time to this. A large repair pit and big bench full of tools are ready for use. The next move is toward the individual table over which the name of the chauffeur of the machine hangs printed. Then the machines are loaded and proceed on their way through the city.

Of the many unique private garages in Detroit, probably the one recently built by Dr. A. N. Collins is among the most convenient and modern in its arrangements. Built as it is, under his beautiful home, with a fine macadam pathway curving gracefully down to the entrance, and a convenient stairway running from his living room down to the place where his machine is kept, the garage is almost ideally adapted to the needs of a man of his profession. The garage has a cement floor, a work bench with machinery and tools for repairing, a cabinet containing parts for replacement, and a swinging hose and electric lights, both of which can reach any part of the machine. The heating is done by the same system as the doctor's home.

Grand Rapids Garages.

Grand Rapids, Mich., has not reached the degree of population that makes a saving [illegible] ce ca ment. Storage room is at the front of the car, ilding and the shop in the rear. The hop. T ent is used for dead storage and has iven to room in one corner. It is reached ery operator.

card, which, operate a garage which is contains a rec can be driven clear on it and then the first floor, there from this card ck at the side of made is calculatestrance at the regular schedule on the first tes are given fcfourth floor are vehicles elevator, lump sum, tney have k being the basis which is er of the garage creet at system di putes eaway entirely obcrated, floor, to be the only first ently inconsistent this ut for washing a carit with dust and one that a where the washing is done. There is also a repair pit on this floor, which is rarely used, however, both because of lack of room and because so little of the work on present motor cars must be done under the machine. The paint shop and dead storage room are on the second floor, which is reached by an elevator. The garage has storage capacity for fifty machines. The shop is lighted by electricity and the office by gas. There is a fire engine house only a half block from the garage, and the shop also has the usual chemical extinguishers. Gasoline is stored at the curb line in front of the garage, and oil in barrels just inside with a drip pan beneath the faucets.

The Michigan Automobile Company occupies a one story structure with basement. The building is of brick with hardwood floor and concrete floor in the base-



DR. COLLINS' PRIVATE GARAGE.

Toronto (Canada) Garages.

The principal garages in the city of Toronto are those maintained by the Dominion Automobile Company, at Bay and Temperance streets; the Automobile and Supply Company, 24 Temperance street; Hyslop Brothers, Ltd., on Yonge, near Shuter street, and that of the Canada Cycle and Motor Company, in connection with the company's big factory, near the end of the Dundas street car line.

The garage of the Dominion Automobile Company is a brick building, with storage facilities for forty cars. It possesses the largest elevator in the country, with a platform 17 feet long, for transferring cars between the garage and the repair shop on the upper floor. The elevator is operated by electricity, and the garage is fully equipped for the care of both gasoline and electric vehicles. The doors are open day and night, with competent men in charge. The storage rate is from $5 to $10 per month. Washing cars, fuel, etc., are charged for extra. The usual charge for washing is 40 cents, and for skilled labor on repair work 50 cents an hour.

The Automobile and Supply Company's garage occupies a six story, fireproof, brick building, completely equipped with every essential, including a sprinkler system, telephone connections to all departments, elevators, turntables on each floor, retiring rooms, etc. Both gasoline and electric cars are handled, and the garage will accommodate 100 cars. The charge for storage is from $10 to $20 a month. Delivery is charged for according to the time occupied and repair work at 50 cents an hour.

Hyslop Brothers, Ltd., have found it necessary to increase their facilities, and they have purchased the vacant lot and adjoining property at the northwest corner of Victoria and Shuter streets, opposite Massey Hall, for the purpose of erecting a new building. It will be of stone and brick five stories in height, 100x125 feet. The entire outlay in connection with this new structure will probably exceed $75,000, and it is proposed to bring the equipment of the new showrooms, garage and shop up to date in all respects. The plans provide for a high ceiling for the main floor of the showrooms, around the walls of which will be a gallery, with doors opening into the business offices, ladies' waiting room, chauffeurs' room, sample room, etc. Separate lockers for each vehicle will be provided, and the building will be equipped with both passenger and freight elevators.

The Canada Cycle and Motor Company a few weeks ago erected a new building for garage purposes in connection with the Toronto branch factory. This is a brick building, 46x121 feet, well lighted on all sides and with a truss roof, leaving the floor space entirely clear of posts or supports of any kind. The overhead hot water system is used for heating, and the cement floor slopes toward a centre gutter opening into a drain at one end of the room.

A St. Louis Garage.

One of the most modern automobile garages in the West is the Reybarn Motor Car Company's establishment in St. Louis, which has just been occupied. The building has a 100 foot frontage by 170 foot depth, and is thoroughly fireproof. The side walls are of red brick, the front is of buff colored brick, and the roof of reinforced concrete supported by trusses from wall to wall, leaving the interior of the building entirely free of posts. The front gives a two story effect, and the building extends back 30 feet. This gives accommodation for a large and roomy office, and show rooms accommodating three of the largest touring or limousine cars. The second story is used as a lounging or waiting room for patrons and chauffeurs; here also are located lockers for each patron and chauffeur connected with the garage. The building is heated by steam and ventilation is by skylights in the roof.

Electricity generated in a private plant furnishes interior illumination and light for large electric signs in front. About 15 feet inside of each of the two front entrances a pit begins and runs the full length of the building. In each pit is a movable turntable on a track operated by a three horse power motor. A car can be taken from its place at the back of the building, placed on the table and run out of the front of the building in forty-five seconds. The table will turn cars of 156 inch wheel base. This arrangement of pit and turntable is novel.

Two overhead washers are used for the cleaning of cars, and compressed air at 120 pounds per square inch, furnished by a private compressor plant, is used to blow off dust, blow up tires, etc. In the back of each stall there is a socket for receiving a connection plug joined by a flexible wire cord to a Coates portable electric buffing machine, which allows of polishing the car as it stands. Each car stands over a shallow pit in the concrete floor, which allows all drippings of oil and grease to run off without injury to the tires.

A 600 gallon Bowser long distance outfit is used to store gasoline, and all lubricating oil is stored in Bowser cabinets in the building.

The machine shop, which is partitioned off by concrete walls, is 50x35 feet, and is well equipped with machine tools; compressed air is used for all lifting purposes.

The clock system of checking cars entering and leaving the garage is in use. Below is a scale of charges for storage, which was first put in use by this concern and is now being generally adopted by all St. Louis garage men:

$30 per month for all limousines, Locomobile Model H, Packard, Pierce, Pope-Toledo, National, Royal, Acme, Rambler Model 15, Viqueot, Rainier, Thomas, Columbia, Dorris, Cadillac, White, Franklin 6 cylinder, Stevens-Duryea 6 cylinder, Peerless, Winton, Ford 6 cylinder, Welch, and all cars of foreign manufacture.

$25 per month for Stoddard-Dayton, Pope-Hartford, Oldsmobile 4 cylinder, Rambler Model 14, Orient 4 cylinder, Maxwell 4 cylinder, 28 horse power Pope-Toledo, Marmon, Mitchell 4 cylinder, Autocar 4 cylinder, Northern, Columbia 2 cylinder, St. Louis 4 cylinder, Locomobile Model E, 20 horse power Franklin.

$22.50 for Moline, Union, Oldsmobile 2 cylinder, Wayne, Rambler Type 1, Maxwell 2 cylinder, Pope-Hartford 2 cylinder, Autocar 2 cylinder tonneau, Franklin type B, Knox, Reliance.

$20 for Reo touring car, Pope-Tribune, Maxwell large runabout, Mitchell, Cadillac tonneau, Buick tonneau, Franklin runabout, Ford 2 cylinder, Queen.

$18 per month for Maxwell small runabout, Oldsmobile, Autocar, Cadillac, Reo, Ford, Yale.

All cars now of the $30 per month storage class, but of a date of manufacture prior to 1905, will come under $25 per month class, except where car has been remodeled, in which case they are to be charged for the same as new car of similar make. All cars now of the $25 per month storage class, but of a date of manufacture prior to 1905, will come under the $22.50 per month class, except where car has been remodeled, when it is to be charged for the same as a new car of similar make.

All transients are charged $1.50 per day. Small delivery wagons, $20 per month. Repairing 75 cents per hour. Overtime, holidays, Sundays and night work, from 7 p. m. to 7 a. m., $1 per hour. Towing machine with one man, $4 per hour; machine with two men $5 per hour.

Gasoline, 20 cents per gallons, straight.

Delivery of cars, $5 added to price of storage. Storage, dead, large cars, $10 per month; small cars $7.50 per month. Storage of an extra body will be same as dead storage for small car.



TURNTABLE IN A ST. LOUIS GARAGE.

An Omaha Garage.

R. R. Kimball's garage is one of two in Omaha, and of about four in the entire State, built especially for the purpose. In planning it Mr. Kimball secured the services of his brother, Thomas R. Kimball, a well known architect of Omaha, and the two traveled through the East, inspecting many garages and selecting the best points of all.

The building is fireproof, being constructed entirely of brick, steel and concrete, the floors being of the latter material. It is 132 feet in length and 44 feet in width, two stories and basement in its rear half, and one story and basement in its front half. It has a storage capacity of 100 automobiles, the ground floor being used for live storage and the basement for dead storage. The shop is on the upper floor.

As an advantage, it is claimed for this garage that its shop is fully equipped for remodeling automobile engines, including boring of cylinders and turning pistons and piston rings. Two lathes, run by electric power, are used, one large and one small, the former being a Lodge & Shipley. An overhead track is used for transferring boilers and engines from machine to lathe, and from lathe to lathe. Such equipment is found in no other garage in that part of the country, most dealers sending the machines to the factory when seriously out of repair. The track system is Y shaped, the stem going to the lathes and the arms extending over two repair pits. The pits are sheet metal tanks, which drop into the floor, and which can be taken out and cleaned.

In a room to the side of the shop is installed a vulcanizing outfit, the kettle of which will hold six tires at a time. It is heated through a pipe from a Stanley automobile steam boiler. All necessary tools for tire work are at hand, and are manipulated by a factory expert.

For protection against explosion, the gasoline is kept in an underground room, concrete lined, in the alley in the rear of the building, from which it is carried into the garage by the Bowser system of pumps. The oil is in two tanks of 200 gallons each,



KIMBALL'S GARAGE, SHOWING INCLINED APPROACH AND ELEVATED SHOW WINDOWS.

connected together by pipe. It can be drawn from both at the same time, or from one at a time, and one can be emptied and cleaned while the other is in use.

For storing lubricating oil, five ordinary water tanks of 110 gallons each are anchored in a half story metal floor in the rear part of the garage, the bottoms reaching pretty well toward the ground floor. The oil is drawn through cocks at the bottom, and gauges are provided to show the amount of oil in the tanks.

The garage has its own steam plant for heating, but uses city gas and electric lights. It has its own electric power plant, which runs the elevator and lathes. Power is supplied by two motors, which can be connected up to run singly or together. The elevator is fast and carries easily a machine of the largest type. On the ground floor a heavy steel bar is placed in front of the shaft at the height of about a foot, to prevent machines running into it. The plant has a house system of telephones.

Mr. Kimball is building air pumps which will furnish compressed air to all parts of the building. It will also be piped through the basement to the street, so that tires can be pumped up without bringing the machine into the building. Preparation is also being made to install a plant for charging batteries. That these improvements are not in now is explained by the fact that the garage is new and Mr. Kimball has not had time to get everything in shape according to his plans.

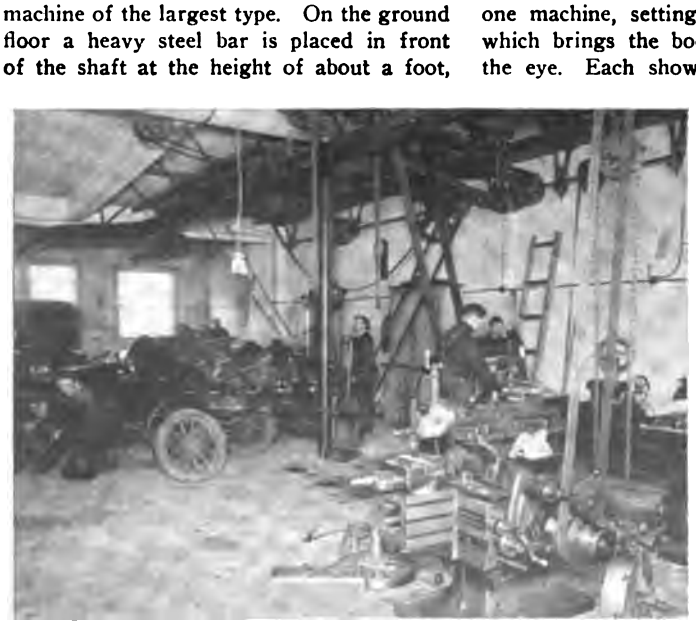
The main floor of the garage is considerably above the level of the street, and the approach is a gentle incline. The entrance is exactly in the centre, and on either side is a show window which accommodates one machine, setting on an elevated floor which brings the body up to a level with the eye. Each show window is the foreground of an elegantly appointed room, the one on the left the office, and the one on the right a waiting room for women patrons. It is furnished with rugs, chairs, divans, mirrors and a table with the latest magazines, especially motoring journals. A room will be built in the rear of the women's room as a smoking and lounging room for the chauffeurs.

Present accommodations for chauffeurs and owners consist of a bench repair system in the basement and a system of lockers on the main floor. Ordinary tools and plenty of bench room are provided in the basement, and the chauffeurs can tinker at their own sweet will.

Automobiles are kept track of by a card system. One part of the card has a place for the number of the machine, the name of the man to whom it is rented and the time it left the garage. This is torn off and kept at the office. The other part, after these same items are entered on it, is torn off and given to the chauffeur. It contains also space for the time of return to the garage, delays due to driver or machine, driver's hire, and the net time used, counting out delays. The chauffeur fills in these items, collecting at the end of the journey if so instructed on the card, and returns the card to the office. The same card is used for owners of automobiles who take a driver from the garage.

Average charges on a touring car for storage and washing and delivery to the city limits when needed are $25 per month; on runabouts for the same items, $20. Oil and gasoline are furnished patrons of the Omaha garages at the same price per gallon as they would have to pay the Standard Oil Company. From 35 to 75 cents is paid for chauffeurs per hour, the average being about 50 cents. Fifty cents an hour is charged for washing, and all the way from 30 to 50 cents an hour is charged for labor. The Omaha dealers charge $3 an hour for the rent of a machine, and furnish a chauffeur.

Many Omahans have sold their horses, or are selling them, and are converting their



OVERHEAD TRACK SYSTEM.



R. R. KIMBALL'S GARAGE, OMAHA, NEB.

VULCANIZING OUTFIT.

stables into garages. Among them are Herman Kountze, the millionaire banker; E. A. Cudahy, the packer; J. S. Brady, wholesale grocer; F. P. Kirkendall, shoe manufacturer; A. P. Austin, wholesale shoe dealer; G. W. Wattles, banker. The private garage idea being new in Omaha, the garage of elaborate equipment and appointment is unknown. Among the best is that of A. P. Austin. He has sold all his horses and now uses the carriage room for storing his two autos, while he has converted the stalls into a shop room, which is fitted up with a lathe and all sorts of hand tools. The gasoline is stored in an underground tank outside the garage, and is brought in by a Bowser pump system. The chauffeur has cosy quarters above in what used to be the coachman's room. Herman Kountze and Frank Colpetzer and others have mercury arc rectifiers for charging.

Dr. J. P. Lord has a small garage for the accommodation of one machine in the basement of his house, equipped with gasoline tank, lubricating oil tank and tools for all work except machine work. Floor and walls are of concrete. Dr. Lord finds it very handy in that he does not need to leave the house when he wants to tinker his machine.

Denver Garages.

Although practically no business houses in Denver are using motor wagons in their delivery and trucking service, there are fourteen garages in the city, and one of these, that of the Gray Automobile Company, at 1548 Broadway, is exclusively devoted to the housing and care of customers' cars.

The machine shop of the company is claimed to be the best equipped in the city, and the company does most of the difficult repair work for the other garages, as well as for its own patronage. In the shop are three lathes, a drill press, a milling machine and a complete blacksmith department. The lathes range from a 6 inch up to a 30 inch swing, and cut either metric or standard threads. The milling machine is of the universal type.

The rates charged for service of mechanics are 75 cents per hour; helpers, 60 cents per hour. Storage rates are from $5 to $30 a month. The dead storage on runabouts is $5. A big machine that has to be cleaned every day costs $30 a month, three hours being required to thoroughly clean a large machine. A portable buffing machine and compressed air are utilized in cleaning. The cushions are cleaned under 350 pounds pressure of compressed air.

Each grade of oil is stored in its own tank, and there is an individual measure for every tank. All the oil tanks, with the exception of the gasoline tank, are above ground. Engines and bodies are handled by means of block and tackle.

The garage is one story high, 62 feet wide and 125 feet long, and is heated by a hot air furnace, located on the main floor of the building. The rooms are lighted by electricity, 2,000 candle power arc lights being used, which produce a very intense illumination. For fire protection there are patent fire extinguishers in all parts of the building, at distances of 5 feet in every direction. Besides that there are two immense doors in the front of the garage, which practically extend over the entire front of the building, so that the vehicles may be removed rapidly and without much fear of congestion. There is also a large door in the rear of the building. The building is of brick.

The Gray Automobile Company store thirty-two vehicles. They do not take care of any electric machines, finding them unprofitable. Besides, Mr. Gray finds that the electric vehicles are usually owned by women, and it is so difficult to do business with women that he would not take care of their cars even if they paid a little better than they do.

Lincoln (Neb.) Garage.

The Sidles Automobile Company has a very neat garage at Lincoln, Neb. The two doors at the entrance, made by the Richmond Safety Gate Company, of Richmond, Ind., slide to the ceiling, leaving the doors entirely out of the road, where they cannot be torn from their fastenings by a reckless chauffeur. The main room is 75x90 feet, without a post in it. The floors are of cement and are slanted toward the centre, giving good drainage. The company has a compressed air tank 4x12 feet, from which air is distributed to all parts of the house. The windows in the office are located so that everything going on in the main garage and shop room can be observed from the office.

A Typical Country Town Garage.

By W. P. G.

The garage of Riley Brothers, Bridgeton, N. J., is centrally located at the foot of Laurel street, one of the principal business streets of the city. The main building has a frontage on Jefferson street of 60 feet and extends back 40 feet. An annex, 40x60 feet, has just been built. The building is constructed of corrugated iron, with a wooden frame and floors. The superior advantage offered by cement for the floors is appreciated, and later on a cement floor will be laid down. A wide swinging door placed at the centre in the front end constitutes the main entrance, and a smaller door on the lower side gives access to the main room. A similar door on the upper side opens directly into the office and reception room. Two large show windows, one at each end, provide an abundance of light, and one of them is used for displaying sundries and supplies. A large painted sign surmounts the front. The building is amply provided with windows on the sides and at the rear end, and together with large skylights in the roof the interior is well lighted.



Repair Shop of Gray Auto Company, Denver.

ARRANGEMENT OF BUILDING.

The northeast side of the front room is fitted up with shelves and show cases, which are used for display purposes, and enable the owners to show their sundries to the best advantage. In addition to the main entrance in front, means of exit are provided by doors at the rear end and also on the side, so that they have three entrances, and being so well provided with doors, the cars could be readily moved to a place of safety in case of fire. The two main rooms are connected by a large passageway between, the front being used for a display room chiefly and the rear for storing cars. The machine shop is located on the west

side of the front room, the benches and lathes being located near the windows, where good light is afforded the workmen. At the rear, near the passageway, there is a washstand for the convenience of patrons and workmen. A row of benches is erected along the two lateral walls of the annex, and the cars are arranged in rows on each side of the room, with a wide area between. Under each car space or stall a pit, 2 feet wide, 4 feet long and 3 deep, is dug, to give the mechanic ready access to the works from below. The work bench being immediately to the rear will afford a very convenient arrangement for facilitating the work of making the necessary adjustments and repairs.

Each patron's car will have its regular place of keeping. The corrugated iron sides and roof, with all the beams and overhead work, will be painted with white kalsomine or water paint. The side used for display purposes is sheathed with heart pine and finished with oil. A room 15x15 on the northwest corner, facing the street, is used for an office and reception room. It is finished in hardwood and oiled. Beside the ordinary office furniture, the walls are ornamented with pictures, and so fitted it makes a very cosy reception room. This is also the headquarters and meeting place of the Cumberland County Automobile Club. All the leading automobile literature, with road maps and other sources of information, is placed at the disposal of patrons.

HEATING.

The garage is heated in winter by steam, pipes being distributed over the building, and the office is heated by a radiator. A 10 horse power upright boiler is located in the basement, and forms the heating plant. Electricity is used for night illumination, and for lighting dark corners that are inaccessible to ordinary daylight portable light fixtures, with long flexible cord connections, are hung at convenient places over the building. Housing facilities are afforded for about fifty cars.

The main floor is about 8 inches above the ground. The floor at the entrance is flush with the pavement, and rises with a gradual incline to the level of the main floor, forming an easy grade for the car to enter. A basin about 8 inches deep and 12 feet square, with a concrete lining, is built in the floor at the rear, to be used for washing cars inside the garage, and a stationary platform in the yard, with slats laid crosswise over a pit, is used when weather conditions are favorable for outside work. A suitable drainage outlet is connected with the basin, and empties into the sewer system of the city.

GASOLINE STORAGE.

The garage is well ventilated by lowering the upper windows and from ventilators in the roof. No gasoline is stored in the main building, but it is kept in a separate house far enough from the main building to prevent the possibility of fire from that source. Ordinary galvanized iron tanks are used for storing, and later on it is the intention to install an underground system of storage tanks with pump conections. The rates for insurance where gasoline is extensively used being absolutely prohibitory, it behooves the owner to take every precaution against fire that human ingenuity can devise. Protection against fire is provided for by chemical fire extinguishers, and numerous buckets are placed near the water faucets. To cope with gasoline fires burlap bags of about 1 bushel capacity are filled with dry sand and suspended by cords from the beams overhead all over the building. Should it be found necessary to use them, the cords can be cut and the bags ripped open, supplying sand immediately and in abundance to be thrown on the flames.

The machine shop is equipped with lathes, drill presses and all accessories of a modern machine shop, and with such an equipment all ordinary repair work can be satisfactorily done. A block and tackle is fastened to the beams overhead, and effectually takes the place of a crane for removing engines and bodies. It can be quickly placed in position for work in any part of the shop, and does the work of a crane very effectually. The motive power for operating the machinery is supplied by a 5 horse power electric motor, and the current is furnished by the City Electric Lighting Company. Cylinder oil is stored in a remote corner of the room, in tanks, and pumped out as needed.

DISPOSAL OF REFUSE.

It is rather a difficult problem to keep floors clean in a place where so much oil is constantly spilled, but the most satisfactory method found is the following: Sand and sawdust are lightly sprinkled over the floor and allowed to remain some time to absorb the oil, when the whole is swept off. When the walls become dingy and unsightly they are given a fresh coat of the preparation mentioned above. Gasoline refuse is disposed of by pouring it on the ground in the rear lot, which, being in close proximity to the river, allows of this being safely done. Oil soaked cotton waste is burned at a safe distance from the garage as fast as it accumulates, and it is kept in metal receptacles until such time as it is disposed of, so that there is no danger of spontaneous combustion of the inflammable substance. The accumulated oil drippings from the cars are kept covered with dry sand to absorb the oil, after which it may be readily removed with the broom.

CLEANING METHODS.

The method of caring for the cars deserves detailed description. Cars are washed, if possible, before the mud has a chance to dry on the bodies, as such treatment is found to conserve the paint and keeps it looking fresh, and preserves the gloss longer than when less care is used. Nothing is ever used on the body except water under pressure from the hose, while the mud is being loosened by light mopping with a soft sponge, and this is followed by drying and polishing with a chamois skin. When carefully done in this fashion, washing does not seem to have any tendency to cause the varnish to crack, but it dulls its lustre, so that the longer a new car can be kept clean by simply dusting the better it is for it. During winter service they are never washed while the mud is frozen to the surface, as such treatment will have a most damaging action on the paint and cause it to crack very promptly. The so called grease solvents are effectual in removing grease from the surface, but they are thought to have a dulling effect on the paint, and for that reason they are very sparingly used, and then only on the running gears.

For the care of the leather trimmings, such as backs and cushions, ordinary harness soap is employed, such as is used by liverymen to clean harness. This will clean leather and keep it soft and pliable, thereby preventing it from cracking. No form of dressing is used for cravenette tops, but they are frequently brushed to dislodge the dust. Dust and water in combination have a most injurious effect on this material, and cause the fabric to rot and become useless as a protective against water. The metal ornamental work, together with the lamps, horns, etc., is polished with silver polish, and after polishing they are given a light coating of mercurial ointment to preserve the lustre, and keep them from tarnishing. Only a small amount of the preparation is necessary for the purpose, and it is applied on a woolen rag. The metallic mercury in the preparation forms an amalgam with the brass and prevents oxidation from dampness. Metallic surfaces can be prevented from rusting by this treatment.

Cars are protected from the direct rays of the sun as much as possible, and while the garage should not be dark, the light should be mellow and diffused. It is a matter of common observation that bright sunlight will cause the paint to fade, and for this reason particularly they should not be so exposed. Cape tops should be kept up and on the stretch when not in use, to keep them free of wrinkles and creases that form when they are kept down for any length of time, and cause the fabric to weaken and ultimately crack.

CARE OF TIRES.

Needless to say the tires come in for a large share of attention. During the time the car is in storage they are partially deflated and the weight of the car is taken off by having it jacked up. Light being injurious to rubber goods it is shut out by having the tires covered with bags made of some material impervious to it, which are made to fit and fastened by drawing strings around the inside of the wheels. Any covering that excludes the light is sufficient, but it is found that the above arrangement is very convenient to use. Oil is a solvent of rubber, and, consequently, has a most damaging influence on tires; the greatest care, therefore, is exercised to prevent it from accumulating on them. When cars are in daily use tires are kept

inflated to the limit, and no guesswork is permitted in this respect, but they are tested by the pressure gauge and each tire is known to have the proper pressure. This is a practical detail that is often neglected, and it is soon learned by experience, often costly, that the best way to prolong the period of usefulness of the tire is to have it pumped up to the limit when under load.

For making minor repairs to the tubes and casings, and when the injury is too extensive to be remedied by the acid cure, a vulcanizer is used. The acid cure process is also frequently used, and has given satisfactory results. When the casings become excessively worn they are returned to the factory for recovering, no attempt being made to make repairs on such an extensive scale. For emergency repairs of blowouts the garage people are in the habit of using a buckskin cover or a protector composed of rubber and canvas fabric, such as are furnished by the tire dealers. When other means are not at hand canvas strips 4 inches wide applied to the tread and held in place by tire tape will render temporary assistance and enable the car to be taken to a place where better facilities are afforded for completing the job. In connection with the proper care of tires the rims receive a share of attention also. They are kept covered with paint, and not allowed to rust. Rusty spots of the rim adjacent to the shoe will soon cause the fabric to rot and a rupture will occur sooner or later as a consequence. Water will also work in around it and penetrate the structure between the plies of rubber, leading to disintegration of the tire, and rendering it unfit for use.

COMPRESSED AIR SYSTEMS.

It is essential in an establishment of the kind under consideration to have some means of compressing and storing air, as pumping up a tire by manual labor is too tedious, and does not have a very salutary effect on the individual. For meeting this requirement, a pulley affixed to the main line of shafting overhead is connected to a small air pump by belting, and the pump is connected with a tank through tubing, which gives a constant supply of air under pressure for inflating tires. The tank is constructed of galvanized iron, riveted at the seams, and has a capacity of 25 gallons, and it is also fitted with a gauge for registering the pressure. This arrangement forms a cheap and satisfactory combination for compressing air. The compressed air can be used for cleaning out oil holes when they become obstructed.

RELIEF WAGON.

A special ambulance or towing car is in course of construction that seems to possess some features worthy of description. A discarded runabout of 7 rated horse power has been put in running condition and fitted with a piano box body. This body will give lots of room, and in it will be carried a full complement of tools and such extra parts as experience proves to be most frequently needed to meet the exigencies of daily use. Towing ropes, extra tires, crow bars, hoisting jacks and all the necessary paraphernalia for making repairs on the road will be always ready in case of emergency. A very useful part of the outfit, and one that can be used for a variety of purposes, is the adjustable ratchet wrench, and this tool is just as useful to the private owner. I have been using one ever since operating a car, and find that it enables one to reach nuts that are inaccessible to the ordinary wrench without removing the body of the car. A special set of tire irons are made use of for removing tires. These consist of flat pieces of iron 18 inches long, 1 inch wide and one-quarter inch thick at the large end, tapered to a blade not thick enough to injure the tire and slightly curved from side to side. These tools give a powerful leverage, and make the removal of a tire a very expeditious operation.

Two varieties of dry cells are used and sold, as they are almost exclusively used in this section, and there is very little complaint from this source. As a matter of fact, they are tested before selling and each customer is certain to get a reliable article. Batteries are kept in barrels in the dryest part of the building, to prevent deterioration that ensues when exposed to dampness.

SUPPLY TRADE.

Three grades of lubricating oil, light, medium and heavy, are kept to meet the requirements of the different seasons, and the importance of looking after the lubricating system is strongly impressed on those whose experience and training in operating cars are deficient. The practical garage man has always a fund of valuable information at his disposal, and if he imparts this knowledge to his patrons the kindness is usually appreciated. A heavy petroleum grease is used for transmissions and differentials; it is more lasting, and the oil is not sprinkled so promiscuously from the gears.

When patrons' cars are not called for in person a message will procure immediate delivery to the home by a competent driver. A systematic overhauling and cleaning after each run is the customary method of keeping patrons' cars in running condition. The rates for care and storage range from $10 to $30 per month, the former price including housing only, while the latter includes cleaning, oiling and adjustments, materials and repairs being charged for at the regular rates. The garage is kept open at all hours, and complete telephone connections enable them to keep in constant touch with anyone needing assistance. A full line of extra parts is kept in stock, and a special stock room, 12x15 feet, is set off at the rear of the front room for their accommodation. The above statement requires some qualification, however, for the extras are kept for the cars of which the owners control the agency. A full line of automobile sundries is carried, including horns, lamps, goggles, tires and gentlemen's and ladies' automobile furnishings. Cars are also kept for hiring out, and experienced drivers are commissioned to take parties out when requested. New and second hand cars are kept constantly in stock.

The gasoline motor vehicle is the car of choice in that section of the country, and a steam car is a curiosity. The only one that the writer knows of is an antiquated affair that has been for sale for the last two years, but there is no prospect of its ever leaving its present quarters, unless the plan suggested by one of the contributors to the Doctors' Number be tried, and the plan to sell the article on credit, with the added assurance that it will stay sold, might be tried in this case with the same satisfactory results.

SOME REPAIR WRINKLES.

Every practical repair man has his own little wrinkle for doing the ordinary every day work of his trade. It is sometimes a difficult undertaking for an amateur to determine the existence of a loose bearing, and from a railroad man I learned that it can be done by the following simple expedient. A small piece of soft wire is flattened by hammering until it assumes a ribbon shape. By removing the oil pipe and inserting this in the hole over the bearing any appreciable amount of space between the shaft and bushing can be made out. The weight of the shaft resting on the bottom of the bearing will, when there is much play, allow the wire to be passed around the shaft, and shows approximately the amount of space between the parts. Although engine pounds come from many and varied sources, looseness of the main engine bearings forms a very common cause. The subject of engine noises, while being somewhat outside of the scope of this paper, is nevertheless a very interesting one, and one that causes a good deal of anxiety to the operator. I once heard a repair man of large practical experience make the statement that all internal combustion engines will pound under different conditions, and as my experience increases I am inclined to the belief that he is correct.

A method similar to the one described above is used to determine whether or not a clutch seats properly. Thin strips of paper are placed on the leather facing and around the circumference of the cone, and if the parts are out of alignment they will not hold when the cone engages in the drum.

Coal oil is largely used to cut out the carbon deposit in the cylinder from excessive lubrication. A thorough flushing out with kerosene will make the engine run better, and it is good practice to repeat the dose frequently.

I notice that many cars are provided with an extra luggage carrier which is constructed of wood, 12 inches deep by 18 long, and extending from side to side. The box is securely fastened to the back of the car, and looks as well and gives more space than basket hampers.

Heretofore it has always been necessary to send the car outside of the shop for work of this nature, but the owners of the garage

referred to contemplate the addition of a wheelwright and carriage painting and trimming shop. When completed they will make tops, cut down and remodel bodies, do their own painting and trimming, and undertake all branches of repair work. Most carriage shops are lacking in facilities for doing such heavy work as painting cars. and some establishment where the work can be done satisfactorily and nearer home will prove a great convenience.

PERSONNEL OF THE GARAGE.

A force of six mechanics are kept constantly employed, one of the brothers has charge of the financial management and the other devotes his time to managing the mechanical department. The work is specialized as far as possible. A trained machinist has entire charge of the machine work, and others look after the general repair work. One man is constantly on the road demonstrating cars, and hustling for business.

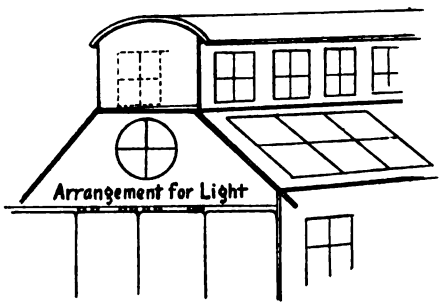
The charge per hour for repair work is 40 cents, the minimum charge for skilled labor. The financial end of the business is managed in a systematic way, bills are rendered and settlement is requested promptly at the end of the month. This establishment was organized during the reign of the bicycle, and the experience gained in the repairing and constructing of bicycles has proven a valuable asset in the practical management of the garage.

The Garage Situation in Los Angeles, Cal.

By O. V. H.

The garage situation in this city is a hard problem, as there is but one in this whole place that could be considered up to date. There are plenty where autos can be washed, polished and stored; also, other places where repairs can be made, some good, some fair and some horrid. There are a number of places built especially for garages that are just buildings—nothing more. They have no special features for convenience, either of the employees or the customers, but the charges are just the same as though every convenience was afforded. One thing quite noticeable here is the absence of light in most of the repair shops, some of them being little better than dungeons. There should be plenty of light and daylight, too.

A roof, as shown, makes a very pleasant light for a machine shop, as the skylight, if on the sunny side, can be coated with a thin film of frosting, and the vertical window give a nice mellow light from above, and the sun's rays cannot shine directly through to reach the floor. This form of roof is easy to ventilate, and does not make direct draughts for the workmen beneath. Another noticeable feature is that the entrance to nearly all the garages is narrow like the mouth of a tunnel, opening directly on the sidewalk where pedestrians are passing constantly, thereby endangering them, even though the sign on either side of the passageway in letters that "he who runs may read" say "Go slow." It seems as though some better method of gaining an entrance might have been devised, even though land is valuable. Some of the garages have entrances opening directly on the walks, but on either side of the entrance is a large plate glass window, through which movements can be seen both by operators of cars and pedestrians. The one garage I mention as being most up to date has a well equipped machine shop in connection where all wearing parts for cars can be made. There are several high grade lathes, a milling machine, shaper, universal grinder, mandrel press, drill presses, a well equipped tool room, with trays, racks and drawers for holding the various small tools, jigs, templates, etc. There are also a blacksmith shop and a small brass foundry, and a pattern shop is being added. It is also equipped with a large gas engine connected to an electric generator by a Renolds silent chain, the generator furnishing power for charging



batteries, lighting, etc. An electric buffer is used to polish brass. It consists of a flexible shaft, with cotton wheel driven by a small electric motor, and can be attached to a lamp socket. Most of the wash racks here consist of a depression in the cement floor, sloping from the four corners to a drain in the centre, which connects with the sewer. An overhead washer is used here, but many of the garages use a common hose and sponge, and chamois skin for drying. The water here is hard on paint, as there is alkali in it, and where much washing is done the surface is soon destroyed unless something is done to prevent it. A great number of people use olive oil rubbed over paint after washing, and then wiped dry with a soft cloth, waste or chamois skin. Another mixture I have used that does not seem to harm the paint and will clean water and oil stains, if not of too long standing, is ten parts raw linseed oil, two parts sweet or olive oil, one part vinegar, and turpentine in the proportion of one tablespoonful to a pint of the other mixture. One disagreeable thing we have here is a freshly oiled road, and at times it is hard to escape passing over it, which is sure to result in a lot of crude oil on parts of the vehicle, and unless this is washed off immediately it makes stains which show quite plainly, as the oil is mixed with particles of grit. Some use soap to remove this, but soap is bad for paint if used too freely or not washed off thoroughly. The above mixture will put a nice gloss on dull paint if there is any life left in it, but, of course, will not repaint a rig. I use it by rubbing on with a piece of soft waste, and rub briskly with a large handful of soft dry cotton waste. In connection with oiled roads I might mention the fact that oil on roads as a dust layer and preventive is ideal, but it is hard to pull a load over it, even when thoroughly beaten down and seasoned. This applies only to oiled dirt roads, but where gravel is spread after the oiling, as is now done, a much harder surface results. Good roads do not come as fast as I anticipated with the advent of the auto, but I predict the commercial vehicle will do more than the pleasure ones have done toward that end. Cold weather is one thing we do not have to guard against here, so no heating of garages is necessary, nor any winter storing, as every day is an auto day. The most convenient means I have found for hoisting out engines, bodies or transmission gears is an endless chain hoist suspended from a trolley which runs on an overhead track. The good points about this are that it requires little space, one man can handle it; it stays at any point, which makes it especially convenient for putting in bolts, etc., as it can be adjusted to exact heights which cannot be done with any ratchet device. With it an engine can be hoisted from the frame and deposited on a truck; or, if the shop is properly arranged, it can be sent to almost any required point on the overhead trolley. To a man who has been accustomed for years to handle work with an electric crane even these labor saving and "lubber lifting" devices seem crude, but they serve the purpose very well, for every small shop cannot have an electric crane. Another device that is very serviceable is a portable crane, as shown, that can be used as a hoist and truck combined. Some have three wheels, some four; some have single hoist drums, others have the drum operated by back gear, which, of course, will lift a larger load. I prefer one with three wheels, as having a three point bearing each wheel has a resting place at all times, no matter if the floor is uneven.

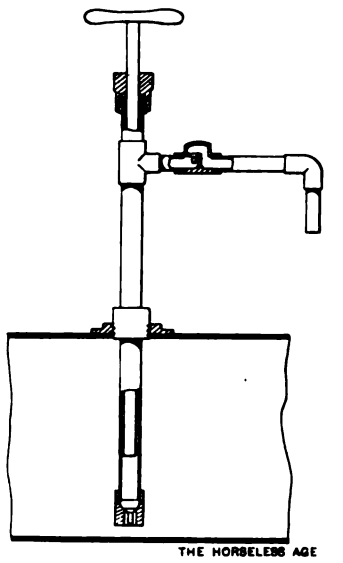
Another great labor saving device is an electric drill for drilling frames, broken stubs or any work that cannot be taken to a drill press. Electricity is so much more convenient than air, steam or a flexible shaft, as all there is to do is to attach a screw plug which contains a fuse to a lamp socket, and turn on the current and use the device as a breast drill. They cost quite a little, but when considering the labor they save the cost seems insignificant. Furthermore, they last a long while, as an electric motor will stand more "grief" than any other piece of machinery of which I can think, and an electric drill consists simply of a motor with a planetary reduction gear of case hardened steel on the shaft to which is attached a small drill chuck. I have found them very convenient for drilling in irregular work that cannot well be held in a drill press chuck, such as oil holes that have to

ıe at an angle. Some garages and repair hops use pits, but when the present gen-:ration of cars is worn out there will be lit-le use for them, as the newer ones are so onstructed that nearly if not quite all vork can be done from the top, which is s it should be. A pit is convenient in ome cases, but as a rule machinists dislike ɔ use them; as ordinarily constructed they re inconvenient to get in and out of, and re usually too small to be of much use. 'he most useful arrangement for a home ıade product I ever used was a runway r platform of heavy planks mounted on our screws, worked by a shaft and bevel ears, and driven by a belt from the shop haft. It was desirable, though crude, as :s good features were no climbing up and own in a pit; all tools, etc., were on the :vel where the work was done. It was an xpensive thing to build, and took up a lot f space, and was finally abandoned. For he lifting of bodies that are made so they an be hoisted straight up a chain hoist or ope hoist, with lock attachment, is about s convenient as anything, but usually they nust be lifted by hand, as so many of the 905 cars were so designed that the crank haft projected through the body, or there vas some other hindrance to a straight lift. it seems strange to me how the auto build-:rs ever got in the way of making the de-igns they now follow, as they do not fol-ow any other machine principle. Occa-ionally we find one that has dared to dif-er from the rest, but very often he has put omething of the "dummy" order on his o make it look like the other fellow's. Take, for instance, the shaft drive and the ıngle at which it is sometimes run. No vonder the universal joints wear out or ɔreak. It is all folly to make such an ıngle, as they can be made directly in line, ınd save wear and tear on the joints.

The best floor for a garage that I have yet seen is Portland cement, or vitrified brick, as it is easily cleaned; oil does not affect it, and it is smooth, but not slippery. Asphalt is worthless for a floor where machinery is used, as any oil or gasoline will dissolve the asphalt, and a hole with a black pasty mass in the bottom of it is the result, and it will stick to one's shoes and track into autos and offices, and makes a bad mess in general. Wood floors are bad, as they absorb too much grease, and are inflammable, though many are used in places that were not built especially for garages.

Rents are so high here that many of the salesrooms and garages are moving out anywhere from nine to twenty blocks, and several large buildings have been erected especially for this purpose, but judging from their inward appearance little thought was expended in their design, though the outward appearance is very nice, seven of them having Mission style fronts. Very few of them have turntables, which are a great convenience, especially for large cars. It also lessens the chance of damaging other cars or backing into the wall. Some places have portable buffers to keep the rear of a tonneau from bumping the wall as the tires strike the buffer first, some have a ledge about 12 inches high running the entire length of storage room, while others have a triangular shaped ridge of cement made in the floor for that purpose. I prefer the ledge about 12 inches high, as it makes it more convenient to sweep or wash the floor.

The fire commissioners require all greasy waste to be placed in iron cans. Nearly every one here uses distillate for cleaning, as it is cheaper than gasoline. Distillate costs 7 cents per gallon and gasoline from 18 to 25 cents. A few auto users run their engines on 7 cent distillate, and though there is more actual power in it the smell is more disagreeable, and the engine does not start quite as readily, especially on a cold morning, and there is more soot and smoke from it. Garage men charge 25 cents for a single gallon of gasoline and 22½ cents in 10 gallon lots. The regular charge for repairs is 75 cents per hour, but some of the smaller shops charge only 60 cents per hour. There is an automobile dealers' association here, and an attempt is being made to maintain prices.



A Simple Gasoline Pump.

I have worked in shops where potash or lye was used for cleaning grease from machinery. The greasy parts were lowered into a tank of hot lye and left long enough to allow the grease to be removed, then taken out and the hose turned on them to rinse off the lye, then a jet of steam turned on them, and finally wiped by hand with waste. The refuse in the tank was converted into soap and used to scour floors and general cleaning. It seems the price of gasoline is excessive when we can look out in one corner of the city and see large numbers of derricks with their pumps working away night and day pumping oil from the ground, but I suppose we must continue paying tribute to the "Octopus," unless the tax on wood alcohol is reduced and it replaces gasoline. All gasoline tanks are required by city ordinance to be placed 4 feet under ground and 30 feet from a building. The latter cannot always be, but the former is followed pretty closely, which makes business good for the pump man. A good and cheap pump which can be easily made is shown, and scarcely needs any description, as it consists of some cold rolled shafting or tubing, some gas pipe, a few fittings and two check valves. The tank has a pad riveted on it tapped large enough to allow the vertical check to slip through it; a piece of 1 inch iron pipe is screwed into the vertical check, and at the right distance from the bottom a bushing is brazed to the iron pipe, so that it can be screwed into a pad riveted on to the tank, and far enough



Portable Crane.

to keep the valve off the bottom of the tank; further up the pipe a tee is screwed on, and into it is screwed a 1 inch discharge pipe, having a horizontal check, nipple and L. On the vertical pipe is screwed a short nipple, with a brass stuffing box and packing nut. Through the vertical 1 inch pipe is placed a piece of seven-eighth inch cold rolled shafting; or, if lightness is desired, steel tubing with brass plugs brazed in the ends can be used, and a piece of three-eighth inch cold rolled rod put through the end for a handle. The rod is then packed with candle wick, and the pump is ready for business. This rod should be loose in the pipe to allow the gasoline to pass around it to escape out of the discharge pipe, as the plunger does not lift above the discharge. The quantity of gasoline will equal the displacement of the plunger at each stroke. Of course there are plenty of measuring pumps on the market, but this offers a simple and cheap home made substitute.

The commercial vehicles are slowly increasing in numbers here, and seem to be liked by everyone who has tried them, and I can learn of no one who has gone back to horses. There is one double cylinder air cooled truck that has done an immense amount of heavy hauling, being used in cement contracting work, and is still doing business. It is hard to get reliable data as to the cost of operation. There is nothing with which to compare autos in the commercial class, as they outstrip horses so far that they are not comparable. There is a firm here that has been hauling heavy loads, doing all kinds of truck work by electric trucks, but at present has suspended business temporarily, owing to an attachment for a small sum. A number of laundries, dyeworks, groceries, dry goods houses, can and storage companies, piano movers, iron works, etc., are using commercial vehicles, mostly gasoline. The new cars seem slow in arriving, and it seems to me that manufacturers would do well to make winter shipments to California before the season opens in the East, as winter is usually as good as summer here for autoing. A great many people thought the heavy rains this winter would put the big electrics out of business for awhile, but they delivered their loads all right by using chain grips on the rear wheels. People are beginning to awaken to the fact that autos are for something else besides pleasure, and the prejudice against them is slowly dying out.

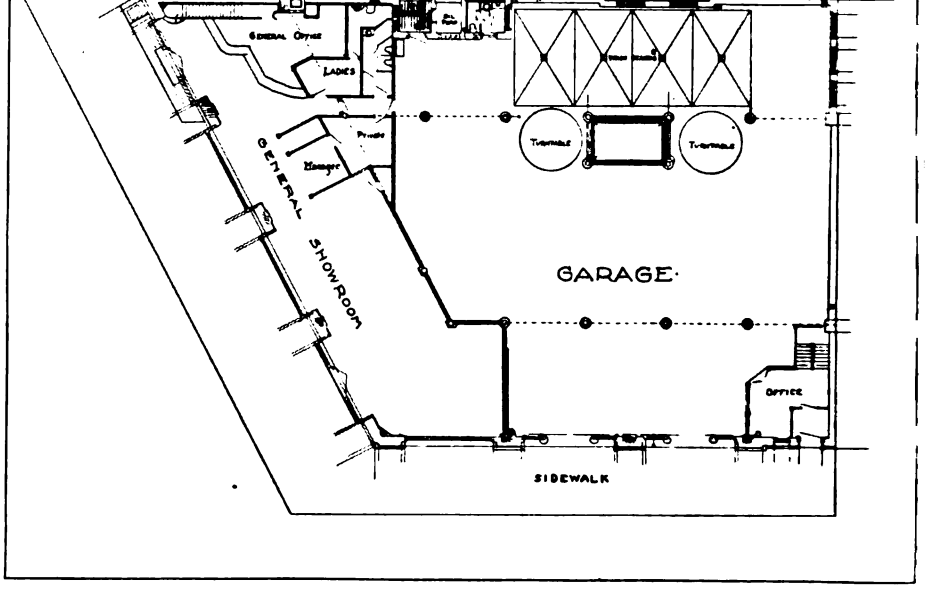
The New Winton Garage.

The new Winton garage, which is in course of erection the coming summer at Broadway and Seventieth street, New York, will probably be finished some time in October. It will be built of light buff brick, four stories high, and the architecture will be in the style of the Florentine Renaissance, with mosaic work in the spandrels.

The elevations of the building fronting on Broadway and Seventieth street will contain large plate glass windows on each story, so that to one coming up Broadway it will have the appearance of a great glass building. Light is one of the most important considerations in the construction of a garage, so that there has been a most noticeable increase in window space in the latest metropolitan garages.

The distinctive feature of this garage will be the flat roof, which will be practically a fifth floor. A portion of it will be covered in with a red tile Spanish overhang, under which it will be possible to work on an automobile in the open air and yet under cover. It may almost be called an automobile roof garden.

It was at first planned to use concrete for the construction of the garage, but the final decision was in favor of brick with iron beams and columns. The dimensions are as follows: 113 feet on Broadway, 101 feet on Seventieth street, 100 feet on side parallel to Broadway, 150 feet on side parallel to Seventieth street.



GROUND FLOOR PLAN OF THE PLANNED WINTON GARAGE IN NEW YORK.

On the first floor will be the office and reception rooms for both men and women. Five plate glass show windows, each 9 feet wide and 14 feet high, will give space for the exhibition of six or eight automobiles. The second and third floors will be used for storage, and the fourth floor will be used principally for the repair shop. Each floor will be of concrete cement, and will be provided with washstands and two turntables. An electric elevator, capable of carrying one machine, will run from the roof to the basement.

The gasoline storage tank is in an open court, which is built in the side of the building parallel to Seventieth street. The cold storage and heating plants will be in the basement.

The architect was Charles A. Rich, of 320 Fifth avenue, New York.

A New Springfield Garage.

An absolutely fireproof garage is the aim of Norcross & Cameron, of Springfield, Mass., in the new building which they are erecting at 55 and 57 Bridge street in that city. It is to be of brick, steel and cement construction. The flooring of the two stories will be of cement, and that composition is also used to prevent the warping of the girders from fire. These girders will be completely imbedded in cement. The partitions of the various offices, the front stairs and the elevator shaft will all be of cement, and the rear stairs will be of iron. The building will carry no fire insurance whatsoever. The structure will be 160 feet deep and 65 feet in width, and, being of two stories, will contain some 20,000 feet of floor space. It will be ready for occupancy July 10. It will contain all conveniences, such as women's parlors and men's rooms. There will be a large elevator in the rear, on to which cars can be driven and immediately conveyed to the second story. A large air shaft, 24x16 feet, will serve the double purpose of furnishing light and pure air. The front of the building will be mainly of glass, the remainder being of limestone and brick.

North Adams (Mass.) Garage.

The garage of the North Adams Automobile Company, located at 112 Ashland street, possesses several desirable features, and being quite up to date in its equipment a brief description of it will serve to illustrate what is desirable in a garage, by striving to furnish that which is demanded in practice.

First, the location is central; parties visiting a city generally desire garage accommodation in the immediate vicinity of the best hotels, at which they usually stop.

Site on level ground; floor slightly above common level. This affords the opportun-

ity to easily run vehicles out in yard by hand whenever it is advantageous to do so; in the event of a fire this seemingly unimportant advantage would greatly facilitate the removal of vehicles.

Stored air pressure, 80 pounds per square inch available at four different points; wash stand, special soaps for washing varnished surfaces.

SUPPLIES.

Gasoline, oils, greases, carbide, tires, lamps, pumps, batteries and metal polishes.

ELIMINATION OF FIRE RISK.

Interior illumination by electric incandescent lamps; gasoline stored in an underground tank located exterior to garage.

FIRE PROTECTION.

Three lines private hose; water pressure 90 pounds per square inch.

SHOP EQUIPMENT.

Gasoline engine, lathe, machine drills, brazing and soldering apparatus, complete kit for tire repairs.

SPECIAL DEVICES.

Flexible shaft, with attachment for receiving small emery wheel, a drill or a rotary brush. With this portable arrangement, grinding, drilling, or brush cleansing (either wet or dry) can be easily effected, any part of the vehicle can be reached, thus bringing the apparatus to the work, instead of bringing the work to the apparatus.

THE PERSONAL EQUATION.

The man is nine-tenths of the service; garage owners, if not mechanics themselves, should have a man in charge who understands the business thoroughly from A to Z.

The proprietor of the garage described above, F. L. Rand, has figured as a successful locomotive engineer, was for a number of years engineer and electrician in a large lighting station, and is the builder of the gasoline engine that furnishes power in his garage. He is also the inventor and patentee of the Rand acetylene generator.

Such a variety of experience and such a fund of tried and tested practical knowledge are acquisitions that few men are fortunate enough to possess. It is the extensive knowledge of power and its applications, coupled with broad training, that



GRINDING.



DRILLING.

furnishes the keynote to success in the diagnosis and treatment of the many ills to which the horseless vehicle is heir.

EMERGENCY SERVICE.

A steam "auto" stands at all times in readiness to respond to telephone or other calls, this machine being used for nothing but relief work, towing in disabled cars, making temporary repairs of a minor character on the road, and furnishing a supply of gasoline when a lack of the "prime requisite" occasions a stall. Any part or fixture that can be put in place on the road is also dispatched to the scene of operations.

Garage Rates in Detroit.

The accompanying table gives the rates mutually agreed upon among the garage owners of Detroit last summer, which are still in force. There is apparently some mutual suspicion, not altogether without foundation, that the renting charge per hour is sometimes cut when business is dull; but in the main the rates are well adhered to. The general opinion seems to be that the monthly rates are entirely too low, but, as one dealer remarked, the public had become accustomed to these figures, and it would be hard to make a change. The price for charging ignition storage batteries is usually 50 cents, while 75 cents is charged for either a full or partial charge for an ordinary electric runabout.

One company which operates a large sightseeing bus, which is practically a 3 ton truck, pays $70 per month for care and charging.

Gasoline at present is sold at 15 cents per gallon, but the garages are daily expecting an advance in price which will compel them to charge the private owner 18 cents. As Detroit is an openly built city a large percentage of the private owners keep their cars upon the premises in small houses usually of wood.

MONTHLY RATES.

Storing, washing, filling and oiling runabouts, $15 per month; small tonneau cars, $17; touring cars, $20 to $25; delivery and return once each day, $7; delivery and return once each day, if man who delivers car is brought back to or called for at garage, $4; calling for or delivering car between 12 o'clock at night and 6 a. m., each trip extra, 25 cents; dead storage, $5 to $7. To obtain a change in rates, owners must notify in advance that their machines are to be put out of commission.

TRANSIENT RATES.

Storing runabouts and small tonneau cars, twenty-four hours or less, 50 cents; touring cars, 75 cents; washing runabouts, 50 cents; touring cars, $1 to $2; polishing brass, 25 cents to $1.50; delivering or sending for auto, 25 to 50 cents; filling and oiling, 25 to 50 cents; use of automobiles to and from places of repairs, per hour, $1; for towing per hour, $1.50 to $3, depending upon size of car towed; labor of repair men per hour, 60 cents; machine work, 75 cents; blacksmith and helper, 80 cents.

RENTING.

Runabout carrying one passenger, with driver, first hour, $2; after first hour, $1.50; per day of ten or twelve hours, $10. Small tonneau car carrying not more than four passengers and driver, first hour, $4; after first hour, $3; per day of ten to twelve hours, $20. Large touring car, with driver, first hour, $5; after first hour, $4; per day of ten to twelve hours, $30. Time to be charged from the time the car leaves the garage until it returns to the garage, from the nearest quarter hour. No rental to be made for less than one hour.

ELECTRIC SERVICE.

Washing and burning up thirty sets 7 P. V. cells, $24; twenty-four sets 9 P. V. cells, $24; thirty sets 9 P. V. cells, $30. Storing, washing, charging and care of batteries per month, $24; ditto and delivery per month, $30; delivery other than one each way per day, each time 25 cents; individual charge for batteries each time, 75 cents; calling for carriage after midnight, extra charge, 25 cents; storage for twenty-four hours or less, 50 cents; storage of carriage with batteries wet, per month, $10; ditto with batteries dry, or without batteries, $5; storage of dry batteries without carriage, per month, $2.50. Machines in wet storage taken out and used during such period of storage shall be charged for washing and charging bat-



POLISHING.

teries, each time so used, $1.25. Carriages stored and used, without attention, per month, $6.

BROUGHAMS.

Care of batteries per month, $15; storing, washing, charging batteries and care, per month, $35; storing with batteries wet, per month, $15; ditto, dry, $5; washing batteries and burning up per cell, $1; individual charges, $1.25; shop labor per hour, 60 cents; lead burning per hour, 75 cents.

Smith & Mabley Garage, New York.

One of the largest garages in the world is that of the Smith & Mabley Company, of New York city, located at Fifty-sixth stret and Broadway, which was designed and equipped by Mr. W. P. Kennedy. This garage consists of a fireproof, concrete and steel constructed building, part of which is four stories and the other portion three, with the blacksmith shop arranged on the roof so that cars can be run to it directly from the fourth story of the garage. The placing of this department practically outside of the garage proper decreases the fire risk. No wood is used anywhere in the construction, except in a few window frames and doors. Even the metal columns are surrounded by hollow fireproof brick, the stairs and most of the doors are also of metal. The entire floor space is in the neighborhood of 76,000 square feet, which, however, includes the office and sales department.

The work is divided into five departments—storage, repair, electrical, merchandise and sales—each in charge of a separate manager. On the first floor at the front are three enormous doors, the middle one opening directly on to an elevator with a platform 17 feet square, in the middle of which is a turntable large enough to take machines up to 125 inch wheel base. This elevator is so arranged that cars which are to go to the upper floors will not have to run on to the main garage floor but can be run directly on the elevator from the street, and from it to any desired floor. There is besides this at the centre of the building another large elevator situated so that cars can run on to it on one end from any floor and off it at the other end. Both of these elevators are electric, with a capacity of 6,000 pounds. The doors are covered with sheet metal and divided horizontally, the upper half going upward and the lower half downward out of the way. When one-half is operated the other half also operates automatically. In the main portion of the building all the floors are used for garaging purposes, with a capacity of about 350 cars. Of the 300 large cars now in storage 230 are in active service, the rest being dead storage. When a car comes in it has a tag placed upon it on which is written what is to be done with it and when it is wanted, with spaces below for the names of each employee, such as the washer, polisher or repair man who work on it and who have to sign their names so that if there is anything found wrong the blame can be located. If a car is to be extensively repaired the owner is required to sign a contract stating exactly what he wishes done, and after the repairs have been made the car is tested before the owner and a representative of the garage, and he is again required to sign a document stating that the repairs, etc., are satisfactory. This system has proved to be very satisfactory and saves many misunderstandings. On each of the garage floors are wash stands, each of which will accommodate eight cars. The number of cars washed and polished each night is in the neighborhood of 175. Each floor is also provided with a small compartment caged off by an iron screen, in which are the faucets for drawing gasoline or oil. The Snell hydraulic system of storage, described in another part of this issue, is employed, and the gasoline as drawn is recorded on the meter, so that the exact amount sold each day or each month is known. The hands of this meter can be set to zero for each individual drawing, so that the amount taken at the time is shown, but the accumulative record goes on just the same. The statement was made by Mr. Kennedy that the average quantity of gasoline sold daily was between 700 and 1,000 gallons. On the main floor to the left of the entrance is the information office, in which are the time recording clocks, by means of which all the movements of the cars are noted, the telephones and the telautograph instrument connecting with the one in the main office, upon which all calls for chauffeurs are recorded. These calls are handed to the chauffeurs in person or placed in pigeonholes, which are provided for the use of each driver. Three hundred steel lockers with individual and different keys are also provided for the use of the chauffeurs. There is a very large recreation room fitted with a shuffleboard, card and billiard tables, and containing also a small restaurant, in which all the heating apparatus is electrical. There is also in connection a barber shop. These conveniences have been provided for the comfort of the chauffeurs, where they can be at ease and yet be within call at short notice.

Two systems of telephones are employed, one being the outside and the other an inside system which is used to relieve the main 'phones, as it has been found that about one-third of all the telephone calls are in connection with the private affairs of the drivers. On the third floor is a well equipped upholstery and paint shop and a storage department for all kinds of goods, such as lamps, tops, clothing or robes, which it is not desired to keep in the regular lockers. These goods are taken care of by check system. On the second floor is also a department of dead storage for cars which are not in use or for those which are for sale, and also a woodworking department fitted with planers, jig saws, etc. On the fourth floor is a well equipped machine shop in which all the metal repairing is done.

The basement is devoted entirely to the care and repair of electrical vehicles, one portion being devoted to batteries, which department is under the management of the National Storage Battery Company. Hydraulic lifts are used for removing underslung batteries from the vehicles; charging plugs are arranged around the walls and posts, so that a vehicle can be charged at almost any place. A charging board is also provided which will accommodate forty vehicles at one time, and there are also a series of repair pits over which the vehicles can be run. Compressed air for tires and cleaning purposes is provided by a Christensen electrical compressor, which stores the air in two tanks from which pipes are carried to all the floors. The building is steam heated and lighted by electric lights. A complete auxiliary electric lighting plant, consisting of stationary gas engines and direct connected generators, is installed in the basement. Waste paper and refuse materials are removed daily by one of their own trucks. A general store, carrying a complete line of automobile goods and in addition a very large stock of duplicate parts for foreign machines, is operated in connection.

Our Idea of a Repair Station for Automobiles.

By O. D. Wheeler.

We have at present a 20 by 60 foot, one story building, but which, when completed, will be 45 by 60 feet. The left front of the building is devoted to our office, while on the right are double doors for entering with automobiles. The right front and centre of the building we use for storing cars for our customers and transients. Now, at the rear of this space, on the right, we have a large sliding door which leads into the machine shop, so you see that from our street entrance to our machine shop is one straight drive.

This shop now is 23 feet long, which gives us a space of 20 by 23 feet, with tools arranged on the left side so as to drive a car right in. This machine shop is 12 feet high, with windows on three sides, which makes it very light and convenient.

For all cleaning purposes we have a depth of 6 inches of sand to absorb all grease and dirty water, and for all repair work we have a false floor, which we lay over the sand. At the right of the building is our gasoline tank, which is a steel tank, holding 150 gallons of gasoline, covered by a small metallic house.

The Packard Motor Company have sent us a copy of their illustrated price list of parts, which contains the number, name, price and the code word of each part, and half tone illustrations of most of the parts of the Packard 24 H. P. car. It is the first complete price list of parts that has come to our attention.

Commercial Garages

The Coming Business of Caring for Commercial Motor Vehicles.

By M. C. Krarup.

In full accordance with sound business principles this special number of The Horseless Age deals mostly with accomplished facts, judging from the list of subjects published in advance. To this store house of material gathered by many for the information of all, and in which no one, however well informed, will fail to find something which had previously escaped his attention, the writer would have liked to contribute his share of personal observations; but with only a few days at disposal —too short for photographic work, drawings and proper selection of special subjects—he finds himself compelled to dip his brush in a pot containing what he has learned of commercial motor vehicles and paint with that on a canvas intended for a garage picture. Naturally, the subject becomes that of the garage for commercial motor vehicles, and particularly the public garage, since there will be descriptions of private garages for trucks and delivery wagons elsewhere in this issue, but probably not one of a garage where the business vehicles of a number of merchants, millers, brewers or manufacturers have been cared for to the mutual satisfaction of the vehicle owners, on one side, and the garage owner on the other. And if the reader finds one such description of a garage where the possible profits on commercial motor vehicle operation have been divided equitably between the owners and the chief caretaker, on any other than a salary basis for the latter, the writer will hazard the guess that the institution has not been conducted more than one year, or that its clients have not been the same persons for more than one year at a stretch for each one. In motor vehicle operation it is rather easy to rob the economy of the second year in favor of the first, particularly in the case of gasoline motor vehicles utilized to the full extent of their working capacity.

PROSPECTS OF THE BUSINESS.

Despite these evil glances at the past and present it is the purpose of these lines to point out, if possible, that the public garage for business motor vehicles cannot long remain the dream castle which it is today, but holds out brilliant promise for investors and workers. Its natural dividends should be the difference in economical results between skillful and bad or indifferent management of motor vehicles, divided by two, and this difference, according to the past, is not less than 20 per cent. annually of vehicle values, say $600 each year for a $3,000 truck. The garage man who can induce his client, the vehicle owner, to pocket this difference by means of rational utilization, and who will enable him to do so by systematic maintenance of the vehicle's working capacity, will be entitled to charge one-half of the gain for his services, over and above the expense of rendering them; and when in course of years the clients shall have learned their part of the new art—the utilization—so well as to cause a reduction of the garage man's share, the volume of the business will necesarily have grown to such proportions as to make less than 10 per cent. net profit, mainly on another man's investment, quite acceptable.

This is anticipating. The successful business vehicle garages today are conducted for corporations and large business houses. Profit sharing is not a feature in them, and it is a most vital feature in the public garage. Probably several of these private business garages are described in this issue, and their technical direction and equipment are necessarily of greater interest for those contemplating public garages for business motor vehicles than any arrangements of public garages in regard to which it is not known whether they are conducive to profits on both sides of the economical fence separating the interests of the garage owner from those of the vehicle owner. The difference between profit mongering and profit making is, of course, vital, since no public garage for business motor vehicles can long subsist, unless it makes profits possible for both parties in the deal.

In calling attention to the descriptions of private business vehicle garages in this connection, the writer desires to make the reservation that he has never seen even a private garage of this kind where grievous interruptions of service were avoided, and the full measure of economy was attained, by keeping a full supply of factory made spare parts on hand and reducing the repair shop outfit correspondingly; neither has he seen any system enacted for grading drivers' wages or determining their fitness according to automatic and book records of their work. On the other hand, it should be remembered in any comparison that the garage conducted for one owner has means at disposal for reaching economical results which would not be available in the same degree in a public garage. Such are, for example, the standardization of vehicle types and their equipment, rendering possible a considerable reduction in the supply of spare parts, and the changing about of drivers from one vehicle to another in cases of sickness or other business emergencies.

The whole subject begs for faith on this one point, that business motor vehicles may be so utilized that the margin of advantage over transportation by horses will be sufficiently large for justifying a division without losing the inducement, and this, upon analysis, resolves itself first into a simple question as to what number of vehicles would begin to warrant the establishment of an independent maintenance plant with hired assistance of the required skill, and secondly, into the question whether such help is available, and whether the merchant can judge of its qualifications, and has anyone on whom to depend for the organization of the whole plant.

SMALL INSTALLATIONS PREPONDERATE.

As a rule business men, in realization of these initial difficulties, will not discard horses completely, even if they have faith in motor vehicles. Though their needs may be much larger they will insist, as the past has shown, upon buying not more than one, two or three vehicles to begin with; and, furthermore, the great majority of merchants have neither now nor eventually any use for a larger number.

Herein lies the chance for the public garage for business motor vehicles, properly conducted. Apparently this chance has existed, theoretically, for some time, but two factors were missing which were required for bringing it into actuality. It is only recently that the great body of merchants have become persuaded, by the overwhelming evidence of repeat orders from pioneer users and large new orders from other prominent firms, that the business advantages of motor trucks and delivery wagons were worth going after, and it is also only recently that the necessity of a really careful study of the utilization and maintenance methods has become more widely appreciated through the failure of some users to obtain the economical results accomplished by others. There is evidence that the merchant class, especially those who have use for trucks more than for delivery wagons, would rush to buy if there were less uncertainty as to what kind of vehicle they should buy, more assurance of getting prompt deliveries, and some way of settling the maintenance question in advance. They are not so willing, as a rule, as they were one and two years ago to take chances on any mechanical chap who declares himself competent to keep the vehicles in order, or on the pleasure vehicle garage man, who is willing to sandwich the truck in among his runabouts and touring cars without showing any signs of understanding that the conditions differ.

What the merchant really prefers is a maintenance contract; an agreement to deliver the vehicle at his place of business every morning in working order for a stipulated sum per month or year. But this he cannot get, for the present. Those merchants, mainly in New York city, who have operated electric trucks under maintenance contract in the past have had the best of it, even when the price was raised from time to time, because the maintainers did not really understand what they were doing, or where the advantages in the use of electric vehicles came in. Using the maintenance contract as a selling inducement—and it proved a powerful one—they fancied that they were expected to keep one electric truck running for something like the expense of a one horse truck, and gave the merchant all the benefit derived from reduced number of drivers and

higher work capacity, and even failed to consider, in view of the profitable sale in prospect, that they paid for all the blunders of the merchant's employees—reckless driving, overdischarging of batteries, etc. Their experience led them finally to see the matter in its true light.

THE QUESTION OF DRIVERS.

Outright maintenance contracts will for this reason probably be out of question for some time, for electric vehicles, and still more decidedly so for gasoline vehicles; for if anything holds gasoline vehicles back and favors electrics it is the unwillingness of anybody to guarantee the size of repair bills and the continuity of service when they are used with "scrub drivers." And this class of drivers the merchant must use, partly for economy in wages, but mostly because "chauffeurs" are useless for the commercial work which the truck driver is expected to do. The "chauffeur" is too haughty, knowing that any day a job of a different and less exacting kind may be offered him.

This, of course, will all be different when gasoline trucks get so anybody can drive them, and when everybody gets so he can drive a gasoline truck—because in reality the work of merely driving is much simpler than the driving of horses.

A large part of the whole development lies in the minds of people.

"Scrub drivers"—meaning plain teamsters or clerks taught the motor motions, but who have never been in leathers and felt the tingling of pride from illegal speed—contrary to opinions as yet prevailing, though rapidly giving way, are no harder on the gasoline vehicle than the average "chauffeur," making up by natural moderation what they may lack in skill—and the latter, to the degree required, comes soon, since nobody has a monopoly on learning a few simple motions. So far as maintenance contracts are concerned, the necessary employment of plain-minded drivers need not long be in the way.

MAINTENANCE CONTRACTS.

The question of giving maintenance contracts, and making an extra profit on them by virtue of the risk, will sooner or later come up in the commercial garage man's business—for the same reasons that keep the practice alive in commercial transportation work by horses—but probably not till the garage man shall have gained plenty of experience on another basis, whereby he will be enabled to set his maintenance price right for himself and right for his less experienced customer.

The maintenance contract system has important advantages, which make it well worth considering whether the time for its adoption may be cut short. It greatly facilitates sales of motor vehicles; it makes for uniformity in caretaking methods, removing transportation plants from the owners' premises and massing the vehicles in garages; it bridges the difficulty of getting competent supervision and stable help by greatly reducing the number of high skilled men required for a given number of vehicles; it brings the manufacturer closer to the user for all practical purposes, because the few garage men would represent the many users; it reduces the working capital needed for the establishment of new garages, because a maintenance contract equitably drawn should give a large profit during the first year of service of new vehicles, part of which should be set aside for taking care of the higher maintenance expense of the following years. This feature, with the temptations it would involve for weak concerns, would on the other hand necessitate that the garage should be very substantially financed—making a distinction between the available resources and the capital actively engaged—so that merchants would be justified in accepting contracts for a long term.

The conflict of interests which has so far neutralized these advantages arises first and foremost from the vehicle owner's inclination to permit overloading and overspeeding of his vehicles, as well as insisting upon their use after business hours, so as to get as much out of his investment as possible. And this proceeding of course greatly increases the cost of maintenance, interferes with the order of work at the garage and frequently makes it impossible, by aggravating the necessary repairs, to have the vehicle at the owner's disposal every morning, as per contract.

Another conflict of interests arises when no maintenance contract is arranged. In that case the worst maintenance system is to the profit of the garage man, just as in pleasure vehicle garages. Neglect of proper caretaking, encouragement of overloading, overspeeding and long hours result in frequent big repairs, on which a round profit may be charged. The interruptions of service last for weeks at a time and are costly to the owner and profitable to the garage man for the time being.

ECONOMY OF DAILY INSPECTION.

The echo from London's omnibus repair stations, where maintenance is at present being better systematized—from sheer necessity—than probably anywhere else, affirms the economy of close daily inspection and liberal use of factory made spare parts instead of shop repairs, for early replacements of parts showing signs of wear or weakness before the operation of the vehicles is actually interfered with from these causes; this testimony, as well as that from private commercial vehicle garages in this country, emphasizes more and more that an advance supply of spare parts and highly skilled daily inspection constitute the two main essentials in economical maintenance, not necessarily the lowest cost maintenance, though ordinarily that, too, but the maintenance which is most economically efficient, utilization of earning capacity and operating expenses both fully considered. Here again is the conflict between the owner's interest and the garage or repair man's interest. Daily inspection costs money, but the charge for it must be included in the garage keeper's general charges per month or year, and replacements by spare parts involve little work for which charges can be made, in comparison with the shop tinkering, patching, brazing and fitting at 60 cents per hour.

The drift from these two forms of conflict must, of course, be toward private garages for merchants—meaning slower introduction of motor vehicles, much bother to manufacturers in protecting their sales and their reputations against the effects of indifferent utilization and maintenance—unless garage men will see that there is only one way of avoiding the alienation of commercial vehicle business, and that consisting in resolutely studying the customer's commercial interests and conducting their own business accordingly. The very fact that only a few garage men will see the situation that way—the majority having proved a different disposition in the past—will be a guarantee to those few who do see it that there is a chance for building up garage enterprises of considerable magnitude specially devoted to commercial vehicles; large business with legitimate profits vs. the present rule in the garage business of a small, fluctuating business with rapacious profits and a constantly changing clientèle.

SOLUTION OF THE COMMERCIAL GARAGE PROBLEM.

The conflict of interests which has heretofore kept the commercial garage out of existence must, according to this reasoning, find its solution in the following chronological order:

First, by the formation of garage companies willing to keep merchants' expenses for maintenance as low as the nature of the vehicles and their service permits, willing to teach the merchants how the expense may be reduced by the proper use of the vehicles and by procuring spare parts in advance, and giving, out of their superior skill, assurance to the merchants that vehicles will be available every day all day, if their advice is followed, but assuming no responsibility or guarantee beyond what is implied in superior knowledge of the subject.

Secondly, by garage companies proving willing to assume maintenance risk, as soon as merchants—each customer individually—give proof of treating vehicles right, so far as their utilization is concerned. The maintenance price will vary, of course, with the type and "make" of vehicles, and may be subject to a sliding scale by which mileage and speed will determine extra charges (in proportion to mileage and rapidly progressive for speed above certain limits), from daily readings of speed and distance-recording instruments attached to the vehicles.

It is not in New York city that this probable development will bud first. There the situation is perhaps not seen so clearly as elsewhere, by reason of the multitude of possibilities for "skilled drivers" and garage managers, which may delude merchants

well for themselves, so far as the knows, until the third year; in all equiring two years to learn, to say of the bother and dissipation of .)

CO-OPERATIVE PLANS.

ties of the second class the situation rer. Manufacturers want to sell and delivery wagons, but merchants y, not knowing whether they can he vehicles properly cared for. The y of competent foremen for motor installations, whether electric or e, is the principal deterring factor. has already been demonstrated h attempts at forming co-operative nts' garages; for example, in Roch- N. Y., and in Cleveland, Ohio. Only iculties attendant upon any organiza- ork requiring capital and special in combination, while returns remain fully demonstrated certainty, have ted the projects from being realized. fficulty has been to secure agreement he real estate question, the location, eage required.

r a few more attempts, a little more tion of the ideas and facts bearing he subject (as in the present article her ones, quite necessary, going into tails, technical and financial), men he money and ripened convictions subject will take the matter into wn hands; the ever difficult co-op- element in previous attempts will ar. More than likely the trucking ies will see the requirements first, tablish the commercial motor vehi- age as a department of their trans- on business, and will give mer- the coveted chance for utilizing vehicles in whatever degree their nt approves of, and at an expense d by skill and "business conscience" r some relation to what is reason- The men to do the skilled detail will come from the ordinary garages m the shops of the industry, no Whether the initiative shall come these sources, too, and the profits o to them in the end, depends upon lves at the present moment. They to be the leaders, because there is rp distinction between the mainte- system, which is good for commer- tor vehicles and that which is good asure automobiles, and in the long e pleasure vehicle garage will be led to adopt any methods which are superior, elsewhere, for keeping s in constant commission at a mini- f expense.

pleasure vehicle garage man cannot to have the demonstration of how ould be done come from another .

he other hand, the pleasure vehicle owner deals at present very largely tionally adopted for reducing the cost without reducing the "pleasure." It is not their viewpoint. Peculiar notions of what constitutes pleasure may be at the bottom of this, but, no matter what is at the bottom, it is a well-recognized fact that the owner of a garage, however well meaning, is, like the Czar of Russia, surrounded by influences which thwart his best intentions; and this makes it extremely doubtful whether he could successfully cater to the merchants' business requirements without giving up catering to owners of pleasure cars. Some of the profits which the latter make almost wholly legitimate by their own conduct would be wholly illegitimate when derived from a truck, or, at least, the taking of them would militate against commercial motor vehicles by forcing merchants to learn the business of taking care of them.

The logic of the situation, as presented, is in the writer's opinion sufficiently irrefutable to establish it as absolutely certain that there will be commercial vehicle garages and that the business of conducting them will be concentrated in comparatively few hands and therefore will be big and profitable for those few.

A big evolution, as that of the use of motor vehicles for commercial transportation work, is not going to be halted or swamped by the lack of men coming to the front to do the right thing for the maintenance of the vehicles; neither will it suffer itself to be delayed much by waiting for the time when every merchant will be able to get competent, conscientious help for taking care of petty installations of two or three vehicles; and that great majority of merchants who in the aggregate count for most in the matter have no use for more.

LINES OF ORGANIZATION.

Assuming now that somehow the commercial garage will grow out of the present condition, with the hearty support of manufacturers who are now suffering from nothing so much as from the reaction of poor maintenance and from the lack of competent agents to place and protect sales, what are the lines upon which it must be conducted?

The problem is to give the vehicle owner the whole benefit to be derived from the constant utilization of his property, at a price which will leave the garage man a profit.

The greatest danger, experience has already shown, lies in placing the general charges too low, thereby compelling high and frequent specific charges, which create dissatisfaction. To avoid this danger the garage man should be thoroughly informed on the manifold business advantages and savings which the use of motor vehicles brings the owner, so as to be able to show the latter in figures what the money value is of a garage method tion system up to a high pitch of regularity and skill, to systematize drivers' reports of irregularities, to keep tab on overload and road speeds and mileage from instrumental records, and to maintain those relations with manufacturers which will bring spare parts to him before they are absolutely needed.

The main idea must be to avoid interruptions of service and high, irregular repair bills by all means. With electric vehicles, for example, the average cost of battery maintenance and battery renewal should undoubtedly be calculated in advance and added to general charges, collectable monthly. For all vehicles normal tire charges should be similarly distributed over the year, leaving only absolutely specific work on batteries or tires to be charged for specially. Sliding scale charges for overloads, overspeeds and over mileage would take care of fluctuations in the normal maintenance cost and would impress upon the vehicle owner in a perfectly equitable manner the necessity of training shippers, loaders and drivers properly.

Undoubtedly the garage man should keep an account book for each vehicle (not only for each customer) and should be able to show the owner speed records, load records, mileage, etc., and their relation to repair records; also the commercial work done by each vehicle and the cost of doing it, so as to assist the owner in picking additional vehicles right, and so as to enable himself to present a clear case to prospective customers, making every bit of knowledge acquired serve the purpose of enlarging the volume of his garage business, but refraining from "entangling alliances" with manufacturers beyond a uniform commission on the sale of vehicles and parts. The vehicles which will pay him best are necessarily those which will pay the user best, since the supposition is that only those go into the commercial garage business who see their future in doing business on that basis.

Over the pleasure vehicle garage man he will have the advantage that his real estate or rental investment may be reduced not only by choosing a location with a view to economy but also by building very compactly, adding floors as the business grows. As vehicles are to be taken out and returned with great regularity, morning and evening, night storage on upper floors is more practicable than for pleasure cars. But his greatest advantage over the pleasure vehicle garage man is dependent upon the fact that he becomes the partner in the use and rational exploitation of the earning capacity of motor vehicles, and not the begrudged beneficiary of their abuse.

There can be but little doubt, it seems, that a garage business conducted on the lines indicated will gradually place the garage owner in possession of a vast fund

practical knowledge bearing not only upon utilization and maintenance but also strongly upon construction, and it will depend upon himself whether this knowledge shall take him into the manufacturing industry or into broader organization of garage work or, by virtue of the economies in transportation work which he will be the first to discover, into the trucking, express or general transportation business.

As compared with the paltry work of catering to the notions of pleasure vehicle owners and their servants, watching the little ephemeral fads in accessories, plucking a fleeting profit from the ignorance or perversity of customers, the organization and operation of garages for commercial motor vehicles present possibilities for indefinite enlargement of activities which should satisfy the most ambitious.

The Building, Equipment and Maintenance of a Commercial Vehicle Garage.

By Fay L. Faurote.

To a company which has been formed for the purpose of handling the delivery work of a number of concerns in a large city the question of the construction and equipment of a garage is a most important matter. There are several things which should be taken into consideration. First, the location of the garage; second, the material of which the building is to be constructed; third, fire protection; fourth, lighting; fifth, heating; sixth, ventilation; seventh, drainage. Owing to the fact that the commercial vehicle business is still in its infancy, many of these features have not as yet had careful consideration, and it is therefore with a view toward furnishing some suggestions to those intending to engage in this business that this article is submitted for the consideration of the readers of this magazine.

LOCATION OF BUILDING.

Anent the selection of a building, it may be said that it is very seldom possible to remodel an old building in such a manner as to make it entirely satisfactory. The problems of lighting, ventilation, drainage and floor construction are very difficult to solve, and nearly everyone who has tried to utilize an old building has found that it is practically impossible—the remodeling costing almost as much as a new building. All of the up to date garages are being constructed almost entirely of brick, concrete and steel, all of which are fireproof and easy to keep clean and painted.

The location of the garage should be determined by three things, namely: First, amount spent for rental or taxes; second, proximity to customers; third, fire protection.

LAYOUT OF BUILDING.

Having determined the location and form of construction for the building, the questions of shape and dimensions are next to be considered. In the case of the garage shown in the illustration, the size and shape of the floor space are so figured that a runway is provided along both walls and the centre of the floor is reserved for the distributing tables and distributing cars; that is, it was planned so that cars coming from the various firms of the city could deliver the packages onto the main distributing tables, and then, after passing around for their regular supply of gasoline and oil, could be driven out again without reversing or interfering in any way with the work which was being carried out on the floor. If you will refer to the drawing you will see that this arrangement works out very nicely, making it possible for eight or a dozen wagons to load or unload in an extremely short time, without interfering with the others in any way whatever.

The length of this particular building is 185 feet, width 60 feet. The structure, with the exception of 90 feet in front, is one story, provided with regular steel roof and skylight so often used in factory construction. The front part of the building was made two stories high in order to provide for a repair shop and stock room.

Another point which may be mentioned in this connection is the fact that whenever possible posts used for supporting the roof should be avoided, and a steel truss construction used instead. In the front part of the building the latter construction has been used, while in the rear you will notice the former.

The location of the posts, however, is such that, in this case, they do not materially interfere with the moving of the cars.

DRAINING.

The floor should be of concrete, and so made that any water which may drop on to its surface will flow toward the centre or toward the wall, according to the system of drainage used. In the garage under consideration the floor is slanted so that the water flows toward the centre, and is drained out through holes in the concrete. Each outlet is provided with a small iron plate drilled full of holes, which, while they are large enough to allow the water to run through, will not permit the drawing in of waste and paper which may have collected on the floor.

Large galvanized iron pans should be provided, which can be placed under the cars to collect any oil which may drip out of the bearings. This, many times, will save a concern considerable money, because much of the oil, if run through an oil filter, may be used over again.

Suitable water connections should be provided along the floor, and sufficient pressure maintained in the mains so that the floors may be flushed easily and quickly.

LIGHTING SYSTEM.

The lighting of a garage, especially at night, is a difficult proposition, owing to the fact that insurance companies will not allow the use of what they term "an open flame light." Electric arc lights of the ordinary form and gaslights come under this head, and therefore their use has been prohibited. Some form of enclosed electric light, such as the incandescent, must be used. Sixty lights of the incandescent variety are used in the garage which has been described. In addition to this several extension cords are provided which allow the



A View in the Commercial Vehicle Garage.



A Repair Pit.



Oil and Gasoline Cage.



Runway to Upper Floor.

lights to be transferred from one position to another, as is often necessary when working around and underneath the cars.

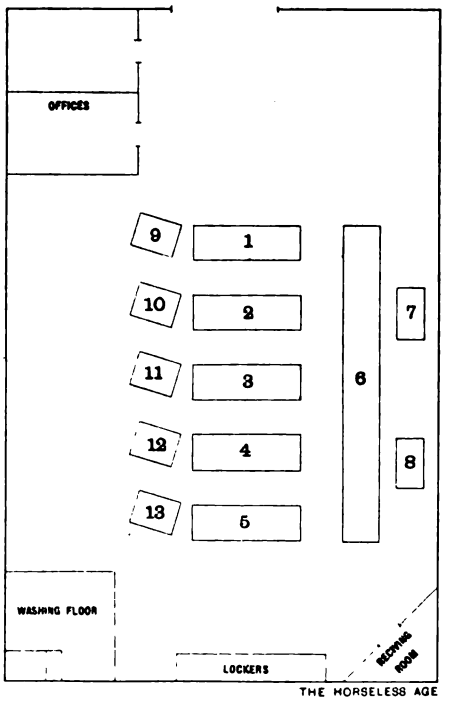
During the day the whole garage is, of course, lighted through the windows in the side wall and skylight.

HEATING SYSTEM.

Two methods of heating have been found to be satisfactory in garage practice. One is the hot air system; air being heated by passing over a set of steam coils, and finally distributed into the various parts of the room by means of large tin pipes. The circulation is forced by means of a blast fan driven by an electric motor. The second system, and the one which is more commonly used, is the regular form of steam heating. A number of pipes are strung around the walls of the garage, and steam from a steam boiler is circulated through them. When this system is used it is advisable to place the pipes some five or six feet from the floor, in order to keep them out of the way and prevent the rubber tires of the cars from coming in contact with them.

The question of ventilation is a very important one, for the reason that the suffocating gases which are produced by imperfect combustion of gasoline are very disagreeable to breathe, and many times cause severe headaches and sometimes unconsciousness. During the winter it is a very hard matter to keep the air in a garage pure and at the same time keep the temperature at a comfortable point. Exhaust fans, driven by electric motors, are used, but even they are rather unsatisfactory. Air chutes, similar to those used in blacksmith shops, are also sometimes provided. They are fairly satisfactory, but tend to increase the heating expense to an alarming extent. Whenever a machine is run for some time indoors it is always a good policy to connect the outlet pipe of the muffler to a pipe running to the outside of the building, thereby doing away with a large amount of gas which would otherwise be forced out into the room.

Probably of no less importance is the arrangement made for storing gasoline and oil. Insurance companies are very strict as to the handling of gasoline, and it is therefore nearly always good policy to equip your garage with a gasoline storage system which meets with their approval. In the writer's opinion, the most satisfactory one of these is an hydraulic system, shown in the photograph. In this system the tank is always filled with water and gasoline, the former, owing to its density, occupying the lower part of the tank and the latter the upper. As the gasoline is forced out, the space in the tank is filled with water, thus allowing no air spaces to form, the vapor in which might cause an explosion. When the tank is refilled the reverse operation takes place, but at no time in the emptying or filling is there a chance for any appreciable amount of gasoline vapor to accumulate in any portion of the tank. Furthermore, the whole apparatus, except the filling and delivery pipes, may be buried underground, thereby making doubly sure that no conflagration can take place.



Floor Plan of Garage.

1—5, sorting tables; 6, main distributing table; 7 and 8, cars unloading; 9—13, cars loading.

For the storage of lubricating oil any of the self measuring cabinet tanks will be found satisfactory. The tank shown in the illustration holds 64 gallons, and the gasoline tank 250 gallons.

FIRE PROTECTION.

A proper fire protection equipment is absolutely essential. Numerous fire extinguishers are on the market, but the regular chemical extinguishers which generate carbonic acid gas have been found to be most efficient. In addition to these there should be hung at various places about the room pails of wet sand. A gasoline fire is very hard to put out with water, and therefore at the beginning of a conflagration the chemicals and sand should be used. Many buildings are equipped with a sprinkling system, which is so laid out as to cover the entire floor space. The various nozzles are sealed with a metal which melts at a rather low temperature, consequently the apparatus works automatically, and as soon as the fire attains such proportions as to heat the air of the room to this melting point the whole floor and objects upon it will be flooded.

PIT AND WASHING DECK.

The balance of the equipment of the garage varies according to the number of

wagons being used, and the amount of money which the company is willing to spend in repair shop machinery and tools. In order to take care of the business properly a repair shop is absolutely necessary. A provision may be made for doing light repair work in one corner of the garage by building a pit in the floor, over which the machine may be run for occasional adjustment. The proper size for a pit is about 4 feet wide by 4 feet deep by 8 or 10 feet long, the length, of course, depending upon the wheel base of the cars being used.

Another part of the repair shop which may well be left on the garage floor is the washing deck. If the floor is made entirely of concrete it will be an easy matter, by sloping a portion of the floor so that it will drain easily and quickly to one point, to locate the washing deck in one corner of the garage. Various forms of washing devices may be obtained, some having a swivel joint in the piping, making it possible to carry the hose around the entire car without kinking it. This form has proved very satisfactory, as it does not wear out easily.



Method of Collecting and Delivering According to Routes.

REPAIR DEPARTMENT.

The repair department proper should be located on another floor, independent of the garage floor proper, and it is therefore necessary to provide some sort of runway or elevator by means of which the cars may be transferred from the ground floor to the repair shop. If an inexpensive equipment is desired a stairway, fitted with board treads on the side and block and tackle at the top, may be utilized, but if possible an elevator should be installed, especially if the building is of more than two stories.

The machinery for the repair shop should be well selected and should be complete enough so that practically any part of the motor vehicles may be repaired in the garage. A fair sized drill press, a shaper or planer, a milling machine and a set of buffing and emery wheels will answer the purpose as far as machine tools are concerned. A blacksmith's forge, anvil and set of tools is another part of the shop which is almost indispensable. The rest of the outfit will vary, but a portable crane, a few "turntable" rollers, an electric drill, a small air compressor, with its accompanying storage tank, a portable buffing machine, driven by an electric motor, a battery charging outfit, a soldering outfit, tire testing tank, a number of galvanized iron waste cans, and a complete set of tools, such as hammers, wrenches, chisels, drills, etc., will be found almost indispensable.

Situated in one corner of the repair shop should be a stockroom fitted with various bins and pigeonholes, in which the various repair parts for the machines may be kept.

It is very often necessary in a large garage to keep a man in the building all night, either to wait on customers or to make some very early trips. In this case it is good policy to provide a room for him in some portion of the shop where he can be easily called. A room of this kind is provided in the garage described, and is used by one of the drivers who is obliged to make a very early trip in the morning. The work is being done for the government under contract, and so, in order to make sure that the car will always go out on time, the company adopted this plan. The man is always there ready for business, and a trip has never been missed.

RULES OF THE BUSINESS.

The maintenance of an efficient delivery service is a very hard proposition, owing to the fact that everything has to be done exactly according to the schedule. Each man is required to report on time, punch his number on the time clock, and report for duty, with his wagon properly cleaned, filled and ready for business. The management does everything possible to facilitate the work, and everything in the garage is kept in the best possible condition. The walls are painted regularly with a cold water paint by means of a large force pump, and everything is done to keep the room light and well ventilated.

Each man is held responsible for his car, and, in addition to this, he is required to keep and turn in every day complete records of the amount of gasoline and lubricating oil used, number of stops and trips made, and any other data which would be of assistance to the management.

Complete records are kept of each car's performance, and from these data bids are made for the business of the various merchants of the city. As the commercial end of the automobile business is as yet almost undeveloped, there are any number of opportunities to get business, and it will only be a question of a few years before the numerous obstacles which now present themselves will be overcome and the self propelled delivery car universally accepted.

Roswell Company's Garage, New Mexico.

The storage of motor cars does not worry the automobile men of New Mexico, where three hundred clear days in the year permit the cars to be on the road practically all the time. The only care of automobilists in that part of the country is the repairs that must be put on the machines. It is, therefore, easily understood why the repair shop there is the most important part of a garage. These are the conditions in eastern New Mexico, at least, where the Roswell-Torrance mail and passenger stage operates. These are the conditions that were considered by the Roswell Automobile Company in building its new garage at Roswell.

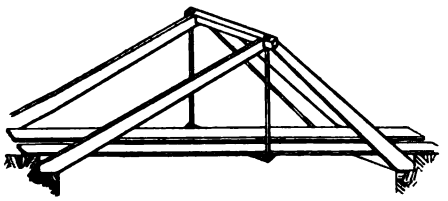
The Roswell Company's garage is a two story brick, 25x70 feet in its lateral dimensions. This floor space is divided in halves, the front room for office, desk and storage, and the rear apartment for a workshop. The whole is floored in concrete.

While the workshop is not large, the best of everything has been secured for its equipment. Every piece of machinery and every appliance is of the very best that could be bought. A large gasoline engine supplies power for a drill press, lathe and shaper. The tool bench is complete. The floor of the shop is constructed so as to make an ideal wash room for incoming cars. A strong stream from an artesian well gives the water and power to remove all mud and

dust, and this water is carried out through a sink hole in the lowest point of the floor.

Under construction at present is a tower on the outside of the shop upon which will be placed a large tank that will contain a large supply of gasoline. This tank will be fitted with pipe and hose that will make the filling of a machine's reservoir an easy matter.

Under construction in the Roswell Company's garage is something new and unique —an automobile bridge. The structure is being built in parts in Roswell and will be moved eighteen miles north and placed at the point where the Roswell-Torrance route crosses Salt Creek. It will be at a point where the new route now being built will touch the one stream of any consequence between the terminals. The bridge is an invention of Manager J. W. Stockard, of the Roswell Automobile Company. It will be a suspension affair, two long troughs hanging from an immense truss. Thus the bridge will have no floor and will be of no service to any vehicle except an automobile, and will not be injured by the ordinary travel and herds of cattle will not molest it. Four immense poles will be utilized in making the spans. They will be placed end to end in pairs, the joints making the apex of the arch. From this apex will be suspended beams that will be connected



with a cross piece at the bottom and this cross piece will support the troughs in the middle of the structure. Their ends will rest on the banks of the stream.

The idea of this suspension bridge was gained from a neat appliance built for the workshop in the form of automobile trestles, which are shown in the accompanying cut. These are ordinary work trestles surmounted by movable troughs, with approach troughs that make it easy to put a car on top of all. The advantages of having the car on these trestles are many in case of repairs or cleaning.

A Gasoline Truck Garage.

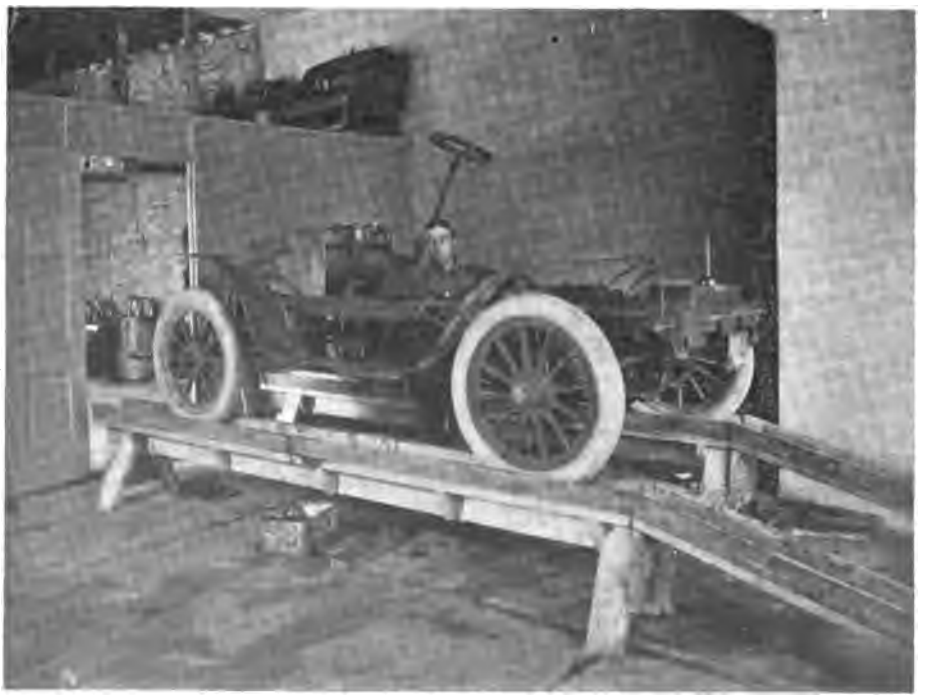
The Chelsea Auto Storage Company, of 516 West Thirty-seventh street, New York, are, as far as we have been able to learn, the only garage which makes a specialty of commercial gasoline vehicles; no electric vehicles are taken. Their method of doing business is unique and bids fair to be in a great measure a solution of the care and maintenance of motor trucks. This company say to the business concerns who own gasoline comercial vehicles: For a set sum we will maintain and repair your machines and deliver them at your door ready for



ROSWELL GARAGE, SHOWING CORNER OF REPAIR SHOP.

service at the time appointed each day. They shoulder the entire responsibility and expense for gasoline, oil, new tires, all repairs and the hire of the chauffeur. Their contracts usually read from one to six years, with a six months' clause which allows either party to withdraw upon giving notice. The trucks are delivered at the door for each day's service of 12 consecutive hours. In case of failure to deliver the car, they retain the right to substitute another machine of their own capable of doing the work. In case of failure to do this they forfeit for each hour a fixed sum, usually in the neighborhood of 45 cents. On the other hand, if the user operates the machine for longer than 12 consecutive hours he agrees to pay the sum of approximately 75 cents per hour for each additional hour's use, or these additional hours are credited to the storage company. The sum forfeited by the storage company is less, as their expense of storage continues during this time.

The charge for this kind of service varies according to the nature of the machine and its work, but is in general in the neighborhood of $200 to $300 per month for large trucks, ranging from three to six tons. The machines now in use average daily about 75 miles, and it is estimated that the



ROSWELL GARAGE, SHOWING AUTOMOBILE TRESTLES.

work which they accomplish is done at a saving of approximately 20 per cent. over horse drawn delivery. Each truck has its number and corresponding space allotted to it. in the garage, and the drivers are required, upon returning, to put their machine in such condition that it will be ready for service the following day; or, in case of the necessity for repairs which would render this impossible, they are required to report such conditions, so that a substitute car can be put in service. The garage is open day and night, with a man in charge, at all times, from whom the chauffeurs may obtain necessary tools and supplies by signing a sheet under which is fastened a carbon in such a way that a duplicate record is made on the back of the sheet written on and also on a sheet beneath. This makes it impossible for men to obtain supplies without a record of the same being kept. These sheets also serve as a means for estimating the expense of operation of the various trucks, an accurate account of which is kept. The time for repairs on each machine is also kept, and as the chauffeurs are hired by the month and are not paid for any job work or any work on a special machine, there is no object for them to incorrectly report the time taken for such repairs.

General garaging of trucks for firms who have not taken up the maintaining proposition is also done, but it is found that, as a rule, after they put in operation more than two trucks they are willing to sign this kind of a contract and put the responsibility on the garage. This is often brought about by the fact that the average user has no man already in his service who is especially fitted for maintaining such machines, and very few of them are willing to specially hire a high priced man for this service, which is absolutely necessary if good results are to be obtained.

Commercial Vehicles as Used by Houghton & Dutton, of Boston.

Houghton & Dutton are by far the largest commercial vehicle users in Boston, and now have fifteen gasoline two cylinder, air cooled cars of well known type, all of which are fitted with solid rubber tires. These are taken care of and repaired by E. A. Bythrow at the Tremont Garage, where they have ample space for storage and a repair shop in the basement, which is directly accessible from the rear without the use of elevators. This company has been using motor trucks for three years, and, according to Mr. Bythrow, there is a saving over horse drawn vehicles, even though he admits that the present delivery wagons are not what they should be. However, twelve of these fifteen trucks are kept in constant service, and are able to make two daily deliveries to out of town districts which never before received but one delivery, even at a time when there was much less to be delivered. One of these machines will do the work which it would take two two-horse teams to do, and the chances are that the next day the horses would be unfit for such severe service. Horses are still used for short city hauls, while the motor vehicles are used entirely for outside deliveries within a range of 10 miles from the city limits, or about a limit of 25 miles from the store. During the only time that odometers were used on these vehicles they averaged 451 miles per week; no recording devices have yet been applied to them. The gasoline consumption is approximately 8 or 9 miles to the gallon. By experimenting with a certain well known carburetor which has been adjusted to these cars, it has been found possible to use a 68 test gasoline instead of 76, the former costing about 4 cents a gallon less, which amounts to a saving in the neighborhood of $4 a day. A man and a boy are employed with these machines, and four men are kept in the repair shop.

Mr. Bythrow expressed his opinion in regard to the present form of delivery wagon, stating that they were designed entirely too much along pleasure vehicle lines, and that neither the frame nor the parts of the engine were made sufficiently strong to withstand the tendency to crystallization, owing to the continuous vibration. Solid tires are absolutely necessary in this class of work, and are one of the heavy expenses, as it has been found that pneumatics will not stand up under the strain. These solid tires, however, have been made to do for 3,000 miles over cobblestones, instead of 2,800, for which they were built, and last in the neighborhood of eleven months. Solid tires being a necessity, a better arrangement of springs is demanded. He states that four-fifths of the trouble is from breakage due to crystallization, and not to wear. He even advocates driving in the car tracks, which is extremely hard on the tires; but the cost due to wear on the tires is much less than the repairs due to breakage from running over extremely rough pavements.

Nearly all trucks are run with an overload, which is another cause of trouble. At the present time Mr. Bythrow is redesigning a truck, in the hopes of producing a machine suitable for their special needs, which is the delivery of parcels, groceries or furniture. Cars for the latter purpose are fitted with special bodies and tops with drop sides. He believes in building the front of the machine in the nature of a bumper, so that in case of minor collisions the dashboard or steering gear will not be disabled. The steering will be by wheel, the engine entirely protected from the mud, and the springs at the rear will be of the platform type. A three speed sliding gear will probably be used, but provided with an automatic brake to slow down the speed of the clutch and gears at the time of shifting. He is not in favor of planetary gearing for delivery wagons.

Central Park Automobile Storage Company.

Located at 110th street and Central Park West is a new garage which is unique as having the largest storing capacity of any one story building in the city. It is built of terra cotta and reinforced concrete and has four large entrances, two at each end, the ends being on different streets, so that a machine can enter and pass out again without turning round, a path being always left open for this purpose. The building being but one story, no elevators are necessary. The floor is approximately 90x150 feet and will accommodate in the neighborhood of 125 cars. It is lighted by six skylights, each 20x20 feet, and the ceiling is 27 feet high. A balcony is arranged across the rear, on which are the chauffeurs' lockers.

System of Checking Cars, as to Arrival, Departure and Who Uses Them.

By J. Grant Cramer.

In order to keep track of times when the chauffeur takes out the owner's car, particularly when the employee has a general authorization to do so, let the employer furnish the chauffeur with numbered slips on which is typewritten or printed the owner's name and permission to take out the car. Each time the car goes out one of these slips must be handed to the person in authority having charge of the garage at that time, and be by him countersigned; the slip must bear the minute, hour and date of going, and must be signed by the chauffeur. It should be signed just at the time of departure and not an hour or two before leaving. A similar slip should be turned in when the car returns. At the end of the week these slips should be returned to the owner of the car. If garage keepers are sincere in their statements that they desire to abate the evil of the unauthorized use of cars by chauffeurs, I think that the above would be a good check on the latter. If an additional check is desired the garage owner could keep a big book into which the particulars found on the above mentioned slips could be transferred immediately upon receiving them; of course, having them signed by the person in charge.

Another very prevalent evil is that of chauffeurs demanding commissions of dealers and agents, and of selling supplies which, in most cases, they have not come by honestly. Let a blacklist be kept at the headquarters of the Automobile Dealers' and Agents' Association; each time that a chauffeur demands a commission of any kind whatsoever let it be refused and his name, the date and kind of demand be entered upon that blacklist, and let the employer be informed as to the exact nature thereof. In case the chauffeur attempts to sell supplies without the written authorization of his master, let the latter be informed, and if the supplies have been stolen let the chauffeur be proceeded against and treated as in a case of larceny.

Such a policy, uniformly pursued, would go a long way toward doing away with the evils just mentioned and prove satisfactory to garage keepers and patrons alike.

A Model Garage.

By C. H. T.

paramount question of the day to the bile owner is, How shall I take care car? An outlay of from $1,000 to for a piece of delicate mechanism, an automobile, demands that a suitice be provided in which this mechanbe kept, with as little risk as possihe owner has his choice of placing in a public garage, with its many ntages, or of providing a garage of n, built upon his own lines and folhis own ideas and inclinations. A deal has been said about the public of today, to its very great detri. On the other hand, as compared , the advantages of the private gare manifold. With a private garage is at the owner's door at all times, needed, either day or night, with no ng and expensive waits. He has to his car at all times, to study its nism and familiarize himself with its gs. An owner who has his own garves considerable by buying his gasod lubricating oils by the wholesale, he have a chauffeur repairs can be at cost, and there is a saving which ear's time would amount to a conble sum of money. Careless mannt, overcharging and incompetence loyees are some of the evils that exmost public garages today. It is imle for garage employees to be famil-



Front Elevation.

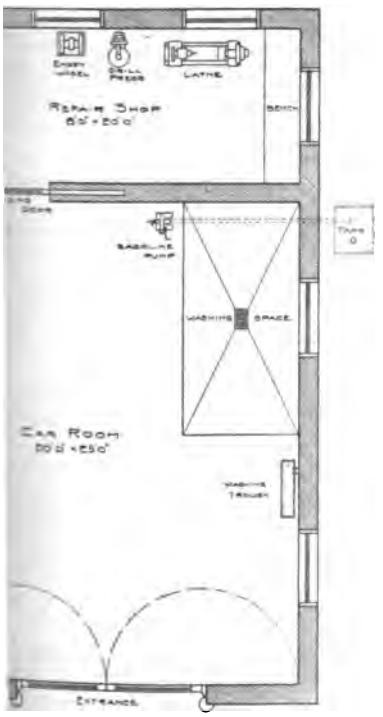
iar with every make of car, and as a result the owner submits his car to inexperienced hands. The result is it takes an unreasonable length of time to find the trouble, and the bill amounts up accordingly, as all time is charged to the owner at a certain rate per hour. This rate is the same whether the car is simply being washed or whether the machinist is making an important repair. If the repairs are made by an apprentice the rate charged is the same. The writer knows of a case where a gentleman sent his car to the garage to have a stud replaced. The bill rendered was $13.75. Of this amount 75 cents was for material and the balance for the time. At this rate the owner, with his own repair shop and chauffeur, could nearly save enough to purchase a new car every year.

The building shown in the accompanying plans makes an ideal garage for the man with one or two cars and a chauffeur. It is of two story construction, but can be built only one story high, if there is no chauffeur and the owner is of a mechanical turn of mind, and can make his own repairs. Everything has been designed with the idea of economizing space, reducing fire risks and minimizing all chances of accidents. The building is made as nearly fireproof as possible, ventilation, heating, lighting and plumbing all being taken into consideration. The construction is of cement pressed into blocks, in imitation of cut stone, with a roof of terra cotta tile. This is an ideal construction for such a building. The cement blocks are made by a very simple and cheap machine, by which any design or style of stone can be imitated in cement, at a cost cheaper than either stone or brick. The face of these blocks can be made of two parts cement and one part sand; the body, one part cement and five parts gravel and sand. These blocks are made with a core through them to provide for air circulation through them. The face of the blocks is impervious to water, resists all climatic changes, and will not crumble or disintegrate. The machine for making the blocks can be operated by an ordinary laborer, and charge for ordinary brick.

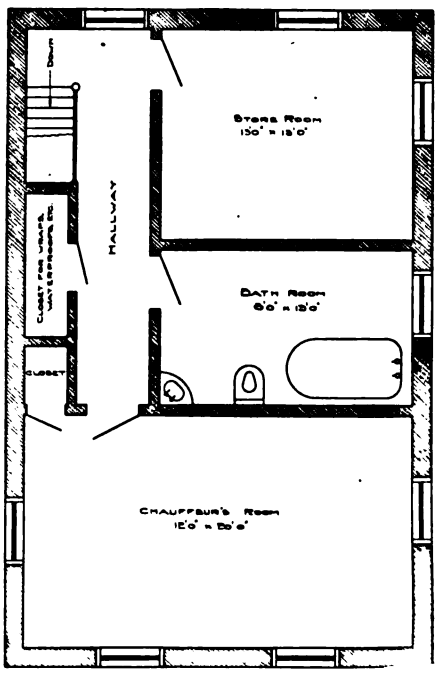
The building shown is 22 feet wide and 35 feet long, and the car room on the first floor will comfortably hold two large touring cars, with ample space for turning. The car room is 20 feet wide and 25 feet long, with an entrance of large double doors, 10 feet wide, which swing in and back against the front walls, taking up no space when open. These doors may be made after the fashion of Dutch doors, and when desired the upper half can be swung open while the lower half is kept closed. The floor is of cement, one corner being so constructed as to provide space for washing the cars. This space has a drain in the centre, that is about 2 inches lower than the sides, which are on a level with the floor. This confines all water to this space, so that the entire floor is not slopped up when washing.

Directly overhead on the ceiling is placed a washing machine, of which there are several on the market. These machines consist of a ceiling plate, a ball bearing joint, and a hose arm of iron pipe about 5 feet long, which swings horizontally near the ceiling, and to which a rubber hose is attached, that is just long enough to reach the floor. This is very handy, as a man can walk all around the car and swing the hose around with him. Nozzles for washing can be purchased which give intermittent jets of water, which are very effective in removing caked mud.

A gasoline pump is located in this room, with the tank sunk underground outside of the building. The pump shown is of well known make, and is very convenient and economical. This pump can be regulated so that any desired amount of gasoline can be drawn from the tank. This prevents run-



First Floor Plan.



Second Floor Plan.

ning over of car tanks while filling, and results in a great saving.

Four large windows are provided in this room, and are so arranged that by lifting the lower sash the upper sash is lowered at the same time, which furnishes a draught, removing immediately all smoke and odors. All the windows on the first floor are protected by ornamental iron guards on the outside.

Heating has been arranged for by providing coils of pipe run around the walls, about 2 or 3 feet from the floor, in order to be out of the way. In this room should be placed a sandbox for fire use in case of emergency. Sprinklers should be arranged on the ceiling, about 3 feet apart. A track for a chain hoist should be run from the car room, back into the repair shop, in order to remove the engine, transmission or any other heavy part from the car and run it into the repair shop for repairs. This hoist can also be used for removing or changing car bodies.

The repair shop is located in the rear, and has three windows and a rear entrance. This room contains a work bench, a lathe, a drill press and an emery wheel. Power for these machines is furnished by an electric motor, which may also be utilized for operating a power air pump, for inflating tires and cleaning by compressed air. Electric light wires for lighting purposes should be run in iron pipe, and be connected to incandescent lamps through ceiling brackets, which are bolted to the ceiling with a ball joint, and have adjustable arms, so that the light may be thrown in any desired position. An oil tank, with force pump for lubricating oils, could be conveniently kept under an ornamental iron stairway, which leads to the second floor. On this floor are three rooms, a front room, 12 feet wide by 20 feet long, intended for the chauffeur, and a bathroom, 8x13 feet, containing a bath tub, stationary washstand and a toilet.

The third room is a storeroom, which may be used for storing extra tires, batteries, lamps, touring baskets, trunks and other supplies. Across the hall is provided a large closet for winter coats, furs, waterproofs, linen dusters and all necessary clothing needed on touring trips. These rooms may be changed to suit individual ideas, or the entire second floor may be turned into one large room and used for storing cars in winter if not in use. A lift could be installed, operated by electric power, to run from the first to the second floor for hoisting cars.

A building laid out and constructed along these lines will be both ornamental as well as serviceable, and will well repay its cost.

A Low Priced But Serviceable Garage.

By Walter C. Scott.

In building a garage the first thing to be thought of is the site. The owner should choose a high one with plenty of sunlight if he would avoid dampness. Next comes the floor, which should be of cement, sloping towards the front. If the owner wishes, he may have a pit in the centre, but this is by no means necessary, especially if the engine of his car be under the hood and not under the body.

A well built frame building is good enough for all practical purposes. Its size will depend on that of the owner's pocketbook, but in the writer's opinion it should not be less than 10 by 20 feet. There should be a window at each side, and a skylight is highly desirable, not only for assisting the owner to see the inside of his car, but for ventilation. Some men prefer to have doors at both front and back of the garage, thus doing away with the annoyance of backing in or out. A work bench may be erected at one side, and a tool chest is handy.

There is, of course, an element of danger in connection with the heating, lighting and draining that should not be neglected. Steam heat is best, but where it is not to be had a room should be built at the side of the garage for a stove or a small furnace. The only artificial light to be used in the building should be produced by electricty. If the current cannot be obtained from a power house a pocket flashlight can be used when needed, but all repairs are best made in the daytime.

The water should be led through a drain to a cesspool outside the building, thus avoiding the danger of gasoline explosions. Less than a month ago the writer noticed a case where a man was painfully injured by dropping a lighted match through the drain into a cesspool beneath the floor.

If the owner cannot afford to buy one of the gasoline storage outfits he should place a galvanized tank at a safe distance from the garage, and under no conditions should gasoline be kept in the building in an open vessel. If the city water be installed a hose can be used to fill the radiator and to wash the car. Care should be taken to loosen the mud with the water before a sponge is applied. Tires should not be washed, as water injures the rubber.

A Plea for Private Garages.

By F. M. Crain, M. D.

Garages in cities are necessary for the accommodation of those who cannot provide a permanent house for their automobile, or who have not the time, ability or inclination to care for their machines. But in villages and small towns, where garages could not be made to pay, the necessity for caring himself for one's automobile is imperative. The housing of an automobile in a public garage usually implies a contract to keep the car in shape for service. To the owner of an automobile this is a weak point in patronizing a public garage, for he soon falls into the habit of letting the garage employees take full charge of his car, except when he is on the road, consequently he does not become familiar with details in the mechanism and managing of his car, which is essentially necessary in order to make a success of automobiling. Responsibilities that cannot be evaded oftentimes pave the way to success in professional life. So it is with reference to handling an automobile. When one is compelled to rely on his own resources he at once "gets busy," and often accomplishes with ease and satisfaction what at first seems impossible.

There are only two ways of making automobiling a success: (1) by employing a competent and conscientious chauffeur and depending upon him to care for and drive the machine; but this method deprives the owner of the real pleasure of automobiling, for he is not an automobilist, but only a passenger; besides, this method is expensive, and beyond the financial ability of a large percentage of those who use the automobile in the discharge of their business. (2) For the owner to be master of his vehicle—not only to take charge of the wheel and throttle while on the road, but, if possible, to take full charge of his machine while in a garage, studying carefully its mechanism in every detail, and making small repairs when necessary.

The importance of caring for one's own machine at home cannot be too strongly impressed on the minds of beginners. It is the little irregularities in the early life of a child that should be safeguarded, and the more serious irregularities later in life will come less frequent. Even so with the automobile. A thorough knowledge of the anatomy and physiology (as it were) of the automobile is essential in order to detect early any departure from the normal condition of its mechanism, so that small and seemingly insignificant defects might be repaired by a novice with a limited number of inexpensive tools in his private garage.

If the little defects are remedied early and all parts kept in proper adjustment, with a sufficient amount of lubrication a car can be made to do good service, and the more expensive repairs necessitating the services of a machinist become so infrequent that one does not mind it. The expense of equipping a home garage with sufficient tools to make small repairs is insignificant.

The automobile house should be sufficiently large for the car and provide room for a work bench, vise, anvil and drills. Very few bench tools will be needed to make all small repairs. If one has the means and the inclination there is almost no limit to the expense to which one may go and the convenience that may be provided in equipping a home garage, but I submit it would be to the advantage of the owner to attend to all small repairs and depend on experienced workmen for the more difficult and important ones.

It is not necessary that a building should be made purposely for housing an automobile. My car occupies floor space between the side of my carriages, and the place

nswers every purpose of a specially built ouse.

For a physician the home housing of an utomobile is quite necessary for con-enience in case of night and urgent calls. always prepare my car in the evening for ny emergency calls that I may get dur-ig the night, and when a call comes I am o sooner dressed than I am on my way, ften reaching my destination long before am expected, which would not be the ise if I kept my car in a public garage :mote from my residence, especially if ie garage is closed during the night.

In addition to the necessary tools that home garage should contain for minor :pairs, it should have fresh batteries, ires, terminals, bolts, screws, rivets, rub-:r packing and a dozen or more little 'ticles that are needed in keeping cars in nning order. The saving in the aggre-ite cost of minor repairs that can be ade by anyone competent to manage an itomobile, and the thorough knowledge ie obtains of his machine by caring for at home, are strong points in favor of ivate garages.

A Well-Equipped Private Garage.

E. Shriver Reese, ex-president of the Cleveland A. C., uses his former carriage house as an automobile garage for storing his gasoline touring car and electric run-about. Some alterations were, of course, made in the building, and a couple of hun-dred dollars spent for tools and equipment, and the garage is considered thoroughly practical for its purpose by its owner.

The building is 36 feet wide and 30 feet deep, with a cement floor, sloping toward the wash rack. The interior finish is of Georgia pine, and the entrance to the building is through a large sliding door. The second story is fitted up as a home for the chauffeur and his family.

Among the equipment of the garage may be mentioned a Bowser gasoline pump con-nected with an underground tank, and a General Electric charging board of the mercury arc rectifier type. The rectifier is connected to alternating mains of a fre-quency of 60 cycles per second and delivers a direct current for charging of 30 amperes at either 11 or 22 volts. Further charging equipment consists of an Elwell-Parker dynamo delivering 25 amperes at 56 volts at 1,700 r. p. m. This dynamo is driven by a three phase sixty cycle Westinghouse induction motor, delivering 2 horse power at 1,700 r. p. m., the terminal pressure being 100 volts.

The shop equipment includes a Twentieth Century foot power grinder and polisher, a bench with vise, a hand drill, gasoline torch, screw jacks, lever jacks and a vari-ety of hand tools. There is also installed a Cleveland Faucet Company's Champion compressed air pump, operated by the city water pressure and connected to an air tank tested to a pressure of 300 pounds to the square inch. For turning the cars around within the garage four roller trucks are used, one of which is placed under each wheel. This dispenses with the need for a turntable. There is also an overhead wash-er, and the building is lighted by incan-descent electric and gas lights overhead. Lubricant is stored in three Bowser self-measuring oil cabinets. Mr. Reese is agent for the makes of cars he owns, which par-tially explains the very complete equipment of his auto house.

Typical Private Garages for Electric Vehicles.





H. B. Dickenson—Rockford, Ill.—J. H. Bachman.





Geo. McCulloch.—Muncie, Ind.—Dr. Cowing.

Courtesy of Pope Motor Car Co.

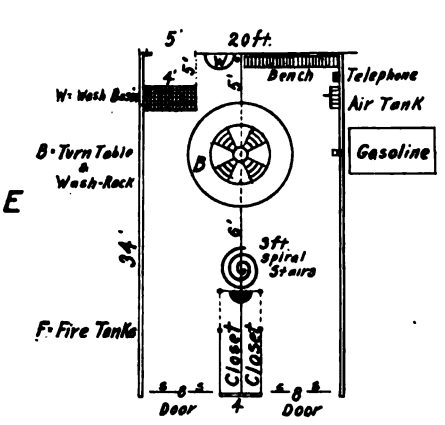
A Southern California Private Garage.

By S. V. West.

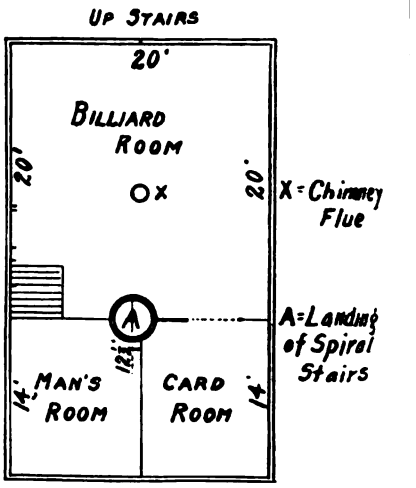
The accompanying plan and elevation show a private garage which has proved handy, efficient and comfortable. The garage is built principally of stone figured galvanized iron, both sides and roof being of this material, and is fireproof. The doors are double, each 8 feet wide and 8 feet high, with a 4 foot spring attached to the outside of each, and a chain connected to the outer end of the spring. When the auto comes onto the platform, in front of the doors, which is resting on long steel rockers, the weight of the machine causes the chain to pull down over the pulleys at M and N and swings the doors open. The chains run down in boxes inside the doors. The springs C hold the doors open until the machine is in the building. Just inside the doors are two slightly raised rounded boards a foot wide, which release the springs holding the doors and also release the chains, allowing the weight of the platform to gently close the doors. The whole rigging will cost about $50. A copper connecting plate can easily be attached to either chain, which can be made to close the circuit of the electric lights as the machine runs onto the platform.

Downstairs, as you enter the garage, are two cloak rooms, each 10 feet long and 2 feet wide, with a chemical cylinder in each, just inside the door. Just back of the closets is a spiral stairway to the next floor, 8 feet high and 3 feet wide, with a landing opening into a square hall, in which the back stairs open. Six feet from the spiral stairs and 5 feet from the rear wall is a turntable, wash rack and pit combined. The table is 8 feet in diameter, resting on a broad pivot of steel. Eight spokes with eight braces form the framework of the table. In the floor are four manholes, whose coverings can be removed easily by hand grips after the machine is on the table or before if necessary. The wooden floor is perforated to allow the wash water to run off into a sink in the alley. Above the table are two double pulleys for hoisting off the bed or lifting any part of the machinery. On the west wall are faucets attached to the gasoline tank, which is in a pit in the alley. A gasoline pump (either air pump or force pump) is attached to the gasoline drum, and a small hose can be run to the machine to fill the gasoline tank. Next to the gasoline faucet is the compressed air tank for inflating the tires. A special pressure gauge is attached to the valve and air hose to measure the pressure. Next to the air tank is the telephone, so it is handy to the work bench, which is on the north wall. Close to the work bench is the stationary wash basin.

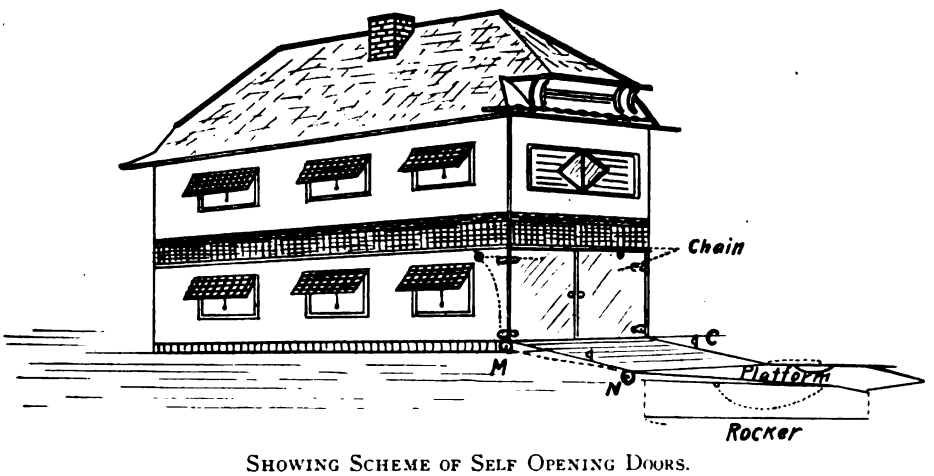
On the upper floor, above the 8 foot room below, is a 20x20 foot billiard room well appointed with windows on all sides, electric lights and fireplace or stove hole. The brick chimney can be either a common flue on the upper rafters or can be built on the alley side. In front is the chauffeurs' room, 14x12½, with stationary stand. On the west side in front is the library and card room, 14x14 feet.



Lower Floor.



Floor Plans of Southern California Private Garage.



Showing Scheme of Self Opening Doors.

A Cleveland Suburban Private Garage.

The private garage of John Sherwin at Euclid Heights, a suburb of Cleveland, is a one story natural brick building, with white trimmings, and was designed by an architect. The inside dimensions of the garage are 28 feet 10 inches in width, 22 feet 9 inches in depth and 11 feet in height. The building has a cement floor with a wash rack and a pit 45½ inches wide by 9 feet 3 inches long. The gasoline is stored in an underground tank at a distance of 20 feet from the garage, and is pumped into the building by means of a Bowser pump located in one corner of the room.

The garage is heated by steam obtained from a boiler located in an adjoining barn, the steam being led through pipes leading alng the side walls near the ceiling. Hot and cold water are obtainable at the hydrant, so that in cold weather the washer may use water of about 40° Fahr. for washing the car. For the illumination of the building there are two triple electroliers overhead, one directly over the entrance, and there is also provided one long flexible cord with a lamp at the end, for use in repair work.

The garage is equipped with a work bench 12 feet long, equipped with a vise. The building has one large entrance with a sliding door, and four windows 40x43 inches. The ceiling has a natural finish of Georgia pine. The side walls are painted a maroon color below and cream color above.

A. E. Norton, Mr. Sherwin's chauffeur, makes the following suggestions regarding an ideal garage: For the accommodation of two touring cars, as are kept in the present instance, he would have the building at least 40 feet wide and fitted with three distinct double hinged doors, in preference to one medium sized door. He would also partition off a room for a washstand, closet and robe room, and would also provide drawers for sundries, and a bench outside this room but on the same side of the garage. With respect to windows, he prefers a fairly large number of windows located fairly high up in the wall. There should also be a cabinet for light and heavy lubricating oils and for kerosene. As regards a repair outfit, Mr Norton says that his time is practically all occupied in driving, and he would not be able to do heavy repairing, and as it would not pay to hire an extra man for this work alone there is no occasion for installing an elaborate repair outfit.

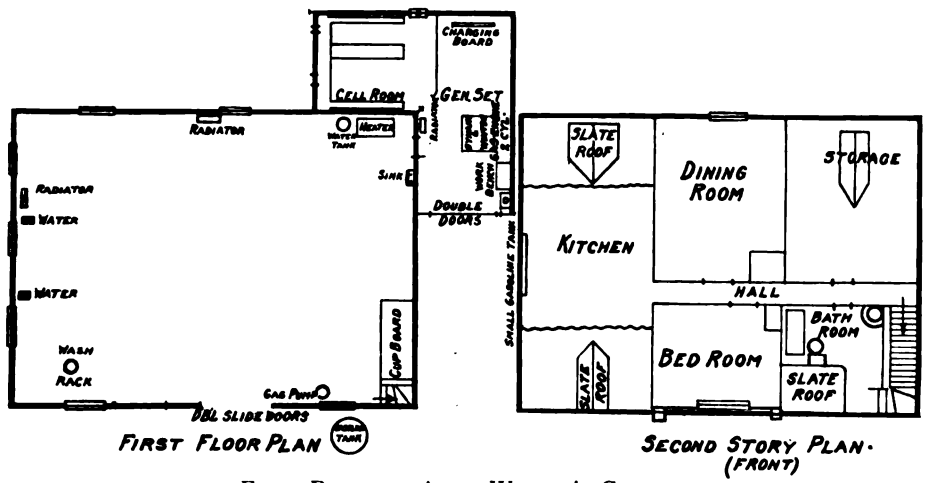
Alexander Winton's Private Garage.

Alexander Winton, of the Winton Motor Carriage Company, at his suburban residence "Roseneath," in Lakewood, Ohio, just west of Cleveland, maintains a garage for his cars which deserves notice both for its architectural beauty and its fitness for the purpose which it serves. The garage is of yellow pressed brick, with stone trimming and white painted woodwork on the outside. There are Colonial columns at either side of the main entrance, and the roof contains four dormer windows, while a dome rises at the centre of the garage. The interior is finished in Georgia pine.

The garage proper is 42 feet 2 inches in width by 32 feet 2 inches in depth; it has a cement floor, double sliding doors 10 feet wide, and seven well distributed windows. In one corner of the first floor there is a wash rack, with running water close by. At the right of the main entrance, and connected with a sheet steel underground tank of 120 gallons capacity, is a Bowser gasoline pump. The tank is located outside of the garage. Hot water heating pipes lead to every room in the building, and a hot water tank is provided for use in washing the cars during cold weather in winter. There are also a large cupboard with shelves and drawers for small tools and accessories, and a wash sink.

At one corner of the main building there is an L shaped addition which is divided into two departments, one containing a two cylinder, horizontal opposed, 20 horse power Winton gasoline engine direct connected to a dynamo; a charging board, a work bench and a 5 gallon gasoline tank supplying the engine. The other compartment contains a sixty-four cell storage battery of 320 ampere hours capacity at an eight hour discharge rate. This electric generating set was installed for lighting both the residence and the garage, as well as the grounds, which cover an area of 4½ acres. In the summer the battery is charged twice a week, and in the winter three times.

On the second floor of the garage building are living rooms which are occupied by the chauffeur and his family. These rooms include a chamber and dining room, each 12x12 feet, a kitchen and storage and bath rooms.



FLOOR PLANS OF ALEX. WINTON'S GARAGE.

A Columbus (Ohio) Private Garage.

The private garage of John Kaufman, of Bryden road, one of Columbus's prettiest residence streets, is probably one of the finest in central Ohio. The garage serves the double purpose of housing Mr. Kaufman's autos and providing a recreation room for himself and his guests. It is two stories in height, built of salmon colored, mottled, pressed brick and has two large entrances, one from the street approached by a winding drive of cement, and one from the alley.

It will comfortably accommodate five cars, six by crowding. The large sliding doors are of dark, hard wood, while the heavy rafters of the ceiling and the walls are white. A work bench and cabinet in one corner have tools for all ordinary repair work. An electric charging board is in the corner opposite. The staircase to the second floor fills the other corner, and in the offset thus formed three tanks of oil are stored, with pumps attached. The gasoline pumps are thus in full daylight to guarantee that no careless workman will light a match while filling cans. Gasoline is stored in an underground tank near the rear door. It is filled from the alley outside. The fourth corner contains a hot water heater, and for the coldest winter days there is a gas stove near the work bench. There is a pit in the centre on one side of the room, and the drain for washing is in the centre on the other.

Upstairs is a large, well furnished room for the chauffeur, and the remainder of the upper floor is taken up by Mr. Kaufman's recreation room, a favorite gathering place for Mr. Kaufman's friends during the winter. It is furnished in Colonial style, with large open fireplace and mission furniture. It contains a combination billiard and pool room, piano and player, sideboard, etc., and the walls are decorated with automobile pictures and characteristic photographs of friends.

A Canadian Private Garage.

The photograph herewith is a front view of the private garage of S. O. Greening, at Hamilton, Ont., showing the two entrances to the garage in the rear of the Greening residence. The garage was especially built and equipped under Mr. Greening's directions for the accommodation of his private automobiles, which appear in the picture. It is fitted up inside with everything requisite for the care of gasoline and steam cars. The building is heated by a hot water system and lighted by electricity.

The Private Garage—An Ideal.

BY BLANK, M. D.

The writer represents a class of owners that is at present large, is rapidly growing, and will soon be predominant. Men of this class own runabouts or light touring cars, seldom rated above 20 horse power. Their cars are for work as well as play, and they care for them themselves. They repair them also. As a rule they are men of moderate means. Their ideals in general are colored by their circumstances, and each individual's idea of the perfect garage is tinted by his personal characteristics, his car's peculiarities, his own mechanical ability, and his powers of imagination. Hence, such an article as this is of value, even to men in the writer's own class, only in a suggestive way.

Money being a large object to such men, the item of cost must influence their ideas. It seems to the writer, however, that, since the car contributes to the income, it should



O. S. GREENING'S PRIVATE GARAGE.

be dealt with generously. He believes that money spent in making his car's home sanitary, from the automobile point of view, is money well invested, and that it pays large dividends in efficiency, freedom from repair bills and economy in running expense. Hence he gives his ideals some leeway.

The garage he will in part describe is such an one as he would like to own. Many of its features are represented in his present car's quarters, and in time they will all be.

GARAGE IN THE HOUSE.

In the first place the ideal garage, like the ideal car, should be accessible. The most accessible place is the owner's house. Hence when the writer builds a home for himself, as he hopes to do soon, its sunniest corner will contain a room for his cars. This room will be separated by sound and fireproof partitions from the main house, and will have an inside entrance by a double door, as well as its outside portal. The floor will be cement, and will slope gradually, not to the centre but to the most convenient side, where water will be caught in a shallow and wide gutter and carried to a coarse strainer, thence to a large water trap, and so to the sewer. Everything about this drainage system will be large, for it will have much mud to contend with.

This floor will be but little above the ground level. The approach will be very easy. Half the broken lamps and damaged radiators are due to steep entrances.

The heating system and illumination will be the same as those of the main house. Probably hot water and certainly electricity. Natural illumination will be as great as the circumstances will allow.

STORING CAPACITY.

The floor space will accommodate, at a pinch, three cars. A man who uses his cars for business needs two. This is simply a matter of economy. A possible (with me a frequent) visitor must be provided for. There should be room also for a work bench along the lighted side, and the ceiling should be eleven or twelve feet high at least.

Electric light plugs should be many, but it is not essential that all should have bulbs. One or two on opposite sides of the room should be near the base of the wall. These are for the portable lights. It leaves the wires on the floor when in use, and not in a position so liable to trip or to need stepping over. The portable lights themselves should be provided with a large copper wire hook, preferably with a swivel in its base. With such a hook you can hang the light to almost anything. One light should be capable of being switched on from outside the outer entrance, and another from outside the inner door. This will save many barked shins both entering and leaving the room.

PIT UNHEALTHY.

One thing the writer is determined that this garage shall not have. That is a pit. The average pit is a sink that should be suppressed by the board of health. It is a dirty, dark, damp, disagreeable hole, sure to be oily, smelly and, however beautifully provided with steps, hard to get into or out of when covered by a car. When you do get in you are sure to find that you have left just the tool you want most on the bench and when you have finished in the pit and taken your work to the bench, lo and behold! your whole tool kit is in the pit. A substitute, with all a pit's advantages, plus several of its own, and few disadvantages except cost, will be discussed later. Even cost hardly figures, for this arrangement replaces 1 pit, 4 jacks, 1 turntable and 2 skates.

EXHAUST OUTLETS.

Through an outer wall of this room, in some convenient, out of the way spot, an iron pipe will be let. A rubber hose connection with a slip joint big enough to slide over the exhaust pipe of the muffler will be provided. Adapters to fit various sizes of exhaust pipes are easy to arrange. This simple contrivance the writer knows from experience to be exceedingly convenient, as it allows running the motor indefinitely in a closed and heated room without vitiating its atmosphere. At times this is a very important point, as the exhaust gases are by no means harmless. The contrivance costs little in money or trouble, and it seems queer that it is not more common.

WASHING FACILITIES.

An overhead swivelled connection for the washing hose will be provided, with the plumbing so arranged that the hose can deliver water of any temperature. Also the working end of the hose will be provided with means for holding a sponge to it. Such an attachment is now on the market. Why didn't the writer patent his five years ago?

A washstand, suitably equipped, will prevent much disorder in the family bath room.

A long distance gasoline outfit, and a few tubes of Kilfyre or one of the other extinguishers, with the regular washing hose, should be ample fire protection. A fusible plug with sprinkler in the overhead plumbing should render this system perfect. Drip pans filled with sand, to be emptied into the ash cans when foul, will be provided, and waste gasoline or kerosene will be burnt outdoors. That's the only way the writer knows to get rid of this stuff unless you live in the open country.

WORK BENCH EQUIPMENT.

The ideal equipment of the work bench needs a special article by itself. It should be only what one's manual skill demands, and should grow with it. A vise, a small anvil, a drill press, a small lathe, will naturally follow each other. A soldering and brazing outfit are convenient. Drills, files, hack saws, punches, taps, dies, wrenches, etc., all are handy. The writer has them all now except the lathe. Power you have with you in your legs and the exercise of which your car deprives you in one way it may give you in another. However, a motor with a connection to a lamp plug is more to the writer's fancy. Whenever he has a job about the house for which he would ordinarily pay a mechanic, he uses the money for tools and does it himself. In that way the tools come easy and knowledge and skill grow. Lots of work which has no connection with automobiling is done now in his garage.

GARAGE APPLIANCE IDEA.

In saying that a substitute for the pit would be discussed the writer may have conveyed a false impression. He has never seen such a substitute, and in fact does not know that such a thing exists. But if he has the ingenuity (and he thinks he has) it will be in active operation soon. Hence we can only discuss what this piece of garage furniture is to do and be, not how it is to be constructed. It is to be a big jack, capable of lifting the whole car an inch or so quickly and slowly to elevate it to a height of about 5 feet. It will be on swivelled rollers and able while loaded to turn about its own centre as a turntable, or to be moved to any part of the floor, so replacing skates. At its extreme height it would elevate the car to the most convenient height for working under it and yet leave the bench and tools accessible. It would improve the working illumination greatly. It would at its lowest position be able to roll under the car. It would usually be left where the car generally stands. The car when returning from its day's work would be run over it. Its position would quickly be made accurate by its own rollers and a well directed kick or two. A movement of the crank or lever and the car's weight would be lifted from its tires. That's the problem. The solution is as yet a little hazy.

Doubtless if the writer had this equipment he would find any number of places in which it could be improved. What of it? He would dislike to reach the boundaries of his imagination.

Home Garaging.

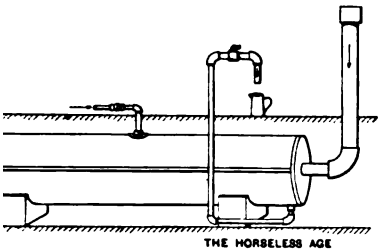
By Dr. Edwin M. Hasbrouck.

I purchased my steam car six years ago, and I still run it day in and day out. Barring a coat of paint which it has badly needed for over a year, but which it has not yet gotten because I cannot spare it long enough, it is still in tip top condition. Naturally all my stable fixings are for a steam car, and as I determined when I purchased my car that it could be maintained at as low a cost as a horse and buggy, and have proven this to be true, some of my home-made contrivances may be of interest.

To begin with, my gasoline storage was a "snag." In Washington, as elsewhere, the law requires that the tank be buried 3 feet underground, and a pumping apparatus costs $40. I did not see my way clear to separate myself from 40 good hard American dollars, so at the junk dealer's for $1 I secured a second hand 60 gallon kitchen range tank, in good condition. The opening

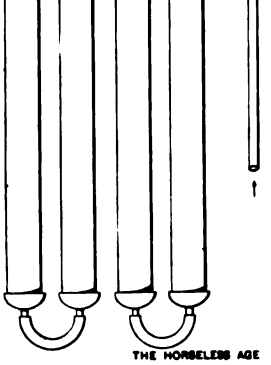
posite side of the tank, near one end, half inch hole was drilled, threaded, plug screwed in carrying a three- inch pipe, which, with Ls, etc., provide for my outflow when the was horizontal and slightly tipped l that end. The opening in the head tank carried a 2 inch pipe, etc., for ake. This apparatus was buried 3 nderground in my stable, nothing e three pipes protruding. The big : the end (the intake) had a screw ıe half-inch pipe was fitted with a ınd the three-eighth inch pipe with linary valve stem and an air cap— hen filling. A few strokes with the ımp gives me all the gasoline I want, e whole apparatus cost me $5.75.

next difficulty was with my water Washington's water supply is de- rom the Potomac, and this was con-



GASOLINE TANK.

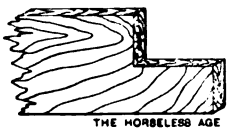
in a more or less muddy condi- As a result the bottom of my boiler ıuled to a depth of 2 inches and more ne mud, caked as hard as stone. A boiler was the consequence, as the nally became so thick that the water ot near enough to the ends of the to protect them. It was therefore ary for me to provide some way of g my water supply. For this pur- had made four sections of 4 inch ized iron pipe, each 4 feet long. each at each end was placed a r of fine brass gauze on heavy sup- These were filled with fine tile set- ınd, and caps were screwed on with le through the centre of each cap. pipes are hung on the wall and con- up with high pressure rubber tubing ɔ gallon kitchen range tank serving eservoir; and the whole was con- with the city water supply. Result: r, pure, sparkling water entirely free ediment of any kind. Twice a year ecessary to take the filter apart and t. It cost me about $20, but boilers 5 and $100, and so it was economy. am somewhat of a mechanical turn d, I do most of my own repairs, al- my kit of tools is not very large. years I have gotten along with the ng outfit (if anything further was for very heavy work I went to a : 1 block and tackle, 2 hammers, on wrenches (large and small), 1 wrench, 1 small wrench, 2 screw-



WATER FILTER.

drivers, 1 hack saw, ½ dozen files of various kinds, ⅛ inch pipe die, 1 pair cutting pliers, soldering iron, cold chisel (2), 1 boiler tube expander, 1 pair gas pliers, 2 pair pincers (large and small), 1 pair tire shears, 1 saw, gimlet, 2 chisels, 1 vise.

This is not a very extensive list, but it is surprising the amount of work that can be done with the outfit—and the amount of plumbing I have done, and the number of times I have had my car all to pieces with no other aid than the tools mentioned. My jack is a rough, home-made affair, made at a time when automobile jacks were selling at fabulous prices. Mine cost me five cents and labor, but it does the work and never gets out of order. First I took a piece of 4x4 studding and tapered one end to make a handle; then I cut a groove across the other end for the axle to rest in. Then with a piece cut from a 10x10 I fashioned my jack thus: Cutting



out a section of the 10x10, as per cut, the handle or lever was attached by a hinge, and with an eye bolt in the block and a hook on the handle my jack was complete. Of course, I will admit it is very crude, but it serves the purpose admirably, and saved the expense of a good jack, and it is just these home made contrivances that count for the saving in the expense of running a machine. I have plenty of friends who tell me that their monthly expense is $60 or $75, and how many are there who pay even more every month in the year? And now I want to say how much my machine averages me per month, including gasoline and repairs—not over $20. I ought to include stable rent, $3 per month, in this, and I believe I have got it down to about the limit.



JACK.

In erecting a special garage building it is advisable not to make it too small, as you may happen to have a visitor for a night, or some motorist may require shelter for his car from a shower, and livery stables don't like us. Then, again, you may own two machines some day. One of the first requisites is a good approach. A high floor necessitates a gangway, and it is so much easier to back in on a level. I always turn and back in, leaving the rig ready to start right out. A turntable is a nuisance on the floor, and it is less trouble and takes little space to turn when returning to the garage.

The second point I wish to mention is protection from fire. In my own case I put on metal roofing and siding on my 20x26 foot frame building, the siding over paper, and the room is easily warm enough, even in a cold country. I put in a window on every side, as light is very essential in repairing and cleaning, the windows being hinged at the top and opening out. I find that in this way I get better ventilation with less wind in cold weather, and I want to say that the gases from burnt oil and gasoline are very injurious and very depressing on the heart, as I found from the following experience: A short time ago, after a short illness that weakened me a good deal, I went to get out my car for a trip, and had some difficulty in starting it, principally owing to too much oil in the crank case and cylinders. I had not worked long in the smoky atmosphere when I felt faint, and, being a physician, I knew the cause and righted my trouble as soon as possible, which was in several hours. The heart slowed down, and I did not care whether I breathed or not, I was so heavy and stupid. So, I say, beware of too much gas and ventilate.

I get solid comfort from my gasoline arrangement. I sunk a packing box in one corner of my building, and in it put a 50 gallon tank, the top being just beneath the floor. For $1.50 I got a tinsmith to make a pump, which pumps into a can for use, and when a barrel comes I tap it and let it run into the tank. This is good enough for a cheap garage. A tasty and convenient arrangement of the inside gives a lot of comfort. A work bench, with a vise and a cupboard above it for tools, bolts, etc.; also a dust-proof cupboard for dope and oil—and repairing and cleaning are made easy.

I like mechanics, and during my spare time I try to improve on my car. I devised a pattern and made a galvanized iron chain boot or case that saved me many a dollar for chains; I also devised a very handy pump, which I attach to the shaft the crank fits on. The crank is attached to the plunger, and the barrel, taken from a bicycle pump, is brazed to a piece of metal, with a hole crosswise through it, and it slips on a pin fastened to the side of the

body. A check valve on an intake in one side and another where the tube runs from it, and it is complete. It cost about $1, and I have used it two years. I also make aprons for the bottom of the car for muddy weather, and never allow any mud to get up on the car above the axles. It is surprising what comfort can be obtained from just such devices, and with a convenient and well equipped garage one can excel the local mechanics, if one devotes himself to it.

To facilitate repairing, I have four ropes which fasten to the corners of the auto body and run up through the second floor to the rafters, then over pulleys, and to the end of each is attached a weight about equal to that of one-quarter of the body. I intend to put in a crane in another place, fastened to the joist, to handle the engine with.

A Capacious Garage.

P. A. B. Widener's private garage at Ashburne, Pa., is one of the best equipped private auto houses around Philadelphia. It is a 30x60 foot, fireproof stone building, well lighted and ventilated, with accommodations for sixteen cars. Its equipment consists of electric charging and switchboard, elevator to remove and replace batteries in electric cars, pit, underground gasoline tank and pump. It has also a repair shop and supply room, well stocked. Mr. Widener employs four chauffeurs, three foreign, one American.

The Club Garage of America, New York.

The new reinforced concrete garage which has been in course of erection the past spring for the Club Garage of America, at Broadway and Sixty-second street, New York, will be ready for occupancy about July 1. The building is being erected by Geo. C. Boldt, proprietor of the Waldorf-Astoria, and will be leased to an automobile company, of which D. M. Harvey will be the president. Mr. Harvey is the promoter of the Club Garage of America, which proposes to establish in the leading cities a chain of garages which will be open to the use of members of the club only. Thus a person by paying an initiation fee of $25 will be able to put up his machine in the club garage when he is traveling from city to city without having to pay garage fees and being subjected to the extortionate charges that are often inflicted on travelers.

Garages have already been secured at Olive street and Westminster place, St. Louis; at Philadelphia near the Hotel Bellevue-Stratford; at Third and Plum streets, Cincinnati, and negotiations are under way for garages at Chicago, Buffalo and Brooklyn.

The new garage at Broadway and Sixty-second street is six stories high, and is said to be absolutely fireproof. It contains 120,000 square feet of floor space, which makes it one of the largest garages in the country. There are two washstands and two turntables on each floor; the capacity of the washstands in the basement will allow fifty cars to be washed at once. All washstands are equipped with shutters to keep them water tight.

The entrance on the Broadway side is 16 feet wide, and the exit on Sixty-second street is the same width.

The showroom, offices, ladies' and gentlemen's reception rooms will be located on the first floor. The second, third, fourth and fifth floors will be used principally for storage purposes. The sixth floor will be devoted to repairing. It will include a machine shop, repair pits and varnish room. A charging plant for electric vehicles will be located in the basement. Two elevators, 10x20 feet in size, will run from the top floor to the basement. Well equipped chauffeurs' quarters will be a feature of the building, which will be a necessity in a garage to be kept open twenty-four hours a day.

The gasoline is kept in five tanks in an open court outside the building, and is delivered to car tanks by means of a tank wagon equipped with an automatic measuring pump and cash register to record the amount of oil taken out. The vent pipes are extended 6 feet above the roof.

The Garage Man's Failing.

By W. P. Hartford.

One of the most unanimous complaints against the garage man is that he pretends to know it all when he really knows very little. I believe he is often perfectly honest in his belief, but none of us can, without being thoroughly quizzed, know that we don't know it all. From the time we turn on the gasoline and start our first engine and on through the 999 failures, we think each time we know it all. The repair man is supposed to thoroughly understand everything about an automobile. We ask too much; the man who makes it doesn't know that much.

I once hired a fine machinist to do some work for me. He told me (and really believed it) that he was a gasoline engine expert; never saw one he couldn't make go. He knew that throttling the exhaust nearly doubled the power. He built an engine and got it fixed so it never did run; the rings wouldn't hold cylinder oil, the connecting rods were too long, the pistons too small, and he never could understand why a jump spark coil could give him such a shock when he could handle the battery with impunity.

There are hundreds of makes of two cycle engines. As they explode twice as often as a four cycle, they should develop double the power. How many of those manufacturers know the reason they do not? Most of them are taking up the jump spark and use a separate coil for each cylinder. Why don't they build a secondary distributor on the flywheel? It only costs a dollar and works to perfection. Only the other day I read a fine explanation of the difference between high and low tension generators, but the writer did not seem to know anything about an alternating current. I have known the correct solution of every problem for the last ten years, and have found I was wrong nearly every time. Let us pity the poor garage man. He is, no doubt, honest but mistaken. Let the garage man pity us; he has made us poor, paying for his mistakes.

I live in a little town where the smallest known measurement is a blacksmith's hair (three-eighths of an inch), so I fixed up a shop in the backyard, bought a second hand 11 inch lathe, a small drill press, a set of taps and dies, a vise and a few other tools. An old 1 horse power engine runs the lathe and emery wheel and a small dynamo. I believe I have solved the garage question for a poor man in a country town. The shop has paid for itself in recreation; my happiest hours are spent there. I have worked out several inventions worth patenting. When I have work beyond my skill I hire a machinist and watch him until I see how it is done. I have saved the price of the outfit by not being "out" with the boys; have built three engines that are not worth a hurrah, but I am prouder of them than Rockefeller is of his oil company, and last and best, I defy any garage man to make me believe it takes five hours and forty-five minutes to consolidate a dooflicker. I take a broom straw and ream out the nozzle myself.

I would suggest to garage victims, automobile owners, and all who may be concerned, that they take a good automobile journal. The Horseless Age is not altogether bad. Buy and read all the books on the subject; none tell too much, or are too accurate. Find out the reason why of everything that goes on or does not go on in ignition, explosion, lubrication, transmission, etc. It would be a great help to all of us if a set of questions were printed in The Horseless Age, asking things we all should know, and printing the best answers. In no other way can we be convinced that we don't know it all, and it is doubtful if this would convince us, but it would help some. At any rate it would be worth the price of a year's subscription to hand the list of questions to the repair man and see him drop dead.

The Coupe d'Or Contest.

An endurance contest for stock touring cars over a course 2,446 miles in length began at Milan, Italy, on May 14. The event extended over a period of seven days and took in practically the whole of the Italian peninsula. The trophy, a gold cup offered by the Milan Automobile Club, was to go to the competitor whose average speed in all of the daily stages was closest to the maximum of 25 miles per hour.

Garage Equipment

Methods and Apparatus for Storing and Supplying Gasoline and Other Oils.

By H. B. Harper.

Be the garage a public or a private one, designed to house 100 cars or only one, the problem of how to handle gasoline and lubricating oils is of greater import than any other question that may arise. Nine out of ten cars depend upon gasoline for their motive power—without it there's little automobiling done—you must have it, you have no alternative.

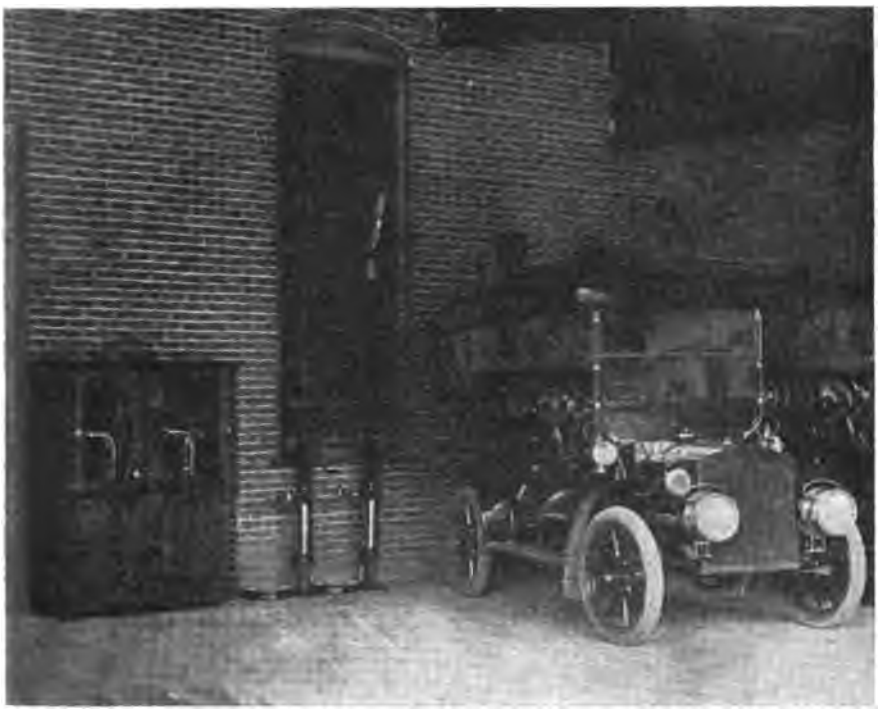
But you say gasoline is dangerous; it is a most volatile liquid, the vapors arising therefrom are highly explosive. These vapors hie themselves to some secluded corner and there await the coming of the lighted match or cigarette to liberate the demon, fire, concealed within them. No, I'll use gasoline, but someone else can take the risk, and so you buy in 5 gallon cans, forgetting that there's enough danger lurking in a 5 gallon can to destroy a whole town. Even the man with the 5 gallon can ought to take greater precaution than he does.

But for most people, buying in small quantities is far from satisfactory, but the insurance authorities forbid your carrying any larger quantity within the building. In most instances it is not enough for filling the car even a single time, and, therefore, not adequate for practical purposes. It is also impractical to buy gasoline by the single gallon, the same as buying coal by the bucket. It is expensive and inconvenient.

It is, therefore, obviously of advantage to purchase gasoline in quantities. Buying by the barrel entitles one to the benefit of the lower price, and it also insures one having gasoline on hand when desired. But this gasoline cannot be stored within the building; it must be carried outside and a definite number of feet distant. And so the gasoline is bought and kept in the barrel or drum or transferred to a faucet tank standing out in the sun.

But again one encounters difficulties, as it is a lot of trouble to run out to this tank every time gasoline is wanted; then, too, the gasoline evaporates, spills over and leaks out; it becomes dirty and gritty, because the tanks are not tight, and what you gain by buying in quantity you lose through evaporation, leakage, waste and deterioration.

The question consequently resolves itself into underground storage and long distance control. This is the model arrangement, providing you secure a good outfit. The advantages of this plan are many. Gasoline is only dangerous as it is exposed to the air. A change in temperature affects it. To store it underground obligates the use of an oil and air tight tank, and underground the temperature is constant. Insurance authorities indorse the underground storage of gasoline.



A Gasoline Pumping Outfit.

Then the next step is to get the gasoline into the building without going after it. This is accomplished by means of a "long distance" pump inside the garage. A self measuring pump is best for all purposes, one that can be adjusted to measure gallons or any parts of same at the will of the operator. The gasoline should be brought into the building by suction; an all metal pump should be used by all means, as any other style is apt to break and liberate the gasoline. Nor should the gasoline be forced into the building by air or water pressure, or by gravity; the pressure may force the pipe joints or faucet, allowing gas to accumulate and explode, or the water may freeze and burst the pipe, or the faucet may be accidentally opened. Nor should a return pipe be used, as it provides an opening for the gas to escape into the building. A short, terse specification for a gasoline storage outfit would read as follows:

The tank must be of No. 12 gauge galvanized sheet steel, riveted and soldered inside and out, and painted with three coats of mineral paint. This must be buried so that the top of the tank is 2 feet under ground. The pump must be all metal and of the long distance self measuring type, operating by suction. Pump must be equipped with double brass valves, double plunger and automatic check valve. It must measure a full gallon at each complete stroke, and be so adjusted as to measure accurately half gallons, quarts or pints if desired. The entire equipment must meet with every requirement of the insurance authorities. It must also bear the guarantee of the manufacturer to remain in perfect working order for five years from date of shipment.

The utility and convenience of such an outfit are added to if it be provided with a gallon meter that will keep an accurate record of all gasoline used; a discharge register for recording the number of gallons drawn at each operation, a nozzle filter to separate the water that might get into the gasoline, an anti-drip nozzle to prevent dripping after pumping ceases, a self locking device to preclude pilfering, and a two-way nozzle, with hose connection, so that gasoline can, if desired, be pumped and measured directly into the reservoir of the car.

Hardly less important is the question of lubricating oils. One thing is certain, ordinary methods of handling oil are responsible for dirty oil soaked floors, disagreeable odors, unsightly funnels and measures littering up the garage, and, last but not least, dirty oil. If all the other disagreeable features together are not deemed of sufficient weight to justify the installation of an adjustable measure oil cabinet, the fact that only by so doing can the oil be kept clean must be considered.

It matters not what class it may be, the efficient operation of any machinery is dependent upon the lubrication. Dirty, gritty oil has caused many a hot box, many a breakdown. If this be true of machinery where the load is constant and the temperature comparatively the same all the time, how much more it applies to the automobile, used in hot weather and cold, with a light load one time and a heavy load another, running at a slow speed one minute and 60 miles an hour the next. It's an absolute

fact that 50 per cent. [?.—Ed.] of all automobile troubles are directly traceable to poor lubrication, not poor oil but oil poorly kept and therefore dirty. Most autoists are very particular about the oil they buy; it must be guaranteed such and such a test, it is bought for its flash test, viscosity, etc., and then it is not kept pure. It is allowed to deteriorate, and how are you going to prevent this if you leave it in the barrel, punching out the bung or knocking in the head in order to make it accessible. It is not within reason to expect it to remain clean when no precaution is taken to keep the dirt out.

The man who has considered this phase of the question quickly purchases an approved oil outfit—sometimes one similar to the long distance gasoline equipment, which, if properly built, will answer equally well for heavy lubricating oils. Underground storage, however, is not necessary, and so the adjustable measure cabinet, being cheaper, is often substituted.

The adjustable measure oil cabinet is a device which peculiarly adapts itself to the requirements of a garage. It keeps the oil itself clean and pure, and it provides against dirty floors, oil covered tins and disagreeable odors.

The tank furnished with such an equipment must be well made, of high grade material. Galvanized steel, double seamed and soldered, makes a serviceable tank when cased in a well built, neatly finished wood cabinet. The pump must also be all metal and capable of such adjustment that any sized oiler can be exactly filled at one stroke.

This type of storage is made in many styles, the most popular of which are the glass front and roll top cabinets. The glass front cabinet recommends itself to many because of the elegant appearance it presents. It can be furnished in any finish to match the woodwork of the garage, and with all metal parts full nickel finish is a most striking outfit.

The roll top cabinet is built along the well known lines of the roll top desk. When not in use the top is closed so that no dirt, dust or grit can come in contact with the working mechanism of the pump. Either style of equipment can be furnished in compartment style for use where more than one kind of oil is used.

The Bowser Portable Wheel Tank.

In a large city floor space is costly, so to keep running expenses down it is necessary to utilize every square foot possible. When filling gasoline tanks in a large garage it has usually been necessary to bring each car near enough to the supply tank to use a short piece of hose, measures and funnel, or to carry the gasoline to the car in unsightly and often dirty cans. To move a car 12 feet long by 6 feet wide requires quite a space and takes some little time. Often it is necessary to fill two or more cars in a hurry when the garage is crowded, and filling in a hurry with a funnel usually means that more or less of the gasoline is spilled upon the car or on the floor.

To overcome these difficulties S. F. Bowser & Co., of Fort Wayne, Ind., have just placed upon the market a portable tank. It consists of a rectangular tank made of galvanized sheet steel, with joints riveted and soldered. The tank is mounted upon three wheels, two of which are large ball bearing bicycle style wheels with rubber tires, placed just back of the centre of the tank, and the third wheel is small and swivels, to facilitate turning the tank in a small space. On the top of the tank is mounted a self-registering pump, which will measure gallons, half-gallons, quarts or pints at a stroke, as desired. From this pump the gasoline passes to the car through a hose fitted with a nozzle that does not require the use of



The Bowser Portable Tank.

funnels and is provided with a valve which prevents any dripping of gasoline after the nozzle is removed when the tank is filled. This hose has a vent pipe which conducts the air displaced in the tank, as it fills with gasoline, into the portable tank, largely preventing the escape of fumes.

A charge register is mounted on the tank. The attendant makes out a slip in triplicate, from the record of the self-registering pump; one copy goes to the owner of the car, one stays in the register, and one is placed in a lock box on the front of the tank.

The standard size has a capacity of 65 gallons. The tank itself is painted a rich dark maroon, the pump is finished in black enamel, and all bright parts are nickel plated. Four of these portable tanks are at present in use in the Boston Motor Mart, and numerous other large garages are using them.

"The Dayton" Gasoline Outfit.

The Boyer-Radford & Gordon Tank and Pump Company, of Dayton, Ohio, are manufacturing a gasoline storage outfit with a registering pump, which is suitable for public or private garages. The system consists of a heavy galvanized steel riveted and soldered tank which is buried in the ground at a suitable distance from the building, and is guaranteed to be evaporation proof. These tanks are from 63 to 500 gallons capacity, and are filled by means of a vertical tube extending to the surface and fitted with an air-tight lock cap. The pipes extend from the tank into the building and connect with the pumping apparatus, which is adjusted to measure accurately pints, quarts, gallons, or larger amounts if desired. The gasoline is pumped by turning a handle continuously in one direction, each revolution measuring a quart. The accompanying cut shows the arrangement of the system. One of the claims made is that the bulk of the gasoline is at a distance from the building, and that all the gasoline that is really in the building is in the small cylinder of the pumping apparatus, which only holds one quart, and this is in an air-tight compartment. A registering device is also arranged on the pump which enables an accurate record to be kept of the amount drawn from the storage tank during a stated period.

The Snell Hydraulic System of Storing Gasoline and Oils.

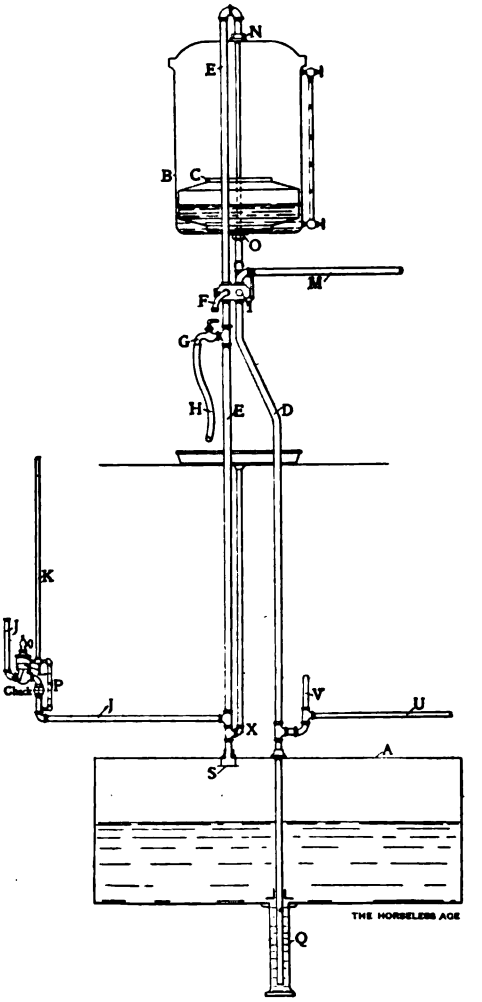
The latest development in the storage and handling of gasoline, oils or other volatile liquids is that of the Snell hydraulic method, which is represented below in diagram form. By means of this system the gasoline does not come in contact with the air, and therefore, no deterioration can take place from evaporation during prolonged storage. The gasoline can be drawn from the system as from a hydrant, no pumping being required. As the entire upper part of the system is under less than atmospheric pressure, gasoline will not drip from the faucets, and it is possible even to allow surplus gasoline which may have been drawn to be sucked back into the system. Drip pans are so arranged that their contents drain into the main tank, which is buried beneath the ground, as is usual in the storing of large quantities.

In general, the system consists of a main storage tank A below ground, and a small 5 gallon feed tank B, which is located in the building. The system is filled completely with liquid, the portion not filled with gasoline being water from the city mains. If an air leak should occur in the piping above the gauge on the filler pipe any gasoline in the upper tank will drain down into the lower tank. There is a gravity balance maintained between the water and gasoline or other oil at all times, so that each individual installation must have the depth of its buried tank and the height, length and

location of the various openings and valves carefully calculated.

Referring to the diagram, the method of filling the system for the first time is as follows: The tank A is filled with water either through the vent V or the pipe U before it is connected with the sewer, which is afterward done to dispose of the water which is forced out upon refilling the system with gasoline. When the storage tank A is completely full of water, the handle on valve I, which is a special three-way valve, is so turned as to cut off communication between pipes D and E, which at the same time opens communication between the bottom of the tank B and the feed pipe M through which the city water under ordinary pressure flows and fills the tank. C is a copper float which is so weighted that it will float at the dividing line between water and gasoline. This float rises as the tank fills until its upper surface comes in contact with the valve N at the top and closes the same, preventing any water from going up and over into the pipe E. Valve I is now turned, permitting part of the water in tank B to run down and fill pipe D. The lower portion of this pipe, it will be noticed, runs down into a water leg Q of the main tank and is open at its lower end, so that when the main tank was first filled with water pipe D was also filled to the same level; thus, pipe D is now filled as high as valve I. Lever I is now turned back to the first position, allowing the small tank B to again fill, replacing the water which it took to fill pipe D. The system is now full of water, with perhaps, the exception of a small portion of the upper end of pipe E, as the water will, of course, rise in that pipe to an equal height to that in D. The system is now ready to be filled with gasoline. A hose from a wagon tank, barrel or other containing vessel is connected to the oil pipe J; the gasoline runs down pipe J through float shut off valve L to the top of the storage tank, where it strikes the deflector plate S and is spread evenly over the surface of the water, forcing the water out of the tank down leg Q, up pipe D and through water drain U to the sewer. Any quantity of gasoline can be poured in as desired up to the capacity of the storage tank, which, however, it is impossible to over-fill, as when this is tried the water column from the water pipe U at vent V down to a point in the tank where the water inside pipe D and leg Q come to a balance is just sufficient to balance a lighter column of gasoline up to the top of gauge P, which now indicates a full tank. Under these conditions the filler float L will close so that no more gasoline can be poured into pipe J; and if this is attempted it will simply overflow on to the ground as would any ordinary receptacle.

In order to draw gasoline, valve I is placed in such a position that it opens communication between the gasoline feed tank and the storage tank. This will allow part of the water in the feed tank to drop down by its weight into the storage tank and force up a like amount of gasoline through pipe E and valve I into the top of the gasoline feed tank B. As this process is taking place, the float C lowers with the water level and upon reaching the position shown in the diagram its lower surface comes in contact with and closes valve O, so that no more water can run down through pipe D. The system is now completely full of liquid, except possibly a little air in the pipe E which will, however, be forced out through



SNELL HYDRAULIC GASOLINE STORAGE SYSTEM.

the delivery nozzle F before the gasoline when starting to draw. The gasoline is drawn by manipulating valve I so that the city pressure through M forces water into the storage tank B and displaces the gasoline from its upper end, which is delivered through pipe E and nozzle F. Any part of the gasoline in storage tank B, or practically all of it, can be drawn at one time, but no water can be drawn, owing to the fact that the float C rises and shuts off valve N. The capacity of the tank B is usually 5 gallons, that being the largest quantity ordinarily allowed by the fire underwriters to be kept within a building. By again turning valve I the water in tank B again runs down and forces up a like quantity of gasoline ready for the next drawing. The drip pan, it will be noticed, is so arranged that any gasoline falling into it will run into the main system, the lower end of its drain pipe being provided with a check valve X to prevent gasoline from rising in it. By means of opening valve G and placing pipe H under the surface of the gasoline in any receptacle the liquid will be drawn into the system owing to the fact that there is a suction. A gauge glass is provided which shows the level of the gasoline in the feed tank B, and pipe K is simply a vent.

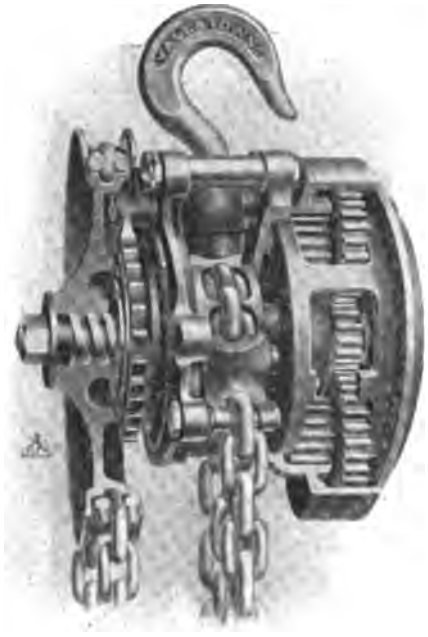
As there is never any air in the system to come in contact with the gasoline it does not vaporize, and there is no loss; furthermore, the risk of explosion due to fire or lightning is practically eliminated, as there is never any vapor in the system. Another feature claimed is the fact that no dirt or sediment can be drawn with the gasoline, as the supply is always taken from the top and never from the bottom.

The Lafitte Welding Plates.

The Phillips Lafitte Company, of Philadelphia, Pa., are selling special brazing and welding plates which come in the form of rectangles approximately 4x8 inches, checkered so as to be easily divided by hand into different sized pieces. By placing one of these plates between two pieces of steel or iron to be welded and heating to a cherry red if steel, or a white heat if iron, a perfect weld may be obtained with very little hammering and in the least possible time. The fact that welds can be made with this moderate amount of heat is a great saver of time and of materials which would be burnt in attempting a weld in the ordinary way. Welds can even be made in restricted places by separating the parts slightly and heating to a cherry red with torches, after which a plate is placed between them, and they are brought together under pressure without hammering. It is very useful in repairing broken steel castings, which it is claimed are as strong as when new after being welded. It can be used to advantage in repair shops for general repair work, and is especially useful in making jump welds, which are usually rather difficult. The plates are composed of chemicals whose action increases the strength of the weld, and which, of course, act also as a flux. These plates are the invention of J. Lafitte, an eminent French scientist, who has spent many years of research in connection with the welding, tempering and brazing of metals, and they have been but recently introduced into this country, although they have been in use for some time in Europe.

The Triplex Block.

The Yale & Towne Manufacturing Company, of New York, have recently added to their line of hoisting devices the triplex block, which is the first device of its kind in which the sustaining mechanism which prevents the load from dropping is entirely separate from the hoisting mechanism, so that the resistance for sustaining the load does not have to be overcome in hoist-



YALE & TOWNE CHAIN HOIST.

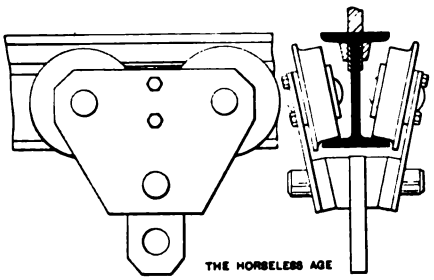
ing. The accompanying figure shows a sectional view through the block, the sustaining mechanism being shown at the left hand side and the hoisting mechanism at the right. The hoisting part of this device consists of a balanced train of spur gears operated by a small central pinion through the train to a large covered internal gear of heavy pitch which forms part of the frame and is the full diameter of the block. The two intermediate gears of the train are carried by a circular frame which is keyed to the load chain sheave with which it revolves, the whole mechanism forming a planetary gear very similar to that used in automobile transmissions. The second photograph shows these gears in side view.

The sustaining mechanism is made up of a set of friction discs, one of which is externally ratcheted and engages a pawl. The hand wheel over which runs the operating chain is screwed upon a circular hub, so that in pulling the chain in the direction for hoisting the discs are solidly clamped together, thus retaining the weight of the object to be lifted; but as soon as the hand chain is pulled in the reverse direction for lowering the friction plates are released, which allows the load to lower rapidly, but only so long as the chain is pulled; for if this motion ceases the discs automatically tighten and the load is securely held. The advantages claimed for this block are the ease and the speed with which one man can move very heavy weights. From tests between this block and their ordinary differential chain hoist the advantages are clearly shown as follows: To lift 1 ton 1 foot with a differential would require three men pulling 216 pounds and overhauling 30 feet of chain; while with the triplex block one man pulling only 82 pounds and overhauling but one foot more of chain could do the same work.



REDUCTION GEAR OF CHAIN HOIST.

These blocks are adapted for garage and repair shop work, for lifting bodies, engines or cars, etc. A steel overhead trolley is arranged with a carrier, as shown in the accompanying drawing, so that parts can be quickly and easily moved from one part of the establishment to another.



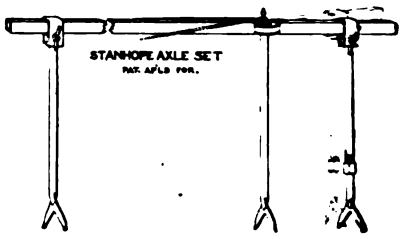
TRACK FOR YALE & TOWNE HOIST.

An Automatic Time Stamp.

The Automatic Time Stamp Company, of Boston, Mass., are manufacturing a time stamp suitable for use in garages or factories. This instrument is small and very compact, with as simple a mechanism as can be expected in an automatic device. These stamps are made for general office use, and will instantly print the hour, minute A. M. or P. M., the day, month or year, and the name and address of the owner. Also from one to eight words or numbers indicating the character of the transaction. Thees stamps save many mistakes and take less time to register transactions than would be occupied in looking at a clock; and in case a mistake does occur, the responsibility can be easily placed. They are also specially arranged to record the coming and going of employees, in which case a set of cards and suitable racks are used.

The Stanhope Axle Set.

The Stanhope Forge and Machine Works, Boston, Mass., have recently placed upon the market the Stanhope axle set, which is designed to allow of finding the proper angle on automobile axles. The wheels



STANHOPE AXLE SET.

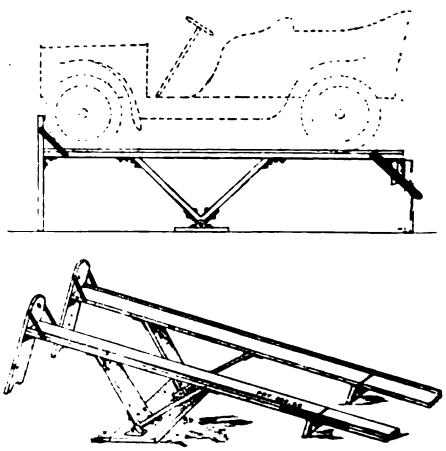
of the car are removed and the set is placed on the front or back of the axle, having the forks set firmly on the arms. The indicator will then show the degrees of the angle. The set is very simple in its construction, and is claimed to be made of the best steel.

The Detroit Combination Tool.

The Detroit Tool Company, Detroit, Mich., are manufacturing a very useful combination tool which combines a drill, vise, pipe vise, emery wheel, anvil forge and blower, which is used in garages and for private owners. The details will not be entered into here, as we have fully described the same in our issue of February 21.

Automatic Quick Repair Jack.

The automatic jack shown in the accompanying drawing is a device lately put on the market by L. R. Maxwell & Co., of Cedar Rapids, Ia. The view shows the jack in position for a car to be driven onto it, and the second view shows its position after the car is in place and the adjustable ends let down and locked, forming a support. This device is in the nature of a "see-saw," the end which is up tipping down onto its supporting leg as soon as the vehicle has been driven onto it. The other end is hinged and can be dropped in position and locked by the cross brace, as shown, so that a person can get under the machine to clean or repair it without having to resort to a pit. It is sometimes used as a washstand and is a very handy apparatus to have in a garage.



MAXWELL'S AUTOMOBILE TRESTLE.

Tool Equipment of the Up To Date Garage.

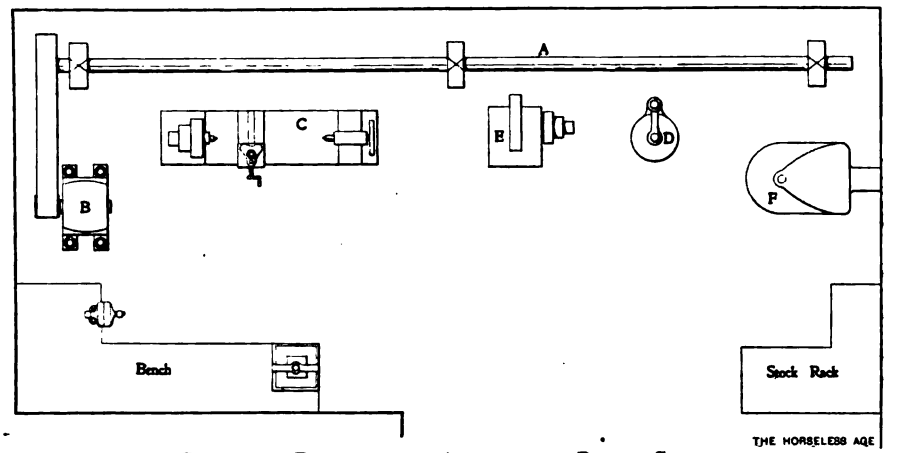
By W. B. Harsel.

The tool equipment question is one of the most important in connection with the garage. I know of only two garages in my vicinity which make any pretense of repairing any part that comes along. It is certainly annoying when one is stalled with a slight break, such as that of a stay rod or perhaps a ball on the end of the rod, and upon driving carefully to a garage is informed that the part will have to be ordered, and perhaps one must wait a week before getting it. On the other hand, if the garage had the simple tools required, the part could have been repaired in half an hour and one could have gone on his way rejoicing. Hundreds of so called repair shops are in no better shape. It is not absolutely necessary to have a large machine shop, but there are a few tools that every garage should have in order to make repairs, which, in my estimation, is the meat of the trade. This brief article will indicate many of the tools required.

Referring to the accompanying model plan of a repair shop, one can have a line shaft located at A, driven by a small motor P placed near the wall, sufficiently large to run all the tools required, say 5 horse power. The lathe C should be capable of swinging at least a piece 24 inches in diameter, and should have a screw cutting attachment. With this tool alone one can make new studs, turn up a new piston, straighten a crank shaft, make a new roller or turn up any part required, without the delay and expense of sending to the factory; and, in addition, the garage owner will please his customer by saving him time and annoyance. Another tool just as important, and in one sense more so, is a drill press, located as at D. It is unnecessary to remark on the application of this tool, as it is in almost universal use, and no shop, irrespective of size, can afford to be without one. It should take drills from one-eighth inch to five-eighth inch or larger. The shaper or milling machine could, if necessary, be dispensed with, but is is very useful, as with this tool one can cut keyways, make many new parts, and by dressing small castings, brackets, etc., save an enormous amount of time in filing and fitting. No garage can do without the forge F. It can be either a hand or power forge, and can be used to bend rods, to weld, harden tools, balls and rollers; to forge up any new parts, such as brackets, levers and rods, and to make springs, etc. One can, for instance, take an old ball race, draw the temper, face it off, and polish and temper it again, thereby saving time and delay in ordering from the factory.

In addition to the above machines, the garage should have a full set of taps and dies from three-thirty-second inch to three-quarter inch; also drills, reamers and pipe taps and dies from three-eighth inch to 1¼ inch. The drills should be from three-thirty-second inch to five-eighth inch, and the reamers one-fourth inch to five-eighth inch.

The other small tools for hand use usually consist of a large and small breast drill, 6 inch and 12 inch; Stillson wrench; several sizes of monkey wrenches, a few flat wrenches and a pipe threading and machinist's vise. A fairly good supply should also be kept on hand of standard nuts, bolts, screws, bar iron and steel, in both flat and hexagon sections; also springs and many other articles such as the demands in the garage indicate. The garage should also have a small truck to carry cylinders and heavy parts, and a small air compressor or pump. Oil filters, waste cans, drip pans to put under cars, several jacks, and a light trolley hoist with chain and tackle for removing engines, bodies and all heavy parts from cars, are absolutely indispensable. Every garage should have a pit to run the car over, which will permit the workman going under the car and standing up to do his work; in this position he can drill holes or fit and attach parts without being hampered. When the garage is equipped as described, work can be accomplished quickly and easily, and the equipment will pay for itself in a short time.



Suggested Plan for an Automobile Repair Shop.

The Ideal Automobile or Carriage Washer.

The Ideal Carriage Washer Company, of Rochester, N. Y., are now manufacturing a device for holding an ordinary sponge on the end of a hose in such a way that the water can run through it so that it can be used for cleaning automobiles or carriages. The washer consists of a central tube, one end of which is provided with an ordinary hose connection, and around which is a coiled spring which forces a cup shaped vulcanite piece toward the other end. Through this vulcanite piece pass three brass wires which are fastened to the hose connection at one end, and are formed into hooks at the opposite end. By pressing down on the vulcanite it slides down the central tube, compressing the spring and spreading the ends of the three hooked wires, so that by placing an ordinary sponge between their points and letting go of the vulcanite, it is forced upward against the side of the sponge, which is tightly gripped between it and the hooked ends of the wire. These ends are protected by the cup shaped piece, so that it is impossible to scratch or mar the polished surfaces of a machine. The water comes through the central tube and passes out of a sprayer at the end, and through the sponge so that there is a continuous flow of clean water, which washes away all the grit and dirt instead of retaining it in the sponge and rubbing it into the surface, as by the ordinary method. The water applied in this way does not splash over the engine or cushions, and can be handled without the necessity of putting the hands in cold water. The makers recommend using the device without the sponge at first, so that the spray softens the mud, and then using the sponge for removing it. This device is applicable to any hose, is inexpensive and very useful around either public or private garages.

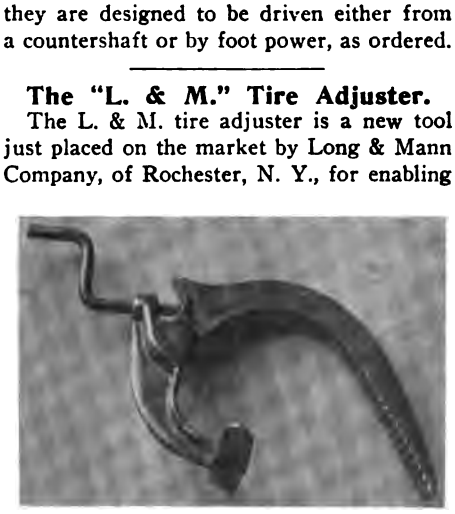
"Field" Grinding and Polishing Machine.

The Charles H. Field Machine Company, of Providence, R. I., have placed on the market a new grinding and polishing machine which is adapted for repair shops and general jobbing work such as is met with in automobile practice; they are designed especially for finishing irregular objects by means of grinding. The tool consists of a vertical column, upon the top of which is supported a sort of shaft with a driving pulley at one end and a flat disc grinder at the opposite end; the emery cloth is fastened in an ingenious manner to this disc without being glued, so that it can be quickly removed and replaced. An attachment is furnished that will use small strips of emery cloth for polishing internal surfaces; a small table with a corrugated upper surface to allow free passage of dust from the grinding is provided, and the guide is so arranged that it can be placed and clamped at any angle for grinding the edges of work. A polishing belt of the

usual type is also a part of the equipment. Upon one end of the spindle buffing wheels, brush wheels, etc., can be attached. A complete set of wrenches is supplied with the machine. Its weight is approximately 175 pounds and it stands 3½ feet high; they are designed to be driven either from a countershaft or by foot power, as ordered.

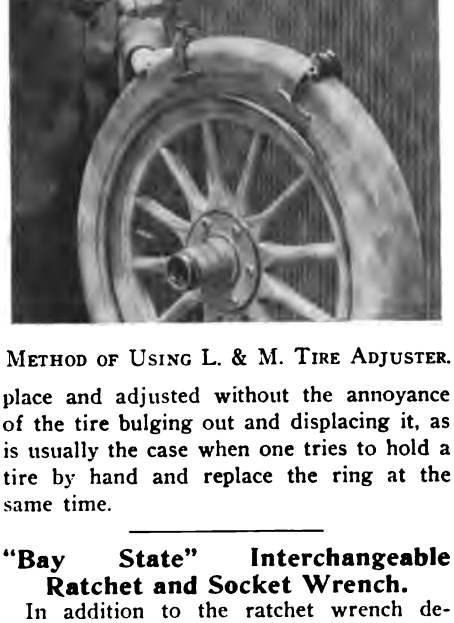
The "L. & M." Tire Adjuster.

The L. & M. tire adjuster is a new tool just placed on the market by Long & Mann Company, of Rochester, N. Y., for enabling



L. & M. Tire Adjuster.

a person to put on a tire or removable ring with less difficulty than can be done by hand. The illustration shows the tool and also the method of applying it to a tire. As shown, this tool clamps the sides of the tire together and prevents their bulging, so that after placing the tire on the rim the outside removable ring can easily be put in

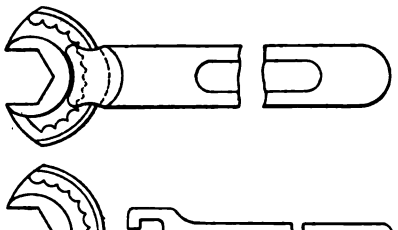


Method of Using L. & M. Tire Adjuster.

place and adjusted without the annoyance of the tire bulging out and displacing it, as is usually the case when one tries to hold a tire by hand and replace the ring at the same time.

"Bay State" Interchangeable Ratchet and Socket Wrench.

In addition to the ratchet wrench described in a recent issue, the Bay State Tool Company, of Worcester, Mass., have put another tool on the market which is a combination of this ratchet principle in connection with a set of four bushings to take different sized nuts, as shown in the accompanying cut. This wrench and bushings are made from steel castings, case hardened, with blue gun metal finish, and are supplied in a case.



Bay State Ratchet and Socket Wrench.

The Never-Fail Auto Can.

A new gasoline and oil can is now being offered to the automobolists by the J. A. Harps Manufacturing Company, of Greenfield, Ohio. A general view of this can is shown in the accompanying photo. The particular feature of this device is that the liquid is not poured from it, but is siphoned through a tube from the bottom of the can, and which emerges at the top, from which it flows into the automobile tanks or other receptacles through a flexible tube, and that the time occupied is much less than it would take to pour it in the ordinary way. The waste from evaporation and spilling it over the parts of the car and cushions is avoided, as well as the injury so frequently done to the opening to the tank upon which the screw-cap must be fitted. This is very often so distorted by placing a heavy funnel into it and then resting the edge of a ten gallon can on the funnel that after the tank is full it is impossible to replace the cap.

The raised portion on the top of the can contains a diaphragm made of specially prepared fabric which is not affected by the gasoline, and through which is a small diaphragm valve. This diaphragm is fastened at its centre to a vertical strip, so that by means of a few strokes up and down of the lever on the top a pressure is created in the can which starts the flow through the outlet pipe. If the can is now placed above the level of the gasoline tank its entire contents will be very rapidly siphoned over, or if the tank to be filled is above, a few strokes of the pump will cause sufficient pressure. As the inner end of the siphon tube almost touches the bottom of the can practically all of the contents will run out. The filler cap on the can has a small diaphragm valve in it, which if pressed while the can is emptying will instantly relieve the pressure and break the siphon, and the flow will cease. This is so positive in its action that a tumblerful can be drawn and instantly shut off before overflowing. Another useful feature is the fact that the can will fill itself from an automobile tank or other vessel which is above it, so that it is possible to very quickly empty an automobile tank, in very many of which provision is made for emptying, except to drain it slowly through the carburetor or a small cock by placing the can below the level with its flexible tube into the tank and pumping up sufficient pressure to just fill the connecting tube, when by suddenly relieving the pressure in the can by pressing the relief valve the liquid in the tube starts to flow back into the can, causing the usual siphon action which will continue until the tank is empty.



Never-Fail Gasoline Can.

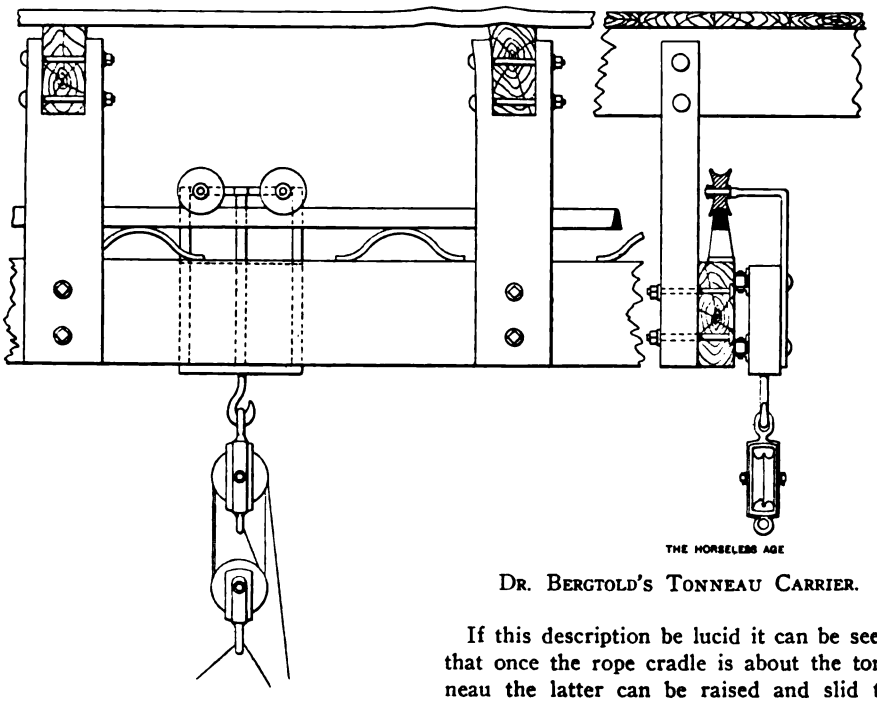
These cans are made only in five gallon sizes and are galvanized inside and out. A similar device by this company has been on the market for some time for filling ordinary lamps, but this is its first application to automobile cans.

Rhodes Clincher Tire Remover.

Another tool specially designed for removing clincher tires is that placed on the market by Rhodes Manufacturing Company, of Grand Rapids, Mich. It is designed particularly for getting the outer casing out of the bead, particularly after it has been run for some time and has become rusted to the rim. It is claimed that the worst case can be removed in a very few minutes and without injury to the tire. The general operation is on the hook principle, one prong of the tool hooks on the metal bead on the inside of the wheel, while the other point bears against the tire immediately above the metal rim, so that by pulling up on the handle the tire is forced inward and detached from the rim, while at the same time it is raised from the bottom, making room for the insertion of an ordinary tire iron. The makers advise going completely around the tire with this tool to free any adhesions before attempting to insert the tire irons.

The Hercules Ladder.

The American File Sharpening Company, 296 Broadway, New York, are now marketing a unique sectional ladder which occupies very little space, and which cannot slip or the rungs break. It is made of one-half inch steel rods formed into links, by means of which any length of ladder can be obtained. At each rung the rods are twisted to form legs or supports which rest against the wall or other surface on which the ladder is used, so that the rungs stand out about 5 inches from the surface. The ladder weighs about 3 pounds per linear foot, and the top link is formed into two hooks, by means of which it can be hung.



DR. BERGTOLD'S TONNEAU CARRIER.

A Tonneau Elevator and Carrier.

BY W. H. BERGTOLD.

A removable tonneau, even in a car of moderate size, is often more difficult to take off and put on because of its shape and dimensions than because of its mere weight. The following device, used now for more than a year, has made the handling of such a tonneau in the writer's garage light and expeditious; it takes up no valuable space, is inexpensive and easy to construct, and can be put up by anyone having even only a little handiness with tools.

The accompanying sketch will, it is hoped, make clear the construction of this combined tonneau lifter and carrier, a brief description of which is subjoined.

An ordinary sliding barn door track is attached to the narrow edge of a 2x4, and the 2x4 is hung from and just below the rafters of the garage by three (or more, if need be) short pieces of 2x4, the 2x4 and its attached track going across the rear of the building immediately over the tonneau when the latter is in place on the car. A single two roller sliding door carrier is bolted to a 12 inch piece of 2x6, and to the inner side of this piece of 2x6 are attached two small trunk casters, to promote the sliding of this 2x6 along the 2x4. This 2x6 serves as a trolley, as it were, running to and fro across the garage. To the bottom of this trolley is fastened a double standing block, through which is reeved a tackle going to a single block below, the hook of which can be caught into a rope cradle embracing the tonneau.

In brief, this device is nothing more than a sliding barn door track, suitably suspended below the roof of the garage, on which runs a single sliding door roller, which supports blocks and tackle for lifting and lowering and transporting the tonneau in and out of place on the car and in the garage.

If this description be lucid it can be seen that once the rope cradle is about the tonneau the latter can be raised and slid to one side, and lowered to the floor or left suspended in the air, as desired, and all the lifting can be done with one hand.

A Portable Power Air Pump.

The use of a pump and air tank is quite universal in well equipped garages, but the losses in such a system are considerable, which means a good deal from the expense standpoint, and it was to overcome this defect of the tank and pump combination that the following described pump was designed and built. The combination was designed by James G. Zimmerman, of the Electric Vehicle and Garage Company, Milwaukee, in whose garage it is used.

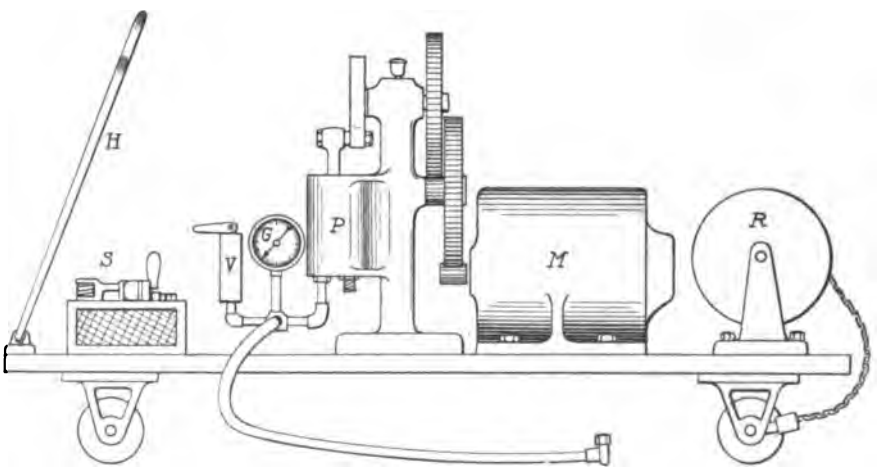
From the sketch it will be seen that the outfit consists of a gear driven pump P, mounted upon a portable truck and gear connected to an electric motor M, with controlling apparatus, so as to make it possible to use the pump at the position desired without having to travel back and forth while inflating tires.

The pump and motor set is sold by the F. W. Spacke Company, of Indianapolis, Ind. The additions are merely a pressure gauge G, a poppet valve V and an electric wire reel R. The reel R allows of the pump being moved about to suit the work, and makes it possible to pump the tires of a car outside of the garage as well as inside. The attachment plug at the end of the tire pump, therefore, serves anywhere in the garage. This is well illustrated in the case where the pump is used. The floor space is 50x150 feet on each of the two floors used. The piping necessary to cover this ground, with a pressure tank outfit, would be subject to many leaks, and the expense of piping would be something worth considering. The pressure gauge always shows what pressure is being pumped into the tires, and makes it possible to inflate corresponding tires equally. The poppet valve can be set to any pressure up to 120 pounds. This prevents bursting of tires by carelessly allowing the pump to continue operating unwatched.

Mr. Zimmerman informs us that this pump has been in use for more than a year, and outside of electric power the cost of maintenance has been practically nothing. In fact the pump has become so much a part of the place that they have had occasion to resort to the laborious hand pump but very few times since placing the power pump in use. The power taken is very small, as will be realized when it is known that the motor is of only one-quarter horse power.

Lubricant for Enclosed Transmission Gear.

The graphite lubricant for enclosed transmission gears recently placed on the market by the Joseph Dixon Crucible Company, Jersey City, N. J. (Dixon's No. 688 Perfected), is manufactured from kiln-dried soft cedar sawdust and a special quality of finely pulverized flake graphite mixed with high grade lubricants. This is said to prevent noise and wear to a great extent, and is not liable to leak from the gear case. It is also said to improve with use.



ZIMMERMAN PORTABLE AIR COMPRESSOR.

Handy Garage Contrivances.

By "Uncle Ed."

The automobile owner who has to do most of his own light repairing and adjusting is the one who is most benefited by handy kinks and convenient methods of doing work, so it is with the hope that the ideas here set forth may reach the eyes of this class of automobile owners that this is written.

About as unhandy a job as a man can "tackle" alone is to try to remove an automobile body without suitable appliances. For the man with a small garage holding only one or two machines, and even for larger establishments, an apparatus as illustrated in Fig. 1 will be found extremely convenient. This consists merely of suitable rollers suspended in bearings from the roof or floor above and having a rope wound around it, long enough to come down below the vehicle body. The roller at one end has four suitable handles to turn it by and the supporting timber has a hole through it through which to pass a stop pin to hold it wherever wanted.

The different parts are clearly shown in the illustration, Fig. 1, and the construction

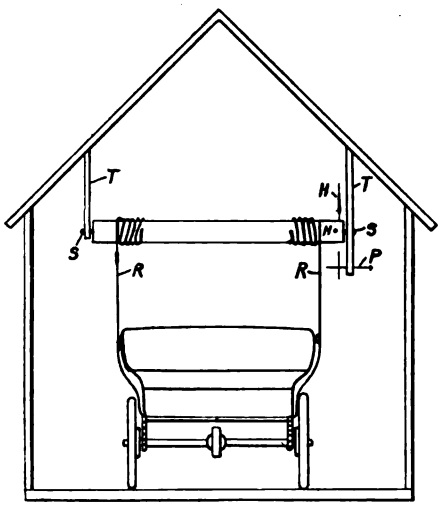


Fig. 1.

will be readily understood. The roller is made of any suitable stick of timber, a good, straight piece of 4x4 making a good roller by rounding off the corners. The short pieces SS at each end, forming the journals, can be of one-half inch or five-eighths inch cold rolled steel shafting, or other suitable material, and can just as well run in a couple of holes bored in the 2 inch plank or scantling TT forming the supporting frame work. The handles HH should be of one-half inch gas pipe and about 12 inches to 14 inches long each side of the roller. The holding pin P should be of three-eighths inch or one-half inch gas pipe. The rope RR should be one-half inch to three-fourth inch, according to the weight of the body to be handled.

Two of these rollers will be required, one for the back and one for the forward end of the body. With these, by raising

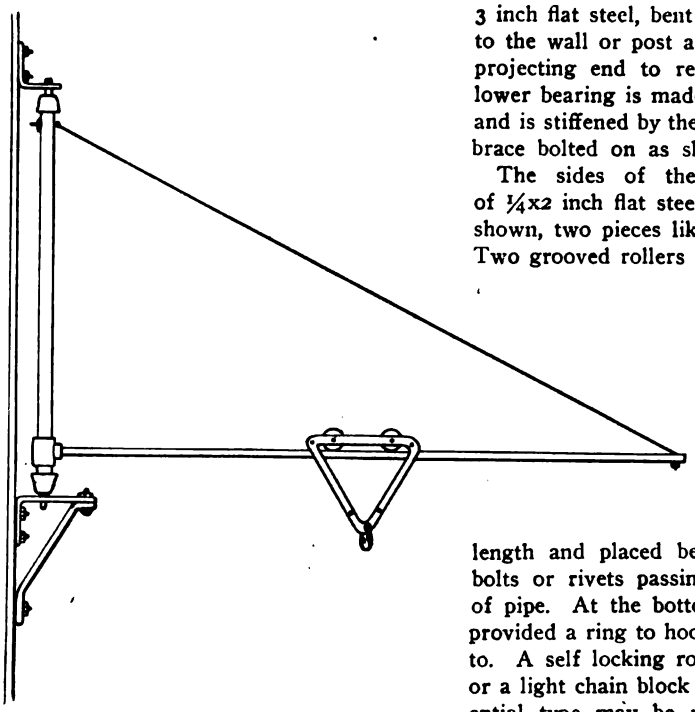


Fig. 2.

one end a little at a time, one man can easily remove the heaviest automobile body with very little trouble.

A very handy short jack screw to use in cramped places can be made by taking a hexagon threaded nut and a square or hexagon headed cap screw of suitable length. By using a thin wrench, such as a bicycle or automobile wrench, to hold each one, it is possible to exert a very great lifting power in quite a cramped place.

For handling engines and other quite heavy parts of an automobile, a self locking rope tackle block is a very handy contrivance. It can be fastened to a hook in the ceiling, or a better way is to put up a jib or wall crane with a traveler and thus make it available over quite a large space. Fig. 2 illustrates a cheaply made contrivance of this sort which, while it will have to be somewhat heavier than the factory made kind for the same capacity, still can be made to serve a very useful purpose at comparatively little expense.

As shown in the drawing, the mast or upright is made of a suitable piece of gas pipe (about 3 inches would be a good average size). At the bottom a reducing tee is screwed on and a piece of 2 inch or 2½ inch pipe is screwed in for the boom. A hole is drilled near the outer end of the boom and the upper end of the mast for the guy, which may be a piece of one-half inch mild steel rod with a thread on each end on which is screwed a nut to hold it in position. At the upper end of the mast is screwed on a reducing coupling with a 1 inch nipple screwed into it for a pivot. The bottom pivot is made in the same manner, as shown, by screwing a nipple into the tee and then putting on a reducing coupling and a 1 inch nipple. The upper bearing is formed of a piece of three-eighths inch by 3 inch flat steel, bent as shown, and belted to the wall or post and with a hole in the projecting end to receive the pivot. The lower bearing is made in the same manner and is stiffened by the addition of a bracket brace bolted on as shown.

The sides of the traveler are made of ¼x2 inch flat steel, bent and welded as shown, two pieces like this being required. Two grooved rollers are mounted on short shafts, as shown in the upper part of the traveler. The two sides of the traveler are held together with bolts or rivets, there being pieces of gas pipe cut to a suitable length and placed between the sides, the bolts or rivets passing through the pieces of pipe. At the bottom of the traveler is provided a ring to hook the tackle block into. A self locking rope tackle is all right, or a light chain block of the Weston differential type may be used—anything which will lift and hold the load wherever required is all right.

With this device it is possible to take the engine out of the rig, swing it around and place it on a work bench or elsewhere without any very great amount of labor, and by making the boom of suitable length it will serve several machines at once. This device is as well or better adapted to a regular garage man's use than to the use of a private owner, although it is applicable wherever it is desired to handle machine parts.

The suggestions for body hoists in this issue will be found particularly useful by owners of cars with motor under the seat.



"Uneedme" Tire Tool.

The Uneedme Tire Tool Set.

The Uneedme Tool Company, of Columus, Ohio, have devised and placed on the arket a set of four tire tools for use with rdinary clincher tires. The accompanying hotograph shows them in use. The parcular feature of these tools is an arrangeent of hooks whereby, after a purchase as been obtained on the tire, the tool can e held firmly in position by placing the ook around one of the spokes, leaving the ands free to operate the other tools, while he advantage gained in the position of the ire is not lost. One of these tools is deigned particularly for elevating the lugs when starting to remove a tire, which is mportant and is almost impossible to do by and. With a set of these tools an obstiate tire may be quickly removed without njury and without the operator wishing hat he had several pairs of hands.

The New Lightning Automobile Cleaner.

The Charles Holmes Machine Company, of Boston, have just placed on the market a new automobile cleaner, which consists of a heavy galvanized iron can, which holds about 4 gallons, with an air pump permanently attached to its side for creating a pressure in the can, by means of which the liquid contents, either gasoline or soap solution, is forced out with great pressure in the form of a fine spray. The spraying nozzle is at the end of a flexible tube and has a shut-off so that its force and quantity can be regulated. The cleaner is provided with a shoulder strap for carrying. On the top is a sort of safety valve to prevent pumping up too great a pressure. One mixture recommended is one gallon of gasoline and one pint of kerosene. By spraying this on the engine it is claimed that it will instantly remove grease that has been baked on, and that very dirty parts can be cleaned in this way much quicker than by hand and without the inconvenience of getting into contact with it. The device is also used for cleaning the bodies by spraying a mixture of light soapsuds. A few strokes of the pump are all that is necessary to put the apparatus into commission, and the makers claim that it will hold pressure for several days and be ready for instant use.

The Shaler Electric Vulcanizer.

An electric vulcanizer, herewith illustrated, is manufactured by C. A. Shaler, of Waupun, Wis. It is designed for the use of private owners of automobiles, as well as for garages and repairmen. The device consists of an electrically heated core enclosed in a metal casing, one face of which is flat for mending inner tubes and the opposed face of which is concaved to fit the outer casing of the tire. The vulcanizer is provided with a wooden handle, and lugs are cast on each side, through which bolts with thumb nuts may be passed for clamping it down to the shelf furnished with the device.



SHALER ELECTRIC VULCANIZER.

In case an inner tube is to be mended it is hung over the shelf and the vulcanizer is clamped on to it. In the case of repairs to outer covers, the vulcanizer is directly clamped to the tire on the automobile, by a bail with thumb nuts, which goes around the rim and through lugs on the vulcanizer. With the vulcanizer is furnished a length of about 20 feet of flexible wire with a plug connection, which can be inserted into any electric lamp socket.

To the shelf is secured a rheostat with twenty-five contacts. By means of this rheostat the heat produced in the vulcanizer can be very nicely regulated, and the same degree of heat, it is claimed, can be maintained for days. The degree of heat can be read off by means of a thermometer attached to the device. A patch 6 inches long can be vulcanized on in one setting of the vulcanizer.

The International Time Recording Clock System.

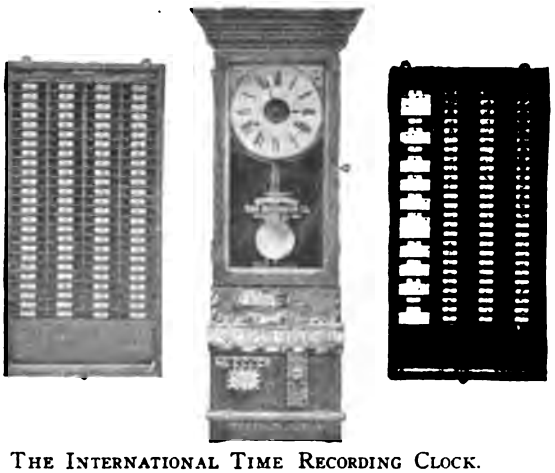
A time recording clock which is used quite extensively in garages and repair shops for checking the incoming and outgoing of the cars, time on repair jobs, and also the coming and going of the employees, is that made by the International Time Recording Company, of Binghamton, N. Y., with New York offices in the Flatiron Building. In the accompanying cut is shown the general appearance of the clock, with racks on either side to hold the cards upon which the records are kept. There are three styles of these cards used, the employee's, the repair man's and the chauffeur's. The repair shop card is shown herewith. The other cards are similar, the employee's card having spaces for recording the times when the employee enters and leaves the shop, and the chauffeur's card spaces for recording his times of departure from and return to garage.

The system, as generally used, consists in arranging the clock and racks upon the wall at a suitable place near the entrance, or in a hanging balcony overlooking the entrance, and placing an attendant, usually a boy, in charge. The lower portion of the clock contains the recording and stamping mechanism, so that by placing a card in a slot and pushing down on the lever the time is stamped on the card under the proper heading and opposite the proper day of the week. The proper heading is obtained by moving a lever into notches indicating the same. The day of the week is automatically taken care of. The duty of the person in charge is to note the outgoing and incoming of each car, and at such times place the card of that chauffeur in the machine and stamp and return it to its rack. In this way a complete record of the incoming and outgoing of the cars is kept, and is sent at the end of each week to the owner of that vehicle. In case a machine is used very frequently, a double card, or even a triple card, may be used. The kind of card suitable is soon found by experience. By this system the owner of a machine is kept accurately informed as to its movements, as the driver does not see or handle the records.

In case of the use of this system for employees the clock is usually placed near the entrance, and each employee, upon entering, inserts his card into the machine and stamps it; an attendant is not usually necessary in this case.

In using this system in the repair shop the method is very similar. Each workman has a card, on which are written the job number and his own number. Upon starting a repair job the card is inserted and stamped, and the same is done upon the completion of the work, which gives an absolute record of the time consumed and is used as a basis for figuring the charge and gives an accurate idea of the speed of the workman.

These clocks are sold outright by the company, who install the same and have a corps of competent men, one of whom may be had at any time for looking over the



THE INTERNATIONAL TIME RECORDING CLOCK.

THE —— COMPANY JOB TIME CARD.

Job No..... Date.....

Employee No.....

Operation .....

.....

.....

Foreman's O. K.....

Day.	Started.	Stopped.	Restarted.	Stopped.	Restarted.	Stopped.	Total.
Sat							
Sun.							
Mon.							
Tues.							
Wed.							
Thurs.							
Fri.							

Total Hours.....

Rate.....

Amount.....

REPAIR SHOP CARD.

clock if it should be necessary. The record cards are obtainable from the company, or can be printed by the user if desired.

A System of Garage Accounting.

Roy O. Williams, of the Curtin-Williams Company, Columbus, Ohio, has perfected a system of accounting whereby he knows the exact cost of storing every kind of automobile which comes in the company's garage. The simplicity of the system is one of its main features, only two blank forms being needed. One is the workman's time card, as follows:

THE CURTIN-WILLIAMS AUTO CO.

Time Card.

Workman's Name.....

Date.....190.....

No. Job.	Work Done.	Hrs.	Min.

The number of the job indicates on what car the work was done. A typewritten list, framed, is conspicuously posted in the workroom so the workman may easily get the shop number of the car, each car which is stored being down on the list with a number, the owner's name and the kind of car.

These time slips are transferred to another card, containing blanks for the job number, the make of car, the style of car, and the month. Below this are horizontal blank lines, one for each workman in the shop. Thirty-four parallel lines run across these lines perpendicularly, making thirty-six spaces—one for the workman's name; one for each day in the month, in which is recorded the number of hours' work on the car that day; one for the total number of hours; one for the rate per hour the workman is paid, and the last two columns for the total amount the workman has been paid for his work on that car during the month.

THE CURTIN-WILLIAMS AUTOMOBILE CO.

Job No..... Make of Car.....

Date..... Style of Car.....

Workman's Name.	1	2	3	4	28	29	30	31	Hrs.	Rate.	Amount.
Total											
Material...											

The four lines at the bottom, for material, are also used for such items as street car tickets used by men returning from delivering a car, or for going after one. The cost of chamois, sponges, water rent, light, taxes—general shopping charges—is proportioned among the cars and included with material charge.

The garage man is thus enabled to tell whether or not he is making money storing any particular car. The man who lives two or three miles away and wants his auto delivered two or three times a day, or the man who has a faculty of finding all the mud holes in town, necessitating the frequent washing of his machine, soon has a good charge account on the job number card, and the owner of the garage can then either get rid of the car or raise the price.

The Curtin-Williams Company also have devised a plan for saving disputes about the quantity of gasoline used. Gasoline bills are rendered monthly. Formerly owners of cars complained that they did not get the gasoline with which they were charged. Usually it was a case of change the bill to suit the customer or lose him. Now when gasoline is put in a car a double tag is filled out, giving the date, owner's name, number of car and amount of oil. One-half of this double tag is retained by the firm; the other half is tied on the steering gear. Now there are no disputes at the end of the month; if there is complaint it must be made when the tag is tied to the steering gear.

Columbus storage charges do not include gasoline, electric current and oil; but they do include washing and polishing, and going after and delivering cars, but if no delivery is desired a reduction of $2 per month is made. A uniform rate schedule has been established by the Columbus Auto Dealers' Association as follows:

Monthly storage rate (including delivery)—Runabouts, $14; medium touring cars, $16; large touring cars, $20; electric runabouts, $15; electric four passenger cars, $16.

Dead storage rates—Runabouts, $5; medium touring cars, $6; large touring cars, $8.

Transient storage, day or night, $1.

Livery rates, with driver, per day, from 7 a. m. to 6 p. m., $20; per hour, first hour, $5; per hour after first hour, $3.

General repairs per hour, 50 cents, nights and Sundays, 75 cents; machine work, 60 cents; nights and Sundays, $1; washing and polishing transient cars, 50 cents per hour.

A System of Checking Garage Materials.

At the Auto Arcade, Forty-ninth street and Broadway, New York, a system of checking materials obtained from the garage, which has proved very efficient, is used. In this establishment there are five departments, such as repair, storage, renting, wood and body working and a store. It was found by the management that three of these departments were not making the money which there should be in them, and the checking system was instituted, and after its use for a short time a decided improvement was shown. This system consists of a series of requisition blanks upon which must be signed the name of the person desiring goods, and also the materials desired, and another set upon which he signs again when the goods are received, so that nothing whatever leaves the garage without a written and signed request, and nothing is delivered without a receipt. This rule applies not only to oil, gasoline and parts, but also to the time for labor. It is also enforced with respect to the different departments when obtaining materials from each other; for example, if the wood department requires gasoline from the garage they have to sign a requisition slip the same as an outside party. Upon the delivery of goods it is acknowledged by signing the proper slip. If a customer borrows a jack, for example, he signs the necessary requisition slip, which in due time is passed into the office, and if at the end of the month he does not return the jack, it is charged on his bill. However, if he does return it, the first requisition slip is given to him from the office as evidence of that return. These slips are numbered consecutively and filed in the office, and if one is lost no charge is made to the person, unless they offer themselves to pay it. In case of suit for a bill, all that is necessary is to show these two slips, both signed by the party concerned, one showing that he requested the material and the other that he received the same, and judgment is given at once. Two cases of this kind have arisen since the system has been employed.

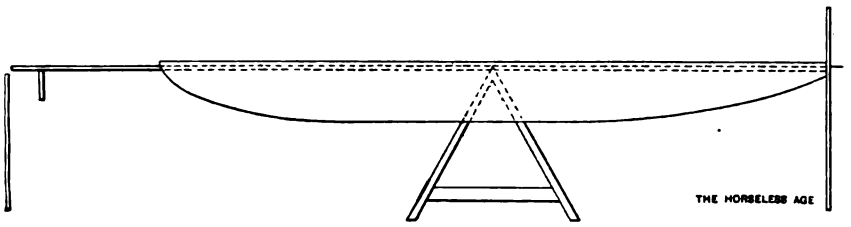
A Cheap Cylinder Oil.

A cheap oil, known as the Franklin Heavy Oil, which is produced in Franklin, Pa., is recommended as being a very good

gas engine cylinder oil, and as its price is much less than ordinary cylinder oil it ought to be of interest to garages and owners. This oil has not been placed on the market as yet as a cylinder oil, but we are informed that some preparation for refining it for this use is in progress. In the condition in which it is now to be had it costs but $4 per barrel, or about 10 cents by the single gallon, and is claimed by those who have used it to work perfectly.

Another Substitute For a Pit.

F. E. Avery, owner of a garage at 1199 Franklin avenue, Columbus, Ohio, has devised a platform or runway which does away with the use of pits and their attendant dangers and inconveniences. It is cheap and simple, and can be made by the workmen in any shop. The materials used for one side were as follows: One 2 inch plank 12 inches wide, 15 feet long; ditto 2 feet 3¼ inches in length; ditto 3 feet 5½ inches in length; ditto, 7 inches in length; and enough of the same material to build a horse whose top will stand 2 feet 3½ inches from the floor; two 1 inch planks, each 12 feet long; heavy iron hinges, and a 1 inch plank about 6 inches wide, to brace the horse on either side.



AVERY'S AUTOMOBILE REPAIR PLATFORM.

First build the horse. On one end of a 15 foot plank fasten securely the piece 3 feet 5½ inches in length, making it an upright and allowing it to project upward above the level of the plank 1 foot, thus forming a bumper which will prevent the car from running off. Six feet from this end nail triangular blocks, one to fit on either side of the top of the horse, allowing a see-saw motion but preventing slipping. On the other end of the long board hinge the piece 2 feet 3¼ inches in length. Take the 12 foot 1 inch boards and nail on sides of 15 foot 2 inch board, allowing them to project 1 inch upward to prevent the car running off sidewise. Fit it even with the end away from the hinge; it may be made a sort of boat shape to give it a neater appearance. Lay the board over the horse and one side is complete. Proceed in the same manner for the other side.

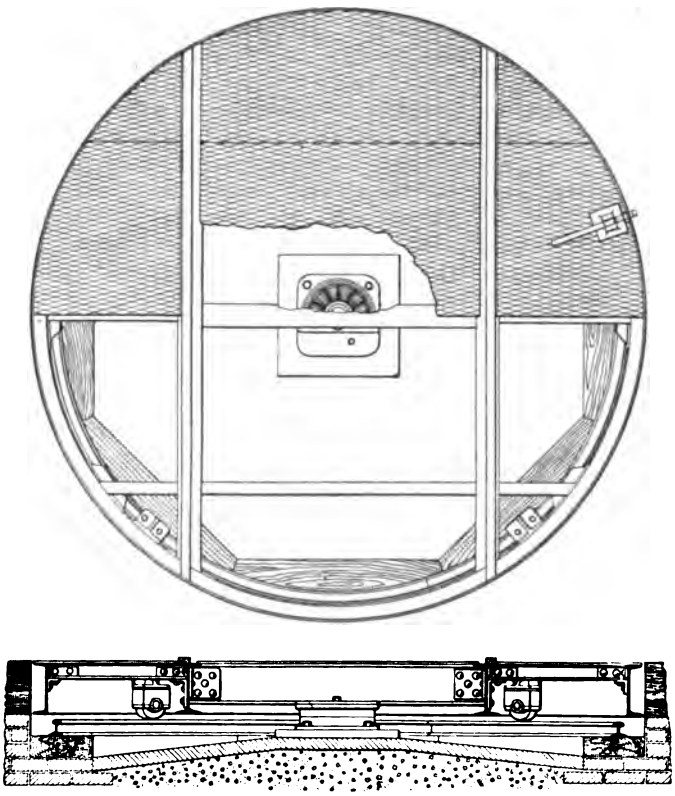
When the hinged ends of the two platform boards are kicked out from under the platform boards fall of their own weight, making an incline. The 2 inch planks 7 inches long are fitted under the platform board near the hinge, forming a support when they are inclined.

With the platforms inclined the car is driven up on them; when the car gets far enough up its weight pushes down the forward end, the rear end flies up, the hinged ends fall under it and the car is in the air. The difference in length of 2¼ inches between the height at the forward end and that at the rear end makes the hinged ends fly far enough under to stand securely. Cleats should be nailed on the floor at the proper position, against which the hinged supports can be kicked far enough inward to insure that they will not fly out and allow the car to run down backwards.

The horses should be fastened in position with heavy bolts.

The heaviest cars in Columbus have been handled on this runway, but with the very heaviest it is inclined to be a little wobbly, though no accident has ever occurred. Two and a half inch planks would be heavy enough for any car.

The distance from the floor to the top of the platform board at the centre, 2 feet 5½ inches, is enough to allow a workman to sit on a small box and work underneath a car. Workmen all say they prefer the platform to a pit.



PHILADELPHIA AUTOMOBILE TURNTABLE.

Philadelphia Automobile Turntable.

The accompanying illustration shows a plan view, partly in section, and a vertical section of an automobile turntable recently brought out by the Philadelphia Turntable Company, Real Estate Trust Building, Philadelphia, Pa. The table has a framework of sectional steel, and is supported by a roller thrust bearing at the centre and a number of casters run on an I beam circular track near its outer edge. The table is provided with a lock for holding it in position when not in use. The construction appears to be very substantial.

The Coates Clipper Portable Buffing and Drilling Tool.

The Coates Clipper Manufacturing Company, of Worcester, Mass., manufacturers of flexible shafting, are placing on the market this year motor driven flexible shaft specialties for garage work. Their flexible shaft is built on the unit link ball bearing system, in sizes ranging from one-tenth horse power transmission suitable for speedometers, up to shafts capable of transmitting 150 horse power. The accompanying cut shows the style of shafting and the parts of the links. The units of this shaft are made of high carbon steel and the driving pins of nickel steel. The universal mechanism is housed by a ball canopy and will admit of high rates of speed. The combination motor and flexible shaft burnishing and drilling outfit is particularly adapted for garage work. It consists of a small high speed motor which can, if desired, be placed on casters so that it can be moved from one part of the garage to another, and a flexible shaft with a cloth buffing wheel at the end. The buff spindle can be quickly removed and a breast drill inserted, which may be used for drilling small or large holes. This drill is very light, and has a speed reduction of 6½ to 1; and it is claimed that a hole can be drilled with this outfit while preparations are being made to do it by the old style hand breast drill. A device is also furnished in the nature of a detachable clutch, by means of which the buff or drill may be instantly stopped without stopping the motor. By removing the cloth buff and putting on an emery wheel and clamping the spindle in the tool post of a lathe, the device may be used for grinding.

Insuring Garages.

Insurance presents one of the most difficult problems connected with a garage. Some companies will not insure them at all, and all agree in treating them as extremely hazardous risks, even under the most favorable conditions. Two things tend to make garages undesirable risks, first and most important of which is the gasoline, on account of its volatile and explosive properties. This hazard is unavoidable, as gasoline will probably remain the principal fuel for motor vehicles for some time to come. The second cause is avoidable, namely, the lax methods of handling gasoline in most garages, which, the insurance people feel, amount to criminal carelessness.

Running a properly equipped garage is not nearly so dangerous as running a planing mill, according to the insurance experts. The danger of fire from shavings is away above that from gasoline, but employees in wood-working establishments through long experience have come to realize the danger from fire, and how to deal with it. On the other hand, gasoline is something relatively new to most employees, and some instruction regarding the proper method of handling is required. Garage fires are of uncommonly frequent occurrence, because employees are, as a rule, so ignorant of the qualities and action of gasoline and so careless of consequences. Doubtless as time goes on this carelessness will be gradually corrected, but this process of education probably means considerable loss of life and property.

Insurance men also complain that proprietors of the garages also often display a lamentable degree of ignorance in respect to the handling of gasoline. They do not seem to realize the necessity of having every up-to-date appliance which will make storage and handling safer.

Owners of garages have to pay from $15 to $30 for every $1,000 of fire insurance on their property. The minimum or basic rate in making up the premium is $7.50 per $1,000 on the contents of the garage and $3.80 (60 per cent. of the contents rate) on the building itself. As a matter of fact few if any ever get this rate. The principal addition is $5 per $1,000 on the contents and $3 per $1,000 on the building, because gasoline is not stored in accordance with the rules laid down by the board of insurance underwriters. In New York city these rules are practically the same as those formulated by the explosives commission of the fire department, an infraction of which is a misdemeanor. The insurance men say, however, that the gasoline storage facilities are hardly ever approved by the inspectors of the board of underwriters. There seems to be a great discrepancy somewhere. If the rules of the fire department are lived up to the underwriters should approve of them. If they are not lived up to the owners are liable to arrest. Stories of graft are constantly in one's ears. Garage keepers often prefer to simplify matters by "fixing" inspectors with fees, rather than live up to the rules. Many garage keepers claim that the inspectors look for these fees, and that gifts of money make dealing with them easy.

The next addition to the insurance rate is made if wood is used in the construction of a building, or where there is an L or lean-to. This addition amounts to from 50 cents to $2.50 per $1,000 on both building and contents. Five thousand square feet area is allowed, in excess of which $1 per $1,000 is charged for every 1,000 square feet, with 10 per cent. off for each division wall. Skylights cost 50 cents apiece per $1,000 on the contents and 30 cents per $1,000 on the building; floor opening, $1 on the contents, 60 cents on the building. A repair shop adds to the rate because the number of employees in a building is regarded by the insurance companies as increasing the risk. Where less than twenty-five men are employed in a repair shop $1 per $1,000 is added on the contents, and 60 cents on the building. Where twenty-five men or more are employed $1.50 per $1,000 is added on the contents.

A gasoline torch is regarded as one of the greatest dangers in a garage, for which $2.50 per $1,000 is added on the contents and $1.50 per $1,000 on the building. For an alcohol or kerosene torch, only $1 on the contents and 60 cents on the building is added. One dollar per $1,000 is added for the absence of fire pails, which charge, of course, is removed if they are installed. Approved communications with other buildings are charged for at the rate of 50 cents per $1,000 on the contents and 30 cents on the building. Unapproved communications cost $1 per $1,000 on the contents and 60 cents on the building.

Filling car tanks from ordinary gasoline cans is charged for at the rate of $1.30 on the contents and 80 cents on the building. If safety cans are used this charge is reduced to 50 cents on the contents and 30 cents on the building. Naturally this is one of the most important matters, but the insurance people find that most garage keepers will use almost any kind of an open can after complying with all the regulations regarding storage tanks, which often involve large expenditures. It is a travesty on safety regulations to see employees carrying gasoline about a garage in open cans, when owners have gone to great expense to install other safety appliances. It is one of of the anomalies of the present state of the business.

The charges for "exposure" refer to the danger from neighboring buildings, and usually do not amount to much in the case of garages, which are such hazardous risks themselves that they are ordinarily the causes of exposure charges in the case of other buildings, rather than subject to the same themselves. If located near woodworking places or flouring mills, however, this becomes an important charge, and is regulated entirely by the character of the work carried on in the other building. For instance, the difference in the risk between a flouring mill and a garage, as looked at by the insurance companies, may be seen by comparing the basic rate of $4 per $1,000 on the flouring mill and 75 cents on the garage.

The rate on a garage building is increased 50 cents per $1,000 if there are two tenants in the building, and $1 per $1,000 if there are three.

The "condition" of the garage refers to its cleanliness. If old boxes, oil rags, etc., are laying around, $1 to $2.50 per $1,000 is added. Unsafe hazards, like a gas bracket that is liable to be turned around against a wooden partition, a tank too near the boiler, or a brazing pot on wooden instead of iron legs, would also come under this heading, and would be charged for accordingly.

The number of automobiles kept in a garage makes an essential difference in insurance rates. There is no additional charge for four automobiles; where from five to ten are kept in the building an additional charge of $1 per $1,000 is made; where from 11 to 20 are kept, $3 per $1,000; 21 to 50 is $3 per $1,000; 51 to 100, $5 per $1,000; 101 to 175, $7.50 per $1,000; 176 to 300, $100 per $1,000. A "dead" machine, with a warranty that no gasoline will be put in it while in the garage, is treated the same as a carriage.

In country places, where it is possible to store the gasoline out of doors, or in an entirely separate building at some distance from the garage, the question of insurance is not so important; but in cities, where land is valuable and it is necessary to economize in every way on space, these matters become of the highest importance. In New York city the rules adopted by the municipal explosives commission last December say that a storage tank shall not be placed under a sidewalk, or in the sidewalk area, unless it can be shown to the fire commissioner that it is impracticable to install it elsewhere. Neither can it be placed inside any building that is more than one story high, or that has a cellar or basement. It must not have a capacity for storage of over 275 gallons. It must be made of iron or steel three-eighths of an inch in thickness; be coated on the outside with tar or other rust resisting material; have all joints tightly caulked; be tested by hydrostatic pressure, 100 pounds to the square inch; have all pipe connections at the top, and be buried at least 2 feet underground. Tanks that are to be filled by pipe from the street must be buried at least 2 feet lower than the grade of the street; and tanks that are within 10 feet of any building shall, if practicable, be buried 2 feet lower than the level of the lowest cellar floor in any such building. Tanks must be imbedded in 12 inches of Portland cement concrete, well tamped in place and should there be more than one tank, it must be separated by at least 12 inches of such concrete.

It is also provided that no pump or pump house shall be placed in a building more than one story high having a cellar or base-

ment, or in the cellar or basement of any building, nor in an area between a building and a sidewalk, or under a sidewalk, nor within the stoop line.

All fire and lights on an automobile, or under the boiler of an automobile, shall be extinguished before bringing it into a garage, and shall not be lit while it is in the garage. This rule is probably not observed very often, nevertheless it is a misdemeanor to break it in the city of New York.

No stove, forge, boiler, or other furnace, flame, fire or fire heat, no electric dynamo, motor, hoist or other exterior sparking electric appliance, and no artificial light (except the incandescent electric light) are allowed in a garage below the topmost floor that is not provided with an entrance on the outside of the building and separated from the garage by unpierced approved fire walls and floors.

It can thus be seen that there is no lack of law. The application of these rules is complained of by garage keepers as working unnecessary hardship in many cases, but when it comes to the matter of insurance every failure to provide the greatest possible protection has to be paid for, and the underwriters make a pretty thorough effort to ascertain the exact conditions existing in every garage.

Concrete Construction for Garages.

By Architect.

The use of cement in all kinds of construction in this country has increased in a marked degree during the last five years. This has been due partly to the great increase in the prices of all kinds of building material, and also to the fact, long known abroad, that cement in the form of concrete, reinforced by metal, is one of the strongest and best materials that can be used.

For many years bridges, arches, abutments, dams and all forms of heavy foundation and construction work have found in cement their greatest friend, for it is cheap, strong and enduring. As it has become more known its uses have increased so that it is now employed in almost all forms of construction.

For garage construction, of course, it was at once seen that, provided large spans in large sections were not necessary, the fireproof character of the material made it invaluable. To secure a building which is practically a monolith and unassailable by fire was recognized as the *ne plus ultra* of garage construction. To this end reinforced concrete is most valuable.

The method of reinforcement is by means of small iron rods or bars built into the concrete, becoming an integral part of it, and allowing some degree of elasticity. Either round, square, corrugated or twisted iron bars are used, and advocates of each are found. The walls of garages may be built entirely of concrete, which ought to be 4 inches thicker than common brick walls and infinitely better. Providing the spans do not exceed 50 feet, girders are formed by boxing the form and sides of the girder and introducing a few one-half to three-quarter inch iron rods in the form of a truss. The concrete is then tamped into the form box, and the result is a girder of tremendous strength. Smaller boxes, at right angles to the girders, are built like a beam, in which are also strung a few iron rods tied over the girders. The concrete is again tamped into the form, and the result is a beam.

Given, therefore, these girders, say 15 feet apart, and the lighter beams, say 6 feet apart, and a skeleton is formed ready for its floor. Here in the floor again comes the use of the reinforced concrete. These floors are no more or less than a mesh of wire over which 3 or 4 inches of concrete is embedded on top of a rough plank-formed centering. When hard the same thing is repeated for all the sections, and the result is a floor which will withstand tons of pressure.

Here, then, is a monolithic building in which barrels of gasoline could be poured and burned without appreciable effect. Such a construction is to be seen in the new Graham & Goodman garage on West Ninety-third street, New York, which is one of the best examples in the city.

Under certain conditions, however, in places where spaces are large and columns few, concrete girders, to be of sufficient strength, would approximate to sizes of 4 feet and more in depth by 2 feet in width, with columns nearly the same diameter, which would be clumsy. In such cases concrete walls and floors may still be used, and the larger girders and columns be of steel of very much smaller sizes, while the floors remain the same in every respect, making a much lighter and neater appearance. Such an example may be seen in the new Winton garage on Seventieth street and Broadway, New York.

The cost of construction is an item of no small importance. With brick from $10 to $12 per 1,000, and mason's labor at $6 per day, with all the nonsensical restrictions of the labor unions as to time and amounts of work done per day, it must necessarily follow that cement at $1.50 per barrel and the cheaper class of labor which can be employed will all tend to make it a popular construction.

Automobile and Hand Cleaners.

Keeping an automobile clean is a matter of the first importance to every garage keeper as well as to owners and chauffeurs. On account of the high speed at which motor cars travel over muddy or dusty roads they probably accumulate more dirt than any other vehicles in existence, in addition to which the quantities of grease, oil and graphite constantly used about the machinery keep the hands of the chauffeur or machinest begrimed. Quick and efficient cleaning is very desirable, and a number of preparations have been placed on the market by manufacturers for dealing with these problems of dirt and grease.

Boyer's hand paste, manufactured by Boyer Brothers, 320 Broadway, New York, is a hand cleaner especially prepared for the use of motor car drivers and machinists. It is claimed for it that it will remove grease, rust, graphite, oil or stains of any kind, and will not injure the skin. No water is required, it only being necessary to wipe the hands with a cloth or handkerchief and all dirt will be removed.

Cleanola, manufactured by the Cleanola Company, Allegheny, Pa., is used extensively for cleaning automobiles, and is claimed to preserve the varnish as well as remove mud stains. It is also excellent for polishing brass surfaces.

Albright, manufactured by Owen C. Hassler Company, Chicago, Ill., is a grease remover and metal polisher. It contains no acid, lye or grit, and is said not to injure the hands or any kind of paint or varnish finish.

Fisk's Auto-car Soap is made by the Fisk Manufacturing Company, Springfield, Mass., and is recommended as an excellent mud and grease cleaner for automobiles. It is made of vegetable oil and will restore the original lustre of varnished surfaces.

The Milwaukee Rubber Works Company, Cudahy, Wis., are about to put on the market a new cleaning fluid, to be called Lavoline.

The Orient Manufacturing Company, East Weymouth, Mass., make a liquid deodorizer and disinfectant which is claimed to prevent dust from rising, to exterminate germs and insects and to serve as a polishing liquid for varnished surfaces. It is also recommended for cleaning automobiles, as it removes grease and polishes metal work.

Mobo is recommended as a cleanser that removes oil and dirt without impairing the varnish or paint of a car. It is made by John T. Stanley, Thirtieth street and North River, New York. It contains no alkali, and is said to impart new gloss to the finished surface.

Tak-a-nap, manufactured by the Thayer-Hovey Soap Company, Darby, Pa., is a soft soap combining the cleansing qualities of naphtha with vegetable oils. This also is said not to injure varnish or paint, and is excellent for removing grease from the hands. It is applied by means of a spray pump.

The Utility Company, 332 Broadway, New York, manufacture Gre-Solvent for removing grease, oils and graphite from the hands. It is claimed for this preparation that it will not injure the skin. They also manufacture the Utility metal polish for automobile bodies.

The Klenzene Manufacturing Company, 1710 Market street, Philadelphia, make the Klenzene auto cleaner, which is said to preserve the finish of the automobile. It is claimed for it that it will not scratch, but covers up old scratches and adds new life and lustre to the finish.

The Puritan Oil Soap Company, 500 Exchange street, Rochester, N. Y., are about

to put on the market an oil soap for automobiles.

Other firms that manufacture special soaps and cleaners for garage keepers are the Rome Soap Manufacturing Company, Rome, N. Y.; Ford & Dennen, 16 Thayer street, Boston, Mass. (Star Auto-car Soap), and Cline & Bockstang, Detroit, Mich.

The American Perfumer Company, Springfield, Mass., have placed on the market a new automobile soap called Instanto. It comes in paste form, and is said to be excellent for varnished wood or metal surfaces, as well as for removing grease and stains from one's hands.

Portable Garages.

Portable garages are used by owners of automobiles who may live on rented property, or who, for some other reason, may not care to put in permanent improvements. They are especially convenient for summer residences, where only a few months' use in the year is required. Many owners also do not care to keep their motor cars in barns with their horses and carriages, and make use of the-ready-to-use house instead of building a more elaborate structure. Manufacturers have devoted considerable attention to evolving the most practicable type of portable garage, and it is now possible to purchase from a number of firms those that are fireproof, strong and durable, as well as quite artistic in appearance.

Charles H. Manley, of the Premier Manufacturing Works, St. Johns, Mich., makes three styles, varying in size from 10 by 8 feet to 20 by 16 feet. They are said to be so constructed that they can be taken down easily for removal at any time.

The Lloyd Iron Roofing and Paint Company, 99-101 West Monroe street, Chicago, Ill., make portable steel garages; also those partly of wood and iron. Sizes vary from 9x10 to 12x18 feet.

E. F. Hodgson, Dover, Mass., makes the Wigwarm portable garages, with either gable or hip roofs and in sizes varying from 10x12 feet to 12x20 feet. These are said to be complete garages, with floors, windows, hoods or blinds, incline bumper and painting.

The Springfield Moulding Works, Springfield, Mass., manufacture four styles, varying in size from 8x10 feet to 18x20 feet.

Mershon & Morley Company, Saginaw, Mich., manufacture six styles, of which all the side walls are interchangeable, and the solid sections are interchangeable with those containing windows and doors. The lumber is painted on both sides. Sizes vary from 9½x9½ feet to 12 feet 8 inches by 22 feet 2 inches.

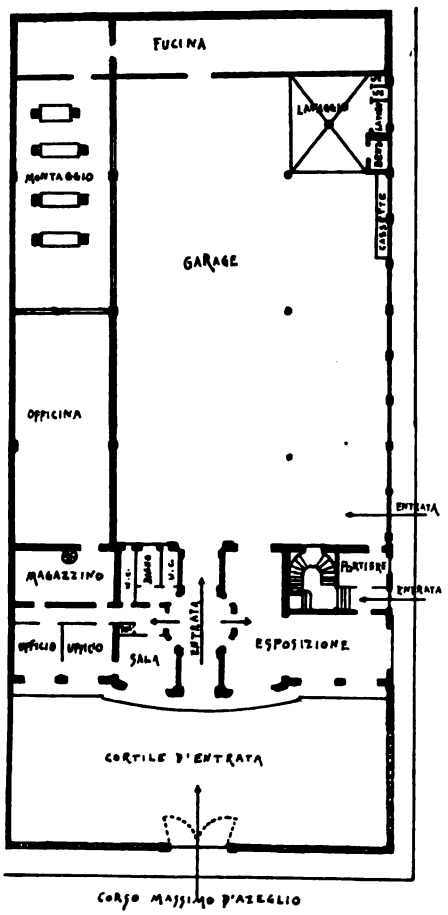
The Wyckoff Lumber Manufacturing Company, Ithaca, N. Y., are just placing on the market a line of portable garages.

A New Garage at Turin, Italy.

The following additional notes on the new Storero Garage in Turin, to which reference is made in the first portion of this issue, are sent us by our Italian correspondent. In laying down the design for this garage, the object of the proprietor, L. Storero, was to secure a modern establishment without any exaggerated luxuries, yet embodying all modern conveniences and facilities known in the garage business. A plan of the garage is shown herewith.

The storing capacity of the establishment is equal to 100 vehicles. The building is composed of a forward portion two stories high, constructed of brick and concrete, and of a large hall of brick and steel. The site of the garage is surrounded by a high iron fence, which was made necessary by the street plan.

The forward portion of the building contains on the lower floor the offices and the storeroom of the machine shop, the latter



communicating by a private stairway with the storeroom in the basement; also a toilet for employees, a toilet and bath, a waiting room and a telephone booth; a large entrance hall, a show room, and a small room for the watchman. In the basement there is the low pressure boiler of the heating system, and on the first floor there are two show rooms and one small bedroom.

The large hall, of brick and steel construction, contains a central portion which is higher than the rest, with a tile roof supported on columns, and a peripheral portion with a flat roof, the space between the two roofs being closed by large windows which serve for the illumination of the interior. This hall contains a repair shop, an assembling department with five pits and a gasoline storeroom. In the machine shop there is a line shaft driven by an electric motor and from which are driven the following machine tools: Three lathes, one drill press, one shaper, one vertical press, one saw and one emery wheel. Another electric motor operates a blower, a lathe and an emery wheel.

For the inflation of tires there is a compressed air reservoir which is supplied by a motor-driven pump and connects by a system of tubing with pressure valves suitably distributed in the large hall. In this hall, along the right-hand wall, there are a large number of lockers intended for movable accessories of the vehicles in storage. At the bottom of the large hall there is a stone-paved washing stand, with hydrants to which a hose may be attached. The washing stand may be completely separated from the rest of the room by means of impervious sheets.

Acetylene Welding.

Sir Charles Forbes, Bart., in a recent lecture on acetylene before an English engineering society, made the remark the most recent development in the application of acetylene, acetylene welding, gave results which, from his own practical experience, he considered nothing short of marvelous. The process is carried out by means of an acetylene and oxygen blowpipe, formerly under high pressure, but now the gas could be used with Fouché's pipe at an ordinary pressure from a generator, and the oxygen in the ordinary cylinders. It was necessary to keep the edge of the bright part of the flame against the work, then the flame had a reducing and not an oxidizing effect on the metal. He explained that by means of this process welding of heavy engines could be done on the spot, without removing them to the workshop, as no shortening of the two parts to be welded need take place, metal being melted into the gaps.

British Special Railway Cars for Shipping Automobiles.

The Midland Railway Company have just sent into traffic a first installment of a series of new covered trucks for the conveyance of motor cars over their line. These vans have been specially built for the purpose, and are fitted with side and end doors, the latter being so arranged that the largest cars can be conveniently and easily loaded. The trucks are 31 feet in length, and are as high as they can be built within the loading gauges. Sliding bars are fitted along the insides of the vans, to which motor cars or road vehicles of any description can be secured. Strong leather straps are used for securing the wheels and other portions of the cars to the bars in question. The vans are large enough to hold two motor cars, or one car and a large brougham.

ılts of the Two Gallon Contest.

r HORSELESS AGE:

what respects was the car which won rize in the recent two gallon test dif- from the other three cars of the make and power which fell far short e remarkable showing made by the r?

ıas been stated that the winning car ot a stock car but was one of special facture; the public would no doubt ciate the facts of the case and would ıd to know why the specially made ent 87 miles on the same amount of vhich propelled the other three 58.4, l 44.05 miles respectively.

examination of the gross weights in- that the winning car was 676 pounds than the average of its companions same name and power, but further his we are not informed.

F. N. B.

great deal is, of course, explained by ference in weight, for not only is the required approximately inversely tional to the weight, but the runa- aving the same power equipment as ıer cars, may well have a somewhat efficiency, as there is less need for to the low gear. That the winning ut was of special construction was a circulated, we believe, by rival com- s, and need not be given any cred- long as there is no proof of the as- . It seems to us that if the makers car knew of a way of constructing ars to give a much greater fuel econ- hey would have applied this method the cars of their make which com- or entered only a single car.—ED.]

ıp Spark versus Make and Break.

HORSELESS AGE:

correspondents Harold H. Brown harles E. Duryea have taken my nts to mean that an inefficient, badly d, run down, jump spark is as good al live one produced under the best ns. It would be unreasonable to paper saying that, but perhaps I have said "provided the spark is of igniting the mixture at all ly." I thought the context made ıning clear that once a good effective park is obtained it is quite as ef- as the make and break, and has us valuable points which are absent e latter.

comparison of the behavior of a par- scharged set of batteries with a fully set, which Mr. Brown refers to, means that the outfit referred to was lesigned; in fact, the coil was only r effective when supplied with, say, necessary with the make and break as compared with the jump spark proves the effect of the spark on rapidity of propagation of flame. It does not; it proves that the make and break system has less inertia to be overcome and that is all it does prove.

While supporting Mr. Brown in his inclination for jump spark, I must say it would have been better to have thought twice before suggesting "false arguments," but I thank him for the suggestion that some data would be interesting.

My sole object in opening this discussion and any others I may open is to call attention to the vital necessity for manufacturers obtaining reliable data by experiment, relying on facts, not guesswork, using less remarks beginning "Probably" or "Doubtless" and making more definite statements depending on known facts. This condition will come about when the present expensive system of trial and error gives way to scientific testing.

HUGO C. GIBSON.

Automobiles in Australia.

Editor HORSELESS AGE:

In Australia automobiles are used almost solely for amusement. Public service vehicles are very limited in number. At present there are in this State (Victoria) six steam buses (Clarkson system) and two gasoline buses (Milnes-Daimler system). Commercial goods vehicles are represented, so far as I can find, by one light gasoline wagon, locally built. Odd electric and gasoline wagons have been imported from U. S. A., but have gone off the road. Men in the trade here do not look for an immediate outlet for commercial vehicles.

My opinion is that this class of vehicle is limited in its applications owing to the price. When imported, freight and duty raise the cost so much that commercial people will not sink capital in them, in view of the short life and big up-keep. What is required is something more serviceable than rubber tires, something cheaper than gasoline, and something without a gear—a machine turned out in lots at a cost not much in excess of a pair of heavy draught horses and truck. The engine must be simple and entirely different from the four cylinder, four cycle type.

HENRY SUTTON.

Arrangement of Levers.

Editor HORSELESS AGE:

An article in your last number, "The Arangement of Levers," by N. W. W., is quite interesting. The conclusions might, however, in the writer's opinion, have been carried a little further. It is unquestionably bad to abandon the steering wheel at a critical moment in order to reach for a controlling lever; but whether it is better to do this in order to change to the low, all critical times. So long as one or more of the speeds are regulated by hand lever this is impossible, but the logical solution of the difficulty seems to the writer to be to give up hand control of the speed changes altogether and substitute pedal mechanism, which will accomplish the desired results.

D. M. SMITH.

Glare of Searchlights.

Editor HORSELESS AGE:

I notice in the interesting and generally commendable letter signed "S," in your issue of May 16, a remark regarding the use of powerful searchlights on automobiles, which, although it is true of many of them, is not, I think, applicable to all. A searchlight having an inefficient reflector, one which absorbs and scatters a considerable portion of the light it receives, is necessarily furnished with a burner giving a very large flame. Such a searchlight will throw an intense glare within a hundred or two hundred feet of the car, and this glare, which in itself is unnecessary and irritating to other users of the road, is unavoidable if the light is not to be so scattered and lost as to make the searchlight ineffective beyond the range of four or five hundred feet.

On the other hand a searchlight having an efficient reflector, one which projects the light forward in a slender compact cone, will throw a useful beam to a range far beyond that which is possible with the inferior reflector. Such a lamp requires only a small flame, and consequently does not throw a blinding gleam on the road and in the faces of passers by near at hand. It is a matter of experience that searchlights with efficient lenses, although their useful range is far greater than that of other forms of automobile lamps, do not blind persons looking into them, for the reason that the intensity of the illumination is only a little greater close to the light than at some distance.

HERBERT L. TOWLE.

Metric Pitch.

Editor HORSELESS AGE:

Being a reader of THE HORSELESS AGE, I would like to ask you a few questions as to how to figure the metric pitch of a gear. It seems different from the way we figure our American gears, even with millimeters.

L. V. D. HENDEN.

[In the French or metric system of pitches for toothed gears the pitch or module is equal to the pitch diameter in millimeters divided by the number of teeth. Thus a gear wheel of thirty teeth 6 module has a pitch diameter of 180 millimeters, or about 7.2 inches. The circumferential pitch is equal to the diametral pitch (module) in millimeters multiplied by 3.1416. To find the outside diameter of the gear add to the pitch diameter twice the pitch (module). The depth of the tooth below the pitch line

is equal to the pitch, plus one-tenth the thickness of the tooth on the pitch line (one-twentieth the circular pitch.)—Ed.]

A Wrinkle.

Editor Horseless Age:

The following suggestion may be of interest to your readers:

Go to some boxmaker and have him make a pine box just large enough to take in your jack, extra inner tube, tire repair kit and tire tools.

Stow this under the tonneau seat and when you have tire trouble, instead of breaking your back leaning over or getting down on your knees, just use the box for a seat and be comfortable.

I've had my troubles, have tried the above and I know.

Four Cylinder Sal.

Typical Record Card.

Editor Horseless Age:

We are enclosing herewith a form of record card or diary which has been found very useful in service. We thought perhaps a suggestion for some such record card would go well in your garage number. The spaces for tires keep track of the left front, right front, left rear and right rear tires separately. Thus the user not only has a record of the time each tire is in service, but of the exact mileage it has covered. The column for batteries is likewise very useful, since it takes count not only of the time but of the mileage. The rulings are self explanatory.

The Veeder Manufacturing Company.

MONTH, ..., 1906.

Date.	Odometer.	Fuel.	Oil.	Tires. L. F.	Tires. R. F.	Tires. L. R.	Tires. R. R.	Batteries	Repairs, Trips, Etc.		Totals.
1										Mileage....	
2										Fuel.....	
3										Oil.....	
4										Fuel cost...	
5										Oil cost....	
6										Repair cost	
7										Tire cost...	
8										Total cost..	
22											
23											
24											
25											
26											
27											
28											
29											
30											
31											

A Possible Reason for the Greater Advance Necessary With the Jump Spark.

Editor Horseless Age:

I have noticed in The Horseless Age and elsewhere letters from correspondents in which the statement is made that the make and break spark must be a better means of igniting the charge in a gasoline engine than the jump spark, because it needs less advance when the engine is going rapidly. It seems to me that a possible cause of part at least of the difference between the two kinds of sparks, so far as concerns the advance necessary, may be the fact that there must be with the jump spark an appreciable time interval between the moment of closing the primary circuit of the induction coil, and the moment when the secondary spark appears at the spark plug. This time interval is a constant independent of the speed of the engine, and therefore at high speeds it corresponds to a greater angular displacement of the crank shaft, and requires a greater advance of the closing of the primary circuit to overcome it. If this time interval or lag, for example, were 1-67 of a second, when the engine had a speed of 1,000 revolutions per minute it would require an advance of the time of closing the primary circuit corresponding to 90 degrees or one quarter of a revolution of the crank shaft, in addition to the advance required for very slow speeds. This suggestion will not explain any other differences that may be noted between the two kinds of ignition, but only the differences in apparent advance required under different conditions of speed or battery strength. W. S. D.

Queries.

Editor Horseless Age:

As I am a subscriber to your valuable paper, I would like to ask a few questions through your columns.

1. Is there any instrument on the market by which one can measure the intensity of the spark at the plug, or can this be determined by other means, and if so, how?

2. How may one get the same intensity of spark at the plugs of a multiple cylinder engine, and know that they are exactly the same?

3. What do you know about the practicability of the Hedgeland solid axle? Is it being used on any of the '06 cars, and if so, give names of cars so equipped? In what is it superior to other axles, and in what inferior?

4. How does it come that a voltameter will register the total voltage of a number of dry cells connected in series, and not the total amperage?

5. What are the objections to the Kimball steel tire casing? Does it affect the resiliency of the tire, and would it not have a tendency to chafe the tire?

J. S. O.

[There is no instrument on the market which permits of determining the intensity of the spark at the plug, but a rough test of the intensity of the spark produced by the plug in the atmosphere can be made as described by the article on "Testing Coils," by Charles E. Duryea, in the present issue.

There is no way of telling whether the sparks in the different cylinders of a multiple cylinder engine are alike, and there is no need for knowing this, as all that it is necessary to know is that the spark in each cylinder is sufficient to ignite the charge, and this can be easily ascertained by holding down the vibrators of the different coils in succession and noting the result on the running of the engine. If the speed of the engine does not decrease when a particular vibrator is pressed down, the corresponding cylinder is not working.

We do not give opinions on particular manufactures, and cannot therefore answer your queries about the Hedgeland solid axle and the Kimball tire sleeve. The Hedgeland axle was recently submitted to a 1,000 mile trial by the Automobile Club of Great Britain and Ireland. The judges' report on this trial appeared in our issue of May 23, page 741, and if you will read this report carefully it ought to give you what information you require.

When a number of cells are connected in series their voltage is added, but as there is only one path for the current to flow through the cells there can be no addition of current. When a cell or battery is short circuited through an ammeter, the current flowing is equal to the electromotive force (volts) of the cell or battery, divided by the internal resistance of the cell or battery. By connecting a number of cells in series both the electromotive force and the internal resistance are multiplied, and the current remains therefore the same.—Ed.]

Solid Tires.

Editor HORSELESS AGE:

In reply to "Investigator" in your issue of May 19, '06, concerning experience with solid tires, I can say hardly enough good about them. After having used "wind bladders" for over four years, with constant annoyance from punctures and blowouts, I purchased a full set of solid tires. If I had believed all of the discouraging reports about these solid tires my machine now would have been a mass of crystallized iron, with a lot of crystallized carbon glittering from the mass nearest the muffler. But so far none of the accidents have occurred that were predicted to happen on account of the various parts crystallizing. As far as ease in riding is concerned, I cannot tell the difference, and if there were any uncomfortable vibrations they would have to be rather severe before I would go back to the days of punctures and blowouts.

Dr. A. N. Collins, in THE HORSELESS AGE of May 23, voices my sentiments exactly, and from his experience with solid tires, and with my own, I cannot help thinking that the machine of the future for practical men will be equipped with solid tires, or tires that will not need any more attention than solid ones.

One point that has not been mentioned in reference to solid tires is that after using pneumatic tires and changing to solid tires one notices how much freer his machine runs. This is very noticeable to the autoist in a hilly country, where hills all the way from 1 per cent. to 20 per cent. are encountered almost every day, and one soon learns what hills can be taken on the high gear, what ones on the low gear and the ones that sometimes he can negotiate on the high and other times on the low. These last named hills clearly prove to me that a machine with solid tires runs freer than one with pneumatic tires, for every day I now go up one of the doubtful hills on the high gear.

I would like to hear more from practical users of machines equipped with solid tires and not those who want to go at full speed through a brickyard.

The editor of THE HORSELESS AGE, I think, owes an apology to the solid tire, for in the issue of May 23 he condemned the solid tire, because one machine equipped with them broke a steering knuckle, and he leads one to believe that the other knuckle broke from the same cause at almost the same instant, not even taking into consideration the blow the steering knuckle received when the opposite ends hit the pavement.

This run and jump conclusion seems to me to be out of keeping with the conservative policy of THE HORSELESS AGE. If I am not mistaken the editor has chronicled before this the breaking of steering knuckles on machines equipped with pneumatic tires; but if he cannot call to mind any machines with pneumatic tires breaking steering knuckles perhaps some of the readers of THE HORSELESS AGE can cite a few cases and I for one can. J. D. ECKER.

Editor HORSELESS AGE:

I note your editorial in last issue on crystallization of knuckles. In running two and one-half years on pavements I had the same thing happen four times. Once both wheels dropped off at the same time. To overcome this I changed my knuckles every eight months. Have done the same with my knuckles while running on solid tires. Only last week saw a machine on pneumatics let down in the same way. All knuckles with ball bearings where a very short section of the spindle, namely, that surrounded by the cone, has a very limited bearing in a circle about the spindle, will crystallize. I have little doubt but what a solid tire will crystallize them sooner, but there is no great difference in my experience.

A. N. COLLINS.

The Open Air Show at Empire Track.

The Open Air Show under the auspices of the New York Automobile Trade Association was held at the Empire Track, near Yonkers, Thursday, Friday and Saturday, May 24, 25 and 26. The weather was ideal and the attendance fair. President Dave Hennen Morris, of the A. C. A., made some brief remarks on the opening day. There were exhibits by thirty-nine motor car manufacturers and twenty-two tire and accessory firms had their headquarters in the large space underneath the grand stand.

Hundreds of men and boys stood on the track during the brake contests and flexibility test on Thursday, but, luckily, none of them were injured. The flexibility test consisted of a 1 mile high speed trial and a quarter mile slow speed trial, both to be made on the same gear with a flying start. Nine cars competed, and Percy Owen's 24 horse power Aerocar was declared the winner, with a score of 700 points, which had made the slowest quarter mile trial in 3 minutes 27 4-5 seconds, and had made its speed trial of a mile in 2 minutes 7 2-5 seconds. Second honors went to Burgoyne Hamilton's 50 horse power Welch, with 534 points, having made the fastest mile trial in 1 minute 21 2-5 seconds, with 2 minutes 34 seconds for its quarter mile trial. Peter Fogarty was third with his 20 horse power Northern, making his mile in 2 minutes 19 3-5 seconds, with 2 minutes 42 2-5 seconds for his slow quarter mile. The first brake test was for touring cars claiming a speed of 40 miles an hour or better, which were given a half mile start, so as to travel an eighth of a mile faster than 11 2-5 seconds, when the brakes were to be applied.

Ernest Keeler won with a 28 horse power Oldsmobile, doing his last eighth in 10 seconds and stopping in 168 feet. A. Cummings was second with a 30 horse power Marmon, doing the last eighth in 11 2-5 seconds and stopping in 175 feet. J. F. Brown, with a 24 horse power Autocar, was third, traveling the last eighth in 10 4-5 seconds and stopping in 177 feet. The other brake test was for touring cars claiming between 24 and 30 miles per hour under the same conditions, except their last eighths were limited to 19 seconds. The Cadillac Company's 10 horse power Cadillac won by stopping in 66 feet; Peter Fogarty was second with his 20 horse power Northern, which stopped in 84 feet; both covering the last eighth in 16 1-5 seconds. An impromptu 1 mile match race between a 12 horse power Franklin, driven by Ewing Easter, and a 24 horse power Frayer-Miller, driven by Peter Fisher, was won by Easter with 40 feet to spare. Both cars carried four passengers and Easter's time was 1 minute 45 seconds.

The summary of Friday's events was as follows:

Power Test, cars required to go through 75 foot stretch of sand from 5 foot start—Won by Ardsley Motor Car Company's 35 horse power Ardsley; time, 9s. Burgoyne Hamilton's 50 horse power Welch second; time, 9 2-5s. Cadillac Company's 30 horse power Cadillac third; time, 12 1-5s. Theodore E. Schultz's 30 horse power Marmon fourth; time, 13 4-5s. Peter Fogarty's 20 horse power Northern fifth; time, 14s. George J. Scott Motor Company's Glide; time, 14 2-5s. Atlantic Motor Car Company's 24 horse power Autocar; time, 28s. White Sewing Machine Company's 18 horse power White; time, 42 4-5s.

Reverse Gear, 75 yards, open to cars with planetary gear transmission—Won by Burgoyne Hamilton's 50 horse power Welch; time, 12 4-5s. Peter Fogarty's 20 horse power Northern second; time, 21 4-5s. No other starters.

One mile special race between three 24 horse power Autocars—Won by car driven by J. F. Brown; time, 1m. 32s. A. H. Whiting second; H. J. Wolfe third. Winner led by 10 feet.

Efficiency test with one pint of gasoline, award made on basis of distance traveled per horse power of car (10 cubic inches of piston displacement equaling 1 horse power)—Won by L. Burne, driving 10 horse power Cadillac, 4.97 miles; total points, 2,601; technical horse power rating, 9.8. Percy Owens' 24 horse power Autocar, 3 miles 95 feet; total points, 793, second; technical horse power rating, 20.9. Frank Lamwell, driving 24 horse power Frayer-Miller, 3 miles, 385 feet; total points, 614, third; technical horse power rating, 26.4. Peter Fogarty's 20 horse power Northern, 2 miles, 360 feet; total points, 438, fourth; technical horse power rating, 24.9.

One Mile Match Race—Won by E. B. Blakely, driving 35 horse power Ardsley; Malcolm Strauss, driving 24 horse power S. & M. Simplex, second.

Saturday's summary was as follows:

Vibration Test—Cars to travel 200 yards from standing start on high ground, and award to be on least water spilled from the pails—Won by E. Keeler (26 horse power Oldsmobile), with loss ⅛ inch; E. Hansch (35 horse power Gobron-Brille), second, with 6-8 inch; A. L. Kull (50 horse power Wayne), third, with 0.28 inches.

Traction Test—Cars to haul 500 pounds dead load 200 yards—Won by A. H. Whiting (24 horse power Autocar), in 25 2-5s.; F. Lowell (24 horse power Frayer-Miller), second, in 23 4-5s.; J. Rell (White Steamer), third, in 44 4-5s.

Obstacle Race—Won by L. Smith (10 horse power Maxwell), in 16s.; Wayne car second, in 16 1-5s.; Autocar third, in 16 3-5s.

One Mile Record Trial—Walter Christie (100 horse power Christie); time, 53s.

Three Mile Match—Won by A. Hudson (26

horse power Oldsmobile), in 4m. 44-5s. Two Ardsleys finished second and third.

One mile, between two 10 horse power Cadillacs carrying ten passengers each—Won O. A. Light, in 2m. 46s.

One Mile Match—Won by A. Cummings (30 horse power Marmon); H. Easter (10 horse power Franklin, second. Time, 1m. 31 1-5s.

Two Mile Match—Won by M. Strauss (30 horse power Simplex); H. Keeler (26 horse power Oldsmobile), second. No time.

Worcester Hill Climbing Contest.

The hill climbing contest of the Worcester A. C. on Dead Horse Hill, near Worcester, Mass, May 24, was held under rather discouraging conditions. The weather was perfect and the road in as good shape as hard work could make it. But the fact that the contest was held on a public highway made it impossible for even a large force of police to keep the crowds back. They spread out over the course, seeking vantage points, and it was only by rare good fortune that a serious accident did not occur.

Then, too, the great number of events and cars, coupled with a division of responsibility between the Worcester A. C. and Chester I. Campbell, of Boston, who managed the event, brought about bewildering confusion. Little or no attention was paid to the sequence of events, and cars were started as they came to the line regardless of the order of event. This was finally straightened out by Referee Speare insisting on having the car, event and driver announced.

One of the interesting features of the hill climb was the presence of three women contestants. They were Madame Des Rochers, in a Franklin; Mrs. E. L. Oppenheimer, of Boston, in a Reo, and Mrs. H. Ernest Rogers, in a Maxwell. Madame Des Rochers was third in event 9; Mrs. Oppenheimer was first in the amateur event, while Mrs. Rogers captured three first prizes.

There were many protests. Some of these were because of a misinterpretation of the definition of amateur, while others were on the grounds of eligibility for the event in which the car entered. In event 10 the Buick 22 horse power, listed at $1,250, was protested because the event was open to cars priced at from $2,000 to $3,000. H. J. Koehler was ruled out of event 7, on the ground of professionalism. In the same event L. S. Pratt, driver of Mrs. Oppenheimer's car, was protested for the same reason. Melvin E. Dixon was ruled out of event 11 on the ground of professionalism, yet he drove in event No. 1, which was for the amateur championship of Worcester County.

Joe Downey, driving a De Dietrich car, was charged with having cylinders larger than the regular stock cars. Referee Speare took the case under advisement. The American Locomotive Automobile Company's Berliet was also protested. The protests will be ruled on later.

The various cups, other than the M. P. Whittall trophy, representing the championship of Worcester County, will be held by the club pending the decision of the board of directors. It was announced before the races that these cups were to be awarded in different events. After the races it was announced that the trophies would be held pending action by the officials.

These cups and the events for which they were to be given were: The A. P. Cristy cup to the garage having the highest number of points in the climb, the Pope Manufacturing Company cup for the special runabout class, the Whittall cup for the county championship in the amateur class, and the *New England Automobile Journal* cup to the amateur making the best time up the hill.

In the contest for cars weighing more than 2,204 pounds A. L. Campbell drove Samuel B. Stevens' 80 horse power Darracq in 1:02. Owing to a misunderstanding of signals there were no official timers at the finish, so this event was not finished until the next day, when Campbell drove the Darracq over the course in 1:01 2-5. This surpasses the record of 1:09 made by Mr. Stevens in his Mercedes last year. Mr. Stevens drove the Daimler in 1:24 1-5 the next day.

J. R. Harding drove the De Dietrich car in 1:19 1-5 in the contest for cars worth more than $5,000, but was protested on account of the car being stripped.

The unofficial summary, subject to revision by the referee and officials, is as follows:

EVENT 1—AMATEUR CHAMPIONSHIP OF WORCESTER COUNTY; STOCK CARS.

Make and Driver.	Cy.	H.P.	Time.
Stanley, H. F. Grainger	2	20	1:31
Pierce, M. P. Whittall	4	45	2:01
Pope-Hartford, M. E. Dixon	4	25	2:15
Stearns, R. M. Garfield	4	45	2:36
EVENT 3—STEAM STOCK CARS.			
Stanley, Baldwin		20	1:26
EVENT 4—GASOLINE STOCK CARS; LIST PRICE $850.			
Maxwell, Mrs. H. E. Rogers	2	10	3:31
Maxwell, Ralph Coburn	2	10	3:45 2-5
Crawford, Crawford	2	10	4:04 1-5



SCENE ALONG THE COURSE.



SCENE AT THE START.

EVENT 5—AMATEURS; STOCK CARS; $850 AND UNDER.

Make and Driver.	Cy.	H.P.	Time.
Maxwell, Mrs. Rogers	2	10	3:23 2-5
Maxwell, Ralph Coburn	2	10	3:45

EVENT 6—GASOLINE, STOCK CARS; LIST PRICE $850 TO $1,250.

Buick, H. J. Koehler	2	22	1:52
Reo, R. M. Owen	2	16	2:01 2-5
Buick, B. N. Crockett	2	22	2:11
Reo, F. H. Pratt	2	16	2:26
Jackson, D. F. McArthur	2	20-24	3:07
Jackson, M. F. Schouffler	2	20-24	3:30 2-5

EVENT 7—AMATEURS; GASOLINE STOCK CARS; $850 TO $1,250.

Reo, Pope	2	16	1:58 2-5
Buick, M. P. Whittall	2	22	2:41
Reliance, W. H. Baker	2	22	4:04

EVENT 8—GASOLINE STOCK CARS; $1,250 TO $2,000.

Buick, B. F. Crockett	2	22	2:35 1-5
Crawford, G. M. Weatherbee	4	24-28	2:56 1-5
Maxwell, Stockbridge	2	16	3:25 1-5
Queen, R. Driscoe	4	26-28	ditched

EVENT 9—AMATEURS; STOCK CARS; $1,250 TO $2,000.

Reo, Thomas	2	16	2:11 2-5
Crawford, Poor	4	24-28	3:12 1-5
Franklin	4	12	3:35

EVENT 10—GASOLINE STOCK CARS; $2,000 TO $3,000.

Pope-Hartford, Grady	4	20-25	1:50
Maxwell, Kelcey	4	35	1:57 2-5
Columbia, Barrett	4	24-28	2:05 1-5
Rambler, Wilson	4	35	2:17
Columbia, Maxim	4	24-28	2:19 2-5
Marmon, Wing	4	30	2:27
Pope-Hartford, Whittle	4	25	2:49
Oldsmobile, Allen	4	26	2:55
Marmon, Ash	4	30	3:19
Jackson, Blake	4	40-45	3:39
Stoddard-Dayton, Sproat	4	35	6:19

EVENT 11—AMATEURS; STOCK CARS; $2,000 TO $3,000.

Marmon, Emerson	4	30	2:26 2-5

EVENT 12—GASOLINE OR STEAM STOCK CARS; $2,000 TO $3,000.

Rambler, Wilson	4	35	2:15 4-5
Marmon, Wing	4	30	2:24 2-5
Marmon, Ash	4	30	3:00

EVENT 14—GASOLINE STOCK CARS; $3,000 TO $5,000.

Stevens-Duryea, Duryea	6	50	1:14 3-5
Columbia, Bald	4	35	2:00
Thomas, Miller	4	50	2:04 3-5
Pope-Toledo, Elliott	4	40	2:05 2-5
Pope-Toledo, Whittle	4	40	2:16
Stearns, Read	4	40	2:18 1-5
Royal Tourist, Baker	4	40	2:38 4-5
Royal Tourist, Church	4	40	2:41 4-5
Jackson, Blake	4	40	2:57 2-5

EVENT 15—AMATEURS; STOCK CARS; $3,000 TO $5,000.

English Daimler, Harding	4	35-40	1:16
Columbia, J. Shepard, Jr.	4	40-45	1:54 4-5
Pope-Toledo, Elliott	4	35-40	2:15
Pierce, Whittall	4	45	ditched

EVENT 16—GASOLINE STOCK CARS; $5,000 AND OVER.

Napier, R. E. Traiser	6	60	1:37 4-5
Fiat, E. Hill, Jr.	4	50	1:38 2-5

EVENT 17—AMATEURS; GASOLINE CARS; MORE THAN $5,000.

De Dietrich, J. R. Harding	4	80	1:19 1-5
Daimler, Stevens	4	35-40	1:24 1-5



ASSEMBLAGE OF CARS NEAR THE STARTING POINT.

EVENT 18—GASOLINE CARS, HEAVYWEIGHT CLASS.

Make and Driver.	Cy.	H.P.	Time.
Stevens-Duryea, Remington	6	50	1:10
English Daimler, Harding	4	35-40	1:12
Napier, Hilliard	8	80	1:14
Pope-Hartford, Grady	4	25	1:28 1-5
Darracq, Campbell	4	80	1:34
Columbia, Maxim	4	24-28	1:36
Berliet, Gray	4	60	1:41 2-5

EVENT 19—CARS 851 TO 1,432 POUNDS.

Stanley, Baldwin		20	1:06 4-5
Stanley, Rogers		20	1:13 2-5
Columbia, Maxim	4	24	1:35
Buick, Kohler	2	22	1:43 4-5

EVENT 20—STOCK CARS, 551 TO 851 POUNDS.

Maxwell, Mrs. H. E. Rogers	2	10	3:02
Maxwell, Coburn	2	10	3:13

EVENT 21—CARS WEIGHING MORE THAN 2,204 POUNDS.

Darracq, Campbell	4	80	1:01 2-5
Berliet, Gray	4	60	1:16
Rambler, Wilson	4	35	1:58 2-5

EVENT 22—FREE FOR ALL CLASS.

Darracq, Campbell	4	80	1:02
Stevens-Duryea, Hancock	6	50	1:09 2-5
Napier, Hilliard	4	80	1:13 2-5
Premier, Moore	8	100	1:37

EVENT 23—OPEN TO ALL MAKES OF GASOLINE CARS.

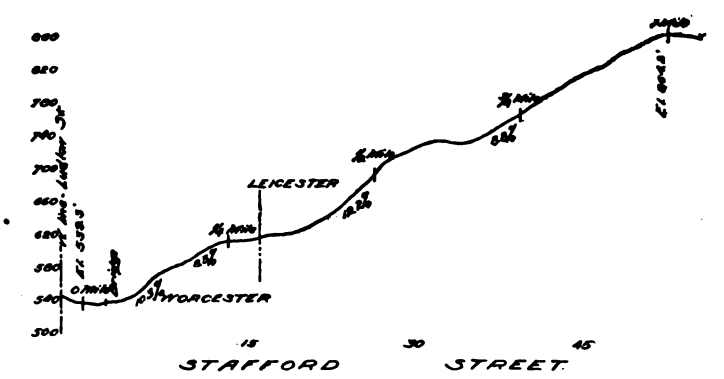
Darracq, Campbell	4	80	1:02 1-5
Berliet, Gray	4	60	1:19 1-5
De Dietrich, Downey	4	80	1:23 2-5
Rambler, Wilson	4	35	2:06

EVENT 24—SPECIAL RUNABOUT CLASS.

Corbin, Markel	4	24	1:57 2-5
Corbin, Kimball	4	24	1:59 4-5
Frayer-Miller, Burrage	4	24	2:42
Buffum, Breed	4	24	2:50 1-5

MOTOR CYCLES.

Indian, Kellogg	1¾		1:15 2-5
Indian, F. Hoyt	1¾		1:17
Marsh-Metz, A. Hoyt	1¾		1:17 3-5



PROFILE OF DEAD HORSE HILL.

Some Important Garages Planned.

The United States Realty and Improvement Company, of New York, have sold to the Packard Motor Car Company a plot containing about 16,800 square feet at the northwest corner of Sixty-first street and Broadway, New York. The dimensions are as follows: Frontage of 116 feet on Broadway and 197 feet 6 inches on Sixty-first street, with a rear line of 100 feet 5 inches and a northerly line of 136 feet. The selling price of the plot was $500,000 cash. The Packard Motor Car Company intends to construct a first class garage there.

The White Sewing Machine Company have purchased property at 205 West End avenue, between Sixty-ninth and Seventieth streets, New York city, and are remodeling the building on the property into an up to date garage. It will be occupied the coming summer.

In Cleveland the White Company have purchased 53 feet of land on Rockwell avenue, between East Sixth and East Seventh streets, and will erect a six story garage of the latest construction and equipment.

Plan to Reduce Risk of Loss by Fire.

A new and simple plan to reduce the risk of loss by fire has been adopted by Edward A. Nelson in his garage at 216 Main street, Springfield, Mass. His plan is to have all the departments in separate buildings, and in this respect his garage is unique. There is a room, 50x30 feet, where the usual garage supplies and the cars of regular boarders are kept; a building in the rear, two stories high, contains the repair shop and washroom; a separate brick building 10x12 feet, is used for the storage of gasoline and oils, and a shed, 60x30 feet, is utilized for storing the transient touring cars. At night the cars are locked up in this shed. Ninety per cent. of the fires in garages, Mr. Nelson says, have been caused by the fact that the various departments are not separated in this manner. In

nearly every case fires have started because of someone entering the garage for a touring car during the night. The suggestion of the separation of the various departments came to him from the insurance companies.

Minneapolis Hill Climbing Contest.

Ideal weather and perfect management made the automobile hill climbing contest of the Minneapolis Automobile Club at Riverside Hill on May 19 a success in every sense of the word. About 3,500 people witnessed the contest. The course was 1,900 feet in length, the hill rising 76 feet in this distance.

From a speed point of view the performance of the home-built steam racer made and owned by N. C. Wilson was the most spectacular, although it was barred from the competition and was entered for a record only.

SUMMARIES.

Class I, open to cars costing $800 or less—First prize, $50 silver cup, won by a one cylinder, 10 horse power Cadillac, owned and driven by Gus Ringlund; time, 1m. 16⅘s. Second prize, $25 silver cup, won by two cylinder, 14 horse power Wayne, owned and driven by F. M. Overholt; time, 1m. 24s. Third prize, a ribbon, won by one cylinder, 8 horse power Reo, owned and driven by W. C. Thornhill; time, 1m. 25 1-5s. Maxwell, owned by W. G. Northrop and driven by C. S. Norris; time, 1m. 28⅗s. Wayne, Model H, owned by L. H. Fawkes and driven by I. Beard; time, 1m. 57¼s.

Class II, cars costing from $800 to $1,500—First prize, $50 silver cup, won by two cylinder, 10 horse power Buick, owned by W. H. Wheeler and driven by H. J. Mich; time, 47s. Second prize, $25 silver cup, won by two cylinder, 22 horse power Buick, owned by H. E. Pence and driven by E. L. Welant; time, 48⅘s. Third prize, ribbon, won by two cylinder, 22 horse power Buick, owned by E. N. Young and driven by H. E. Pence; time, 51¼s. Queen, owned and driven by J. A. O'Brien; time, 93¾s. Jackson, owned and driven by J. S. Spargo; time, 1m. ⅘s. Franklin, owned and driven by Robb; time, 1m. 5s. Granite motor car, owned by Lende and Sween and driven by Claus Lende; time, 1m. 12s. Model Gas Engine Company, owned and driven by A. L. Cedarholm; time, 1m. 45¾s.

Class III, cars costing from $1,500 to $3,000—First prize, $65 silver cup, won by four cylinder, 24 to 30 horse power Mitchell, owned by C. C. Evans and driven by Erne Thompson; time, 43⅘s. Second prize, $50 silver cup, won by four cylinder, 28 horse power Olds, owned by J. J. Barclay and driven by William Folberth; time, 43¾s. Third prize, $25 silver cup, won by six cylinder, 40 horse power Ford, owned by Phelps and driven by W. E. Wheeler; time, 44¾s. Ford, owned and driven by W. E. Wheeler; time, 45⅘s. Franklin, owned and driven by Charles Meyer; time, 51⅗s. Rambler, owned by L. H. Fawkes and driven by Ed. Clark; time, 51⅞s. Olds, P. R. Brooks owner and driver; time, 52¾s. Frayer-Miller, M. W. Savage owner, W. C. Thornhill driver; time, 54¼s. National, owned by L. H. Fawkes and driven by H. L. Jenkins; time, 54s. Franklin, owned and driven by Gus Ringlund; time, 59¾s. Marmon, owned by A. F. Chase and driven by H. B. Allen; time, 59¾s.

Class IV, cars costing $3,000 or more—First prize, $25 silver cup, won by four cylinder, 35 to 40 horse power Pope-Toledo, owned by H. E. Pence and driven by George Soules; time, 37¾s. Second prize, $25 silver cup, won by four cylinder, 50 horse power Thomas Flyer, owned by J. J. Barclay and driven by William Kipper; time, 38¼s. Third prize, ribbon, won by four cylinder, 35 horse power Peerless, owned and driven by Charles Meyers; time, 40s. Peerless, owned and driven by Gus Ringlund; time, 44s. Thomas Flyer, owned by J. J. Barclay and driven by George C. Hilgers; time, 45s. Royal Tourist, owned by G. W. Caplin and driven by T. M. Anderson; time, 46s. Thomas, owned by P. H. Brooks and driven by Carl Arosin; time, 59⅘s.

Class V, no prizes, freak and stripped cars—First, freak steamer, owned and driven by N. C. Wilson, maker; time, 32⅘s. Royal Tourist, owned by George C. Caplin and driven by Harry Jardine; time, 47s.

Class VI, second hand cars, made prior to 1905, no prizes—First, Jackson, owned by A. W. Strong and driven by John Nelson; time, 1m. ⅘s.

Motor Buses for Buffalo Hotel.

George Duscherer, proprietor of the Lenox Hotel, Buffalo, N. Y., has placed an order for four electric coaches, to be used for passenger service between the hotel and depots. The Brunn Carriage Works, of Buffalo, has the contract, and will build the bodies in its own plant, but owing to the rush of work in the machine shop has sublet the contract for construction of the chassis, which will be built by the Auto-Car Equipment Company, of Buffalo.

The specifications call for broughams with an inside seating capacity of ten passengers each. The chassis will be of steel frame construction, with front springs 44 inches long and rear springs 52 inches in length, from the Perch Spring Company, of Bridgeport, Conn. A wheel steering gear of the worm type will be used, and the electric storage battery will consist of forty-two cells of the 15 W. B. type, built by the National Battery Company, of Buffalo, N. Y. This battery, it is estimated, will give the cars a range of 50 miles on one charge. Westinghouse Type B. or B. B. vehicle motors, with double chain drive, will be used, and these are to be fitted with the Morse silent running chain. A speed of 15 miles an hour is guaranteed. The brakes will be of the internal expanding type, with emergency brakes on both motors.

Artillery wood wheels, 36 inches in front and 42 inches in the rear, will run on Hess-Bright ball bearings and 2 inch axles. The wheels will be fitted with 3½ and 4 inch tires, respectively, of the Turner A grade, with 62 inch tread for the front wheels and 72 inch tread for the rear.

Pennsylvania Towns on Lookout for License Law Violators.

William F. Kimber, representative of the New Jersey Automobile and Motor Club on the law committee of the American Automobile Association, calls attention to the fact that New Jersey licenses are not recognized in Pennsylvania, and that the local authorities of the small towns on the Pennsylvania side of the Delaware River are just now more than ordinarily vigilant in the enforcement of this requirement. During the summer it is a common thing for autoists from eastern New Jersey to cross the State en route to the Delaware Water Gap, cross the Delaware River at Bridgeton or Stroudsburg or by Meyer's Ferry from the town of Delaware, N. J., to Portland, Pa., and thence along the beautiful shade road on the Pennsylvania shore of the Delaware River to the Water Gap. The authorities in the small towns on the Pennsylvania side of the river are taking advantage of the ignorance of the laws of their State displayed by autoists from New Jersey and New York.

April Exports and Imports.

The value of the exports of automobiles and parts from the United States for April, 1906, amounted to $408,333, as against $237,462 for the same month last year, thus showing an increase of $170,871. The value of the exports for the ten months ending April 30, 1906, amounted to $2,473,206, as against $1,876,063 for the corresponding period last year, and $1,542,535 for the year before. The distribution according to countries was as follows:

	April, 1906.	Ten Months Ending April 30, '06.
United Kingdom.....	$74,746	$616,177
France	31,375	170,601
Germany	11,517	57,259
Italy	55,960	227,588
Other Europe.....	20,774	123,233
British North America.	82,133	435,850
Mexico	91,881	293,002
West Indies & Bermuda	4,252	224,676
South America.....	9,748	61,780
British East Indies....	2,313	31,046
British Australasia.....	18,504	148,124
Other Asia and Oceania	3,329	44,096
Africa	831	26,925
Other countries.....	970	12,850
Total	$408,333	$2,473,207

One hundred and forty-four automobiles valued at $421,268, and parts valued at $39,709, were imported during April. For the ten months ending April 30, 1906, the number of automobiles imported was 888, valued at $3,115,361, and parts valued at $319,076.

Head of Bureau of Combustibles Dismissed.

George E. Murray, superintendent of the bureau of combustibles of the New York fire department for the last ten years, was removed this week by Fire Commissioner O'Brien for incompetency. Many violations of the law in regard to the storage of explosives were found.

It will be recalled that Superintendent Murray submitted the report that the sewer explosions in New York's garage district this spring were not caused by gasoline. Later this report was discredited by Former Health Commissioner Lederle, who showed conclusively that the explosions were caused by gasoline.

LEGISLATIVE and LEGAL

The Legal Status of the Garage.

By Xenophon P. Huddy, LL. B.

The garage is as necessary to automobiles as the livery stable is for the proper care of the horse. In fact, the garage has been defined by high judicial authority as the modern substitute for the ancient livery stable. The responsibilities assumed by one maintaining a garage are of the most serious character, and although there have as yet been few judicial decisions defining the rights and liabilities of the garage keeper, there are numerous questions readily suggested that may arise at any time from the housing of the twentieth century conveyance.

The garage keeper is a custodian, and the garage is of the nature of a warehouse. Warehousemen and wharfingers have long been subjects in judicial controversies. Many of the rules of law which have been announced in reference to these parties apply to the garage keeper. Garage keepers, wharfingers and warehousemen all are engaged in the storage business. They are what the law terms bailees for hire.[1] They take care of property. They house and protect for compensation the belongings of other people. The business of the keeper of a garage is merely that of a warehouseman or livery stable keeper, with the substitution of the automobile as the property placed in keeping. Necessarily, however, by reason of the peculiar characteristics of the property stored where automobiles are placed in the garage, peculiar duties and responsibilities are created to which the garage keeper is subjected when he receives the automobile of another for safe keeping.

The relation between the garage keeper and the owner of an automobile is contractual, and is known in law as a bailment, which term denotes the placing of property by one person having a general ownership in it in the hands of another person temporarily for compensation. The law of bailment is one of the oldest branches of jurisprudence of which the legal profession has knowledge, and the rights and liabilities of the parties to a bailment are very well defined.

Turning to the garage keeper's duties, it is incumbent upon him to furnish a suitable and safe building for the storage of the property which he invites under his care. He is obliged to furnish a garage which is safe for the storage of automobiles, safe so far as water and rust are concerned, and safe in being fireproof, at least reasonably so.[2] Not only must the building and premises be reasonably safe for the storage of automobiles, but it is the duty of a garage keeper to protect the property under his care against the acts of persons who may have occasion to visit the garage on business or for other purposes. The same principle of law applies to the acts of the garage keeper's employees who fail to bestow proper care and protection on the property entrusted to them. If an automobile is injured or damaged through a lack of propert attention of the garage keeper's employee, the employer may be liable in damages to the owner of the automobile.

The test of whether a garage keeper has properly fulfilled his duty in reference to the care of an automobile is "Did he exercise ordinary care and diligence on the particular occasion in respect to the property entrusted to his custody? Did he use all the care and diligence which a prudent man exercises in relation to his own property?" A garage keeper is not liable for damages where an automobile is injured while within the garage, unless he has been guilty of negligence or bad faith. He is not an insurer of the property placed in his care, and is only bound to the same degree of care which prudent persons usually take of their own property, and is liable only for ordinary neglect.[3]

In case a fire should break out in the garage, and automobiles stored therein are destroyed, the garage keeper is not responsible, unless it can be shown that by the exercise of ordinary care he could have prevented the conflagration, either by means of a different construction of the premises or the providing of a reasonably proper fire extinguishing appliance, or if the fire should be started by the negligence and carelessness of visitors he would not be liable if he took reasonable precaution against such contingencies by the promulgation and enforcements of proper rules. It is the garage keeper's duty to keep a strict watch over the premises and to see to it that there is no danger permitted thereon which is apt to injure the property in his care by fire started by persons carelessly using matches or smoking. The keeper of a garage must be on the alert to protect the property belonging to other people, which they have placed in his custody. This may require the establishment and enforcement of rules and regulations applicable to people who come to the garage.

The proper heating of a garage may be of importance. If it is necessary to keep the building of a certain temperature for the safety of automobiles, then it is the garage keeper's duty to maintain the temperature requisite. He cannot be excused on the ground that his fire accidentally went out, or that an employee neglected to attend to it. It is his duty to see to it that the conditions of the garage are proper. He is paid for fulfilling this duty.

If an automobile should be stolen from the garage the garage keeper may or may not be liable, according to the circumstances of the case.[4] If he was careful and on the alert to prevent thefts, and did all that a reasonable man might be expected to do under the circumstances, there can be no responsibility on his part to the owner of the automobile. On the other hand, if the garage keeper negligently allowed people to come and go from his building, and did not keep an eye open to protect property under his care from theft, then there is liability to the owner of the machine, and he may hold the garage keeper liable for its value, provided the automobile is not recovered. Where a servant or employee of a garage keeper steals an automobile the garage keper is not responsible to the owner, unless he was himself guilty of gross negligence. If the keeper of a garage has exercised reasonable care in the selection of honest employees he cannot be held responsible for their dishonesty, in which he had no participation.

The rights of the garage keeper are not so numerous as his responsibilities, in so far as his relation to the automobile owner is concerned. His principal and most important right is that of receiving his charges for the storage of the property. He is entitled to receive the compensation agreed upon, and at the stipulated time. If there is no express agreement as to price to be charged for the storage or care of a machine, then the owner of the automobile would be responsible for a reasonable sum, which amount would be determined by the current rates for storing machines of like character.

The garage keeper has no lien on the machine, or a right to retain possession of it, where the owner uses the machine from day to day, because there is no possession which the garage keeper has upon which a lien can be based. In order to establish a

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[1] *Bailment.*—Where an automobile is stored with a promise that it will be safely kept, the contract is one of bailment, and the bailee assumes the obligation of ordinary care and prudence, although a separate space is assigned for the automobile, and a lock securing the entrance to it is under control of the bailor.—Jones v. Morgan, 90 N. Y. 4; aff. jt. 24 Hun, 372.

[2] *Regulation of Garages.*—Judging from recent developments in New Jersey and New York, the supervision by law of the construction and the conduct of the business of garages may be expected in the near future. In New York city explosions have occurred in the sewers due to the accumulation of gasoline drained from garages. An ordinance has been passed to remedy this evil. In New Jersey litigation is now pending in the courts attempting to prevent the storage of gasoline in frame garages.

[3] *Only Liable for Negligence.*—A garage keeper, in the absence of bad faith, is only liable for negligence.—Claflin v. Meyer, 75 N. Y. 260, 31 Am. R. 467; rev. jt. 43 Super. Ct. (11 J. & S.) 1. See also Lynch v. Kluber, 20 Misc. 601, 46 N. Y. Supp. 428; (Sup. 1827) Platt v. Hibbard, 7 Cow., 497; (1832) Knapp v. Curtis, 9 Wend. 60; (1832) Schmidt v. Blood, 9 Wend, 268; (Com. Pl. 1863) Arent v. Squire, 1 Daly, 347; (Com. Pl. 1875) Smith v. Simms, 51 How. Pr. 305; (Super. 1879) Madan v. Covert, 45 Super. Ct. (13 J. & S.) 245; jt. aff. 81 N. Y. 629.

[4] *Automobile Stolen from Garage.*—A garage keeper is not liable for an automobile stolen from his custody, except on evidence of negligence.—(Super. 1877) Madan v. Covert, 42 Super. Ct. (10 J. & S.) 135; (1879) Id., 45 Super. Ct. (13 J. & S.), 245; jt. aff. 81 N. Y. 629.

Proof of larceny or burglary does not of itself relieve the garage keeper. He must, in addition, show that he did not in any wise contribute by any neglect or want of precaution on his part.—Abecasis v. Gray, 43 Super. Ct. (11 J. & S.) 573.

Theft by Employee.—If an automobile is stolen by the servant of a garage keeper, without gross negligence on the keeper's part, he is not liable.—Schmidt v. Blood, 9 Wend. 268.

lien for the purpose of enforcing charges against an automobile the party claiming the lien must have had continuous, unbroken possession. A surrender of the possession of the property surrenders the right to a lien. If, however, the garage keeper has had unbroken possession of an automobile he possesses a common law right to retain the machine until the charges are paid.

Before concluding it might be suggested that it would be of advantage to garage keepers and owners of automobiles to have at their disposal a certain fixed form of contract covering the storage of automobiles, containing proper agreements for the protection of the parties in case contingencies happen similar to those pointed out above.

Alcohol Bill Passes Senate.

The so called free alcohol bill passed the Senate last Wednesday, after receiving several important amendments. One of them was that the bill should not go into effect until January 1, 1907, instead of after three months, as the bill read when it came from the House.

In another amendment the Senate adds to the penalties for violation. The House bill named a fine of $5,000 to be paid upon conviction, or imprisonment for five years, at the discretion of the court. The Senate adds the confiscation of personal and other property used in the unlawful business.

The chief reason assigned for extending the time for the bill to go into operation was that the Commissioner of Internal Revenue asked time in which to make preparations to carry the law into effect.

Debate upon the bill in the Senate, while not prolonged, was of an interesting character. It was shown that there was an immense popular pressure upon Congress for the passage of the law, which finally broke down all opposition from the Standard Oil Company and the wood alcohol manufacturers and compelled the Senate to act promptly and with great unanimity. The chief speech made upon the measure was by Senator Teller; who said he had been overwhelmed by letters and messages from his State urging him to vote favorably on the bill. However, the senator, while obeying the voice of his people, had the temerity to say that they and pretty much all the other people of the country were mistaken as to the benefits which would accrue from the law. His and other expressions upon the Senate floor showed that the members of that body were acting under compulsion and not from choice or conviction.

The bill has already gone to conference and will be disposed of within a few days.

Virginia's New Law.

The new Virginia automobile law to become effective June 13 is a matter of concern to every owner of a car in that State. It is believed the law will be generally adopted by the cities and counties of the Commonwealth.

One of the most notable features of the law is the provision that the owner or operator of an automobile, when a horse or other animal shall become frightened at his machine, shall come to a stop and descend and assist the driver of such animal to quiet the animal. This provision, however, does not apply to women, a large number of which drive their own machines in Virginia. It was inserted at the instigation of farmers in the great southwest section, who claim that the lives of themselves and families are endangered by the automobilists who dash by at frightful speed, leaving the drivers to quiet their frightened animals as best they can. They claim that the presence of the automobiles has been the cause of numberless accidents. The southwest is the greatest automobiling region of Virginia.

The effect of the law is already being felt, although it is not yet in operation. A great many local automobilists are already observing the provisions of it. An attempt to comply with the provisions of the law resulted in a peculiar accident recently. D. B. Tennant, of Oatlands, halted on the road for the purpose of assisting a farmer to quell a frightened animal, leaving his wife and her mother seated in the car. The younger woman, in her excitement, threw wide open the throttle of the machine, which, bounding forward at high speed, struck her husband, knocking down and running over him. It then took a course straight across country, carrying the women, who were completely helpless, neither being able to operate it. The automobile brought up in a ditch, and both women were thrown out. Mr. Tennant was considerably injured.

Owner Not Liable If Not in Motor.

New York.—Edwin A. Strout, a wealthy business man residing at No. 508 West 112th street, by a decision handed down recently by Judge Saunders, in the Eleventh Municipal District Court, will not have to pay Virginia Samuels, of No. 514 West 125th street, $500 damages. Mrs. Samuels left a street car at 125th street and Amsterdam avenue in March last, when Mr. Strout's automobile, driven by Philip H. Lucas, of Mount Vernon, swung suddenly around the corner, struck her and hurled her 10 feet away. She testified that Lucas dashed away without offering to assist her in any way.

The woman was assisted to her home, and was unable to work for ten weeks. Suit was brought against Mr. Strout to recover $500 damages.

Through his attorney Mr. Strout contended he was not responsible for the accident when he was not an occupant of the automobile and while it was not under his control. Lucas had borrowed the automobile from Mr. Strout.

Judge Saunders sustains the contention of Mr. Strout that he is not liable for any damage done by his automobile while it is not in his actual possession.

When Massachusetts Automobilists Are Criminally Liable.

Boston, Mass.—Whoever participates in the overspeeding of an automobile is criminally liable, according to a decision announced recently by a majority of the Supreme Court of Massachusetts. If the owner or any person having control of the machine knew or allowed the motor car to run illegally he is equally liable with the chauffeur. The decision was in a test case, known as the Commonwealth against Rolan H. Sherman, who is a son of Judge Edgar J. Sherman, of the Superior Court bench of Massachusetts. Mr. Sherman was found guilty in the Central District Court at Worcester for driving his automobile more than 12 miles an hour, the speed limit fixed by the town of Leicester. In the Superior Court, to which he appealed, he was found guilty. Holding that he could not be convicted on the evidence, Mr. Sherman carried the case to the Supreme Court. It was agreed that he was in the automobile, which was going at an excessive speed, and that he was one of five persons in the vehicle, although he was not himself operating it. The high court holds this proof sufficient of conviction. It says the automobile was registered with the Highway Commission by the defendant, and in his own name, warranting a finding that he was the general owner or that he had a special property right which gave him control. The court decides that if he is guilty he is guilty, not as owner, but because the evidence warranted the jury in finding as a fact that he participated in the machine being run at an illegal speed.

Alfred Reeves Manager of A. M. C. M. A.

At a two days' session of the A. M. C. M. A., held at the Hotel Manhattan, New York, this week, Alfred Reeves was chosen general manager of the association, to succeed Roger B. McMullen, resigned. The offices will be removed from Chicago to New York, and located in the Spalding Building, 31 West Forty-second street. Mr. Reeves has been secretary of the New York Automobile Trade Association.

It was decided to establish an associate membership for importers, and a resolution was passed protesting against the proposed action of the A. A. A. committee on the Glidden Tour in limiting entries to cars of a certain weight.

The New York Motor Club will give its annual orphans' day automobile trip to Coney Island June 6. It is expected that 3,000 children will be given a ride. This will not be possible unless more cars are offered. Chairman W. J. Morgan says that only 125 vehicles have been offered thus far, and 400 will be needed.

OUR FOREIGN EXCHANGES.

The Location of the Spark Point.

One of the factors which influence the dependability of ignition is the location of the ignition point. First of all, no matter what type of ignition is used, the ignition point must be so located that the interior parts of the ignition mechanism are protected against oil, are well cooled and always fanned by the new charge. Reliable ignition can only be secured by meeting all these requirements. However, as simple and easy as it may seem to fulfil these conditions, it is very difficult in practice.

In the design of a motor cylinder the chief object to be considered by the designer is to obtain a very uniform product, with as few wasters as possible. The requirements that must be met are multifarious and those which are imperative, if reliable ignition is to be secured, are liable to be relegated to the background.

Thus, the unfavorable arrangement of the ignition mechanism on the 1903 Mercedes motor, in a position where it is much exposed to oil, is chiefly due to a desire of the Daimler Company to produce a light motor of great output. To this end they arranged the inverted inlet valve at the middle of the cylinder head, and in order that the spark points might be surrounded by the incoming charge they were obliged to place the spark mechanism on the opposite side from the exhaust valve, in a position where it could most easily be reached by the oil passing through the piston rings.

The writer considers that, as regards high specific power, the Mercedes 1903 motors are even to-day unequalled, but this advantage was gained at the expense of reliability, and was, therefore, little appreciated by the public. On the contrary, the arrangement of the ignition mechanism in the 1902 Mercedes motor (in the side of the inlet valve chamber) was so unusually favorable that short circuiting in consequence of sooting of the interior portions of the make and break mechanism was rare, indeed, and their high degree of reliability places these motors even to-day among the most desirable ones. The Daimler people, therefore, continued this arrangement in 1904, as well as 1905 and 1906, the best proof of its advantages and its value. Spark points located directly above or below the inlet valve can never become oil covered or sooted to such an extent as to cause interior short circuits; they are always fanned by the fresh charge and can be easily so arranged that they are cooled sufficiently.

It cannot be claimed, however, that the spark terminals can be easily taken apart, especially if they are carried by a flanged plug, as in the Mercedes motor. The spark plugs of the two inner cylinders are particularly hard to get at, and the unscrewing of the nuts holding these plugs in place, between two hot cylinders, does not constitute one of the enjoyable features of automobiling. This flanged ignition plug is one of the characteristic features of the Mercedes motor. It has its advantages, as well as its disadvantages, and the latter have caused a large number of French manufacturers, who have adopted make and break ignition, to separate the stationary and movable electrodes and to mount each one separately in the cylinder head. Closely related to the flanged ignition plug of the Mercedes motor is Maybach's ignition channel, a feature which, so far as the writer is aware, is found only on the Mercedes motor. The flanged ignition plug carrying both the stationary and movable electrodes undoubtedly has the advantage of combining on one support two parts, the operation of which is interdependent, and which, in case of faulty operation owing to short circuiting, must both be disconnected and inspected. An interior defect of the ignition mechanism may just as well be due to the stationary as to the movable terminal, and to determine whether the one or the other is at fault without taking the mechanism apart is often extremely difficult, if not impossible. Consequently, in the case of such a defect, where the parts are mounted as in the Mercedes motor, the removal of both is not only desirable but necessary.

The reason, however, why the Daimler Company has constantly retained the flanged ignition plug is to be found in the second peculiarity of the Mercedes motor, the ignition channel, which connects the chamber in which the spark terminals are located with the compression chamber. This ignition channel evidently serves the purpose of creating a shooting flame which would ignite the compressed gases more quickly than a single spark between the points of the ignition terminals. However, though this idea may be right theoretically, especially as applied to low tension ignition, in practice difficulties are encountered which diminish its value and often make it illusory. The ignition channel has a real value only in case the make and break terminals located in the chamber at its bottom are completely protected against sooting, and at the time of ignition the chamber is filled with fresh gases capable of giving a strong shooting flame.

But to satisfy these two requirements is a very difficult task, and in many cases impossible, and for this reason numerous French designers who have adopted make and break ignition prefer the advantage of an absolutely reliable and uniform to a very energetic but not so reliable ignition. They have developed the stationary contact terminal in the form of a spark plug, and screw it separately into the cylinder head, as near the centre of the compression space as possible; while the movable contact terminal, also separate, is mounted at right angles thereto, horizontally in the side wall of the cylinder head or the valve chamber. These designers, therefore, use no ignition channel, and disregard the advantages of the shooting flame. The ignition in their motors is apparently less rapid and they are obliged to advance the spark more in proportion for a given speed. Owing to the fact that the stationary and movable contact terminals are mounted separately in the cylinder wall, they have a greater choice in the selection of the location of these parts and are able to place the stationary terminal in such a position that it is fully protected against oil, and always fanned by a current of fresh gases and thus cleaned. This circumstance, in connection with the possibility of easily and quickly removing the stationary terminal when, owing to a defect in its insulation, it must be replaced, makes this arrangement of separate spark terminals more reliable in operation than the flanged ignition plug mounted in the wall of an ignition chamber communicating with the combustion chamber through an ignition channel; and the Frenchmen, as practical men, prefer a higher degree of reliability to an increased output of the motor coupled with the possibility of failure.

As regards the location of the spark plug in connection with high tension magneto and battery ignition, the conditions of faultless operation are the same as with make and break ignition. The spark plugs, too, must be so located that they are protected against oil, and kept as cool as possible. The ignition channel would be no advantage with either type of ignition, for the reason that the jump spark possesses less igniting power than the contact spark; and, so far as the writer knows, the principle of the ignition channel has never been advantageously employed in connection with high tension ignition.—*Der Motorwagen.*

Foreign Notes.

A number of English automobile manufacturers and agents have recently indulged in record runs between London and Monte Carlo for advertising purposes. In France the legal speed limit in the country is 30 kilometers (18½ miles) per hour, but it is not enforced, as in England, by means of police traps.

A special meeting of internationally recognized automobile clubs was called at London on May 25, to consider a proposal of the A. C. G. B. & I., or a revival of the Gordon Bennett race on practically the original lines, except that the weight limit is to be 850 instead of 1,000 kilogs.

The annual report of the British Patent office shows that inventors are largely concentrating their ingenuity upon automobile improvements, especially anti-slipping and anti-puncture devices and speed gears.

MINOR MENTION

The Northwestern Storage Battery Company have removed from Chicago to Milwaukee.

The A. C. of Maryland has printed the new Maryland automobile law in pamphlet form for distribution.

Willis H. Dutton, Washington, N. J., has been appointed State motor vehicle inspector for that section.

The Reo Motor Car Company are breaking ground for two new buildings, which will give 65,000 square feet additional floor space.

The Chicago A. C. has issued a brochure showing the plans for the new clubhouse to be erected between Jackson and Van Buren streets.

The Newmastic Tire Company have a plant at 370 Manhattan avenue, New York. They will manufacture tires and filler, and make repairs.

Louis F. Buff, of the Buff & Buff Manufacturing Company, Jamaica Plains, Mass., is in the market for a good self-starting arrangement.

The Warner Instrument Company will open a branch office at 1251 Michigan avenue, Chicago, Ill., June 1, with A. J. Inderrieden as manager.

William Herrick, treasurer and manager of the William Herrick Company, agents for the Peerless cars, 1334 Michigan avenue, Chicago, died May 25.

The Sterling Engine Company, of Buffalo, N. Y., is looking for a site for the erection of a new plant for the construction of commercial motor vehicles.

Beside their motor truck business the recently incorporated Nielson Motor Car Company, of Detroit, will soon place on the market a runabout, with single cylinder and friction drive.

The Lawrence (Kan.) A. C. has been organized with the following officers: President, Dr. A. P. Hults; vice president, J. A. Henley; secretary and treasurer, Ernest Crawley.

Motor car drivers are warned to be especially observant of speed regulations at Springfield and Westfield, Mass. Courses are marked off on Main, Elm and Franklin streets, Westfield, to catch unwary automobilists.

The Memphis (Tenn.) A. C. has been organized with the following officers: President, S. T. Carnes; vice president, A. S. Caldwell; secretary, Harry Liggett; board of control, P. P. Williams, chairman; J. A. Ombrey, Jr., F. F. Hill, W. F. Yates and J. Falls.

It is reported at Altoona, Pa., that the Commercial Trust Company of America has been organized, with H. S. Kerbaugh as president. They are said to have purchased Kerbaugh's car repairing plant at Bellewood, and will manufacture automobile trucks, moving vans, &c.

The McGiehan Manufacturing Company have reorganized and moved to 1557 Broadway, New York.

The Caledonian County A. C. has been organized at St. Johnsbury, Vt., with the following officers: President, Dr. W. J. Aldrich; vice president, George Burbank; secretary and treasurer, C. T. Ranlet.

The price of gasoline still continues to rise. Within the past week an advance of 3 cents per gallon on the grade usually purchased by motorists was announced by the Standard Oil Company, making the price 18 cents per gallon.

The temporary headquarters of the Automobile Club of California are at 21 Presidio avenue, San Francisco, the home of L. P. Lowe, chairman of the executive committee. This committee requests that all members send their present address at once.

It is reported that the Commercial Truck Company of America has been organized at Tyrone, Pa., with H. S. Kerbaugh as president. It is said that the new company has taken over Mr. Kerbaugh's plant near Bellwood and will manufacture motor trucks.

The Hewitt Rubber Company, of Buffalo, N. Y., is experimenting in the manufacture of a puncture proof rubber tire for automobiles. It is claimed that excellent results have been obtained and that arrangements will shortly be made to manufacture the new tires regularly.

Grand Rapids (Mich.) policemen are now making a crusade against machines not equipped with tail lights as required by law. These are supposed to give warning in the rear and illuminate the license number, but they do not do the latter, and because of dust and draft it is almost impossible to keep them burning. Motorists claim that with four lights on a machine, the side lights showing a bullseye behind, there is sufficient illumination on any car.

Garage Notes.

H. P. Hineline and Clarence Feese have opened a garage at Elyria, Ohio.

Gillis, Jones & Miller, Santa Monica, Cal., will erect a fireproof garage the coming summer.

C. D. Martin has opened a garage and repair shop at 538 East Eighteenth street, Paterson, N. J.

A garage has been opened at Jewett City, Conn. F. G. Waters is president and A. A. Young treasurer.

J. M. Clark has succeeded the Pope Manufacturing Company at the garage on Casino Terrace, Newport, R. I.

J. A. Dowling has opened a garage at Portland, Me. He was formerly with the Harry Fosdick Company, Boston.

Walter B. Duffy will rebuild the garage on Plymouth avenue, Rochester, N. Y., that was burned March 23 last.

Benjamin Cook and Charles L. Clark are planning to establish a garage and repair shop at Sandwich, Mass., the coming summer.

Luke Kilgallon has just completed a fireproof garage at the junction of Grenwood avenue and Broadway, Far Rockaway, Long Island.

The Newport (R. I.) Engineering Works have erected a garage at 359 Thames street in that city. It has 8,000 square feet floor space, and will open for business June 1.

Morgan S. Simms' livery stable, 3928 Baum street, East End, Pittsburg, Pa., is being remodeled for a garage.

The Pawtucket (R. I.) Auto Company, W. H. Fuller proprietor, will build a garage on East avenue hill in that city the coming summer.

The Harvard Marine and Auto Company, Cambridge, Mass., will build a garage adjoining their property at 25 Eliot street the coming summer.

The Ellicott Automobile Station, at Ellicott and Washington streets, Buffalo, N. Y., is being remodeled by the new proprietors, Wenzel & White.

Bell, Billmyer & Rorke will open a garage at 211 West Eighty-seventh street, New York, June 1. It will be a fireproof structure, with a capacity of seventy-five cars.

The Auto Exchange on Alexandrine avenue, in Detroit, will soon build an extensive addition to their garage, which will be used as a repair shop. Mr. J. E. Peters will be manager.

W. C. Jaynes, who recently disposed of his interest in the Jaynes Automobile Company, of Buffalo, N. Y., has rented the storeroom formerly occupied by the Hartford Rubber Company at 686 Main street, for use as an automobile salesroom. It is understood he has secured the local agency for two standard makes of cars.

Trade Personals.

John L. Poole, for several years foreign representative of the Olds Motor Works, has been appointed foreign sales manager of the Aerocar Company.

George H. Strout has resigned as president and director of the Western Automobile Company, St. Paul, Minn., and returned to his home in New York city.

B. L. Gravel, formerly with the Oldsmobile Company, has been appointed superintendent of the Amos Pierce Automobile Company's factory at Syracuse, N. Y.

Frank J. Dimmer has been appointed manager of the Fee-Bock Auto Company on Jefferson avenue in Detroit. He was formerly connected with the Seidler-Miner Electric Company.

New Agencies.

Coldwater, Mich.—V. L. Pendleton & Co., Maxwell cars.

Portland, Me.—J. A. Dowling, Pierce and Columbia cars.

Louisville, Ky.—The Zorn-Strauss Company, Thomas cars.

Boston, Mass.—The Boston Mechanical Company, Motor Mart, Moon cars (New England agency).

Commercial Vehicle Notes.

Annapolis, Md., has two companies letting out motor vehicles for hire. With the enlargement of the Naval Academy the prospect of business is good.

The city editions of the New York *Herald* and *Evening Telegram* are now being delivered in a Panhard car, the chassis having been fitted with a delivery wagon body.

The Knox Motor Truck Company, of Springfield, Mass., are about to ship a watering cart to the Metropolitan Park Commissioners of Boston for use on the State Park reservations.

The East Jersey Motor and Transportation Company, of Elizabeth, N. J., have purchased three Knox buses having a carrying capacity of from sixteen to twenty passengers. Delivery is promised by June 20. They expect to purchase three larger buses to carry from twenty-five to thirty passengers the coming week. The smaller vehicles will be put in operation on the main line between Elizabeth, Rahway and Roosevelt, and on the branch line from Linden to Tremly, as soon as they arrive. The larger machines will be used on the main line.

Trade Literature Received.

East Jersey Motor and Transportation Company, 81 Broad street, Elizabeth, N. J.—Prospectus.

J. H. Williams & Co., 150 Hamilton avenue, Brooklyn, N. Y.—Catalogue of drop forgings.

The Aston Motor Accessories Company, Ltd., Birmingham, England.—Catalogue of products.

The Auto Parts Company, 47 and 49 South Canal street, Chicago, Ill.—Circulars of specialties.

McGiehan Manufacturing Company, 1557 Broadway, New York.—Booklet, "McGiehan Speedometer."

Joseph W. Jones, 132 West Thirty-second street, New York.—Booklet, "Police," advertising Jones speedometer.

St. Anne Kerosene Motor Company, St. Anne, Ill.—Catalogue of the Perfect kerosene engines and automobiles.

Newmastic Tire Company, 370 Manhattan avenue, New York.—Booklet, "What Autoists Think of Newmastic Tires."

The Railway Lock-Nut Company, 77 Jackson boulevard, Chicago.—Description and price list of the Bull-Dog lock-nuts.

The H. H. Franklin Manufacturing Company, Syracuse, N. Y.—Booklet, "Weight vs. Ability, Safety, Comfort and Cost."

Century Cement Machine Company, 181 and 183 West Main street, Rochester, N. Y.—Booklet of the Hercules cement stone machine.

Kilgore Automobile Air Cushion Company, 46 Columbus avenue, Boston, Mass.—Circular of Kilgore auto air cushion "Shock Eliminators."

Hennebique Construction Company, 1123 Broadway, New York.—Description and illustrations of the Hennebique system of armored concrete construction.

Manufacturing and Equipment Company, 299 Marginal street, East Boston, Mass.—Booklet of sanitary all metal factory wash bowls, soda and potash kettles, stools, etc.

New Incorporations.

Motor News Company, Detroit, Mich.—Capital stock, $30,000.

The Bruno Auto Company, Brooklyn.—Capital, $5,000. Directors, D. H. A. Burns, A. E. Burns and Fred Burns, Brooklyn.

The Gaither-Owen Company.—Capital, $5,000. Incorporators, R. A. Rainey and R. M. Owen, New York city; C. T. Gaither, Youngstown, Ohio.

Trout Auto Livery Company, Chicago.—Capital, $2,500; dealing in automobiles. Incorporators, David Trout, Warren M. Trout and Bion L. Trout.

Park Place Garage and Machine Company, Brooklyn, N. Y.—Capital stock, $25,000. Incorporators, John E. McKenna, T. C. Gaillard and James C. McKenna, Brooklyn.

Abell Speedometer Company.—Speedometers, etc. Capital, $100,000. President, Rollin Abell, Dorchester, Mass.; treasurer, A. N Frost, Lawrence, Mass.; clerk, William F. Howard, Roxbury, Mass.

Royal Auto Company.—To buy and sell automobiles; capital, $5,000. President, Oscar E. Berry, Brighton, Mass.; treasurer, Winnefred B. Lowell, Boston; clerk, Winnifred E. Clogston, South Boston.

Franco-American Auto and Supply Company, Chicago.—Capital, $25,000; manufacturing and dealing in automobiles. Incorporators, William T. Church, Howard W. Lewis and Lloyd A. Wicks.

The Harris Auto Machine Company, Buffalo, N. Y.—Capital, $100,000, $500 paid in. Incorporators, Byron P. Angell, William D. Chamberlain, Dayton A. Minard, Barnett W. Harris and Herbert A. Pullen, of Buffalo.

The Gully Auto Company, Hollis, Mich.—One thousand dollars capital stock; to operate an automobile line for freight and passengers between Eldorado and Hollis, in Greer County. Incorporators, J. C. Gully, of Eldorado; R. J. Gully, Jr., and W. D. Gully, of Hollis.

Peterson Manufacturing Company, New York City.—To manufacture special lubricating devices for different makes of cars. Incorporated under New York State laws with the following officers: President, J. T. Peterson; vice president and secretary, George W. Phillips; treasurer, Lorillard Spencer, Jr.

The Stevens-Duryea Company, of Chicopee, Mass., under Massachusetts laws.—Capital $300,000. Incorporators, I. H. Page, president and treasurer; J. F. Duryea, vice president; William M. Remington, clerk, and Charles P. Fay. All four of these are directors, and they will constitute the whole board. The company will manufacture the Stevens-Duryea automobile, which has hitherto been made by a department of the J. Stevens Arms and Tool Company, of Chicopee. No changes in the plant are at present projected.

Patents Issued May 1, 1906.

819,036. Cushion Tire.—Frank M. Ashley, New York, N. Y. Filed August 3, 1903.

819,039. Vehicle Wheel.—Marcellus Bunker, Woburn, Mass. Filed October 26, 1905.

819,089. Gas Turbine.—Charles W. Shoemaker and John M. Lithgow, Allegheny, Pa. Filed April 14, 1904.

819,116. Valve and Ignition Mechanism for Internal Combustion Engines.—Herbert Austin, Birmingham, England. Filed March 5, 1904.

819,118. Variable Speed Gear.—William Baines, Crosby, England. Filed May 31, 1904; renewed March 26, 1906.

819,148. Feeding and Igniting Mechanism for Explosion Motors.—Franz R. Lorenz, Gumbinnen, Germany. Filed November 28, 1904.

819,156. Appliance for Putting Tires on the Rims of Vehicles.—Leon G. Morrill, Norwood, Mass. Filed March 11, 1905.

819,202. Gas Turbine Operating System.—Henry F. Blackwell, New York, N. Y. Filed March 14, 1904.

819,211. Vapor Generator.—Richard F. Driscoll, San Francisco, Cal. Filed September 24, 1904.

819,213. Reversible Power Transmission Gear. Ole O. Furru, St. Paul, Minn. Filed March 21, 1905.

819,244. Vehicle.—Frederick J. Newman, Chicago, Ill. Filed January 9, 1905.

819,268. Electric Sparking Device.—Albert E. Doman, Elbridge, N. Y. Filed February 1, 1905.

819,283. Sparking Igniter Adjusting Device for Explosive Engines.—Thomas B. Jeffery, Kenosha, Wis. Filed March 20, 1905.

819,288. Nut Lock.—Alibert Kootz and Edward E. Schirmer, Parkersburg, W. Va. Filed September 27, 1905.

819,302. Wheel Mount for Vehicles.—George D. Munsing, New York, N. Y. Filed September 22, 1905.

819,303. Wheel Mount for Vehicles.—George D. Munsing, New York, N. Y. Filed September 26, 1905.

819,334. Transmission Gear.—Alexander T. Brown, Syracuse, N. Y. Filed November 16, 1905.

819,337. Vehicle Wheel.—Samuel S. Childs and William Childs, Jr., Bernardsville, N. J. Fied August 22, 1905.

819,344. Vehicle Wheel.—James F. De Jarnette, Omaha, Neb. Filed May 22, 1905.

819,374. Elastic Tire for Road Wheels.—Edward C. F. Otto, London, England. Filed March 7, 1905.

819,377. Driving Mechanism for Automobiles.—William C. Price, Chicago, Ill. Filed July 8, 1905.

819,386. Shock Absorber.—Harry C. Turner, Los Angeles, Cal. Filed August 31, 1905.

819,387. Pneumatic Tire.—Charles R. Twitchell, Los Angeles, Cal. Filed June 20, 1905.

819,421. Clutch Mechanism.—Benjamin A. Gramm, Chillicothe, Ohio. Filed November 29, 1905.

819,436. Magnetic Metal Collector for Gear Casings.—George H. Jones, Philadelphia, Pa. Filed July 14, 1905.

819,452. Pneumatic Cushion.—Vaclav H. Podstata, Dunning, Ill. Filed October 13, 1905.

819,469. Clutch.—Nels E. Swanson, York, Neb. Filed September 11, 1905.

819,503. Tire for Vehicle Wheels.—Victor E. Belledin, Paris, France. Filed November 16, 1905.

819,544. Friction Clutch.—Albert Hérisson, Nimes, France. Filed November 22, 1904.

819,557. Internal Combustion Engine.—John B. King, Plymouth, England. Filed April 26, 1905.

819,618. Apparatus for Recording the Movements of Vehicles.—Benjamin F. Teal, Glenside, Pa. Filed August 9, 1905.

819,656. Ball Bearing.—Wilhelm Höpflinger and Ernst Sachs, Schweinfurt, Germany. Filed August 2, 1905.

819,695. Speed Changing Attachment for Tachometers.—Anthony Fricker, Pittsburg, Pa. Filed October 23, 1905.

Patents Issued May 8, 1906.

819,825. Lifting Jack.—Nicholas Weiler, Sioux City, Ia. Filed September 9, 1905.

819,947. Nut Lock.—John Strack, Newark, N. J. Filed March 7, 1905.

819,890. Friction Clutch.—Thomas J. Kehoe, Fort Wayne, Ind. Filed November 9, 1904.

820,008. Vehicle Seat.—Donald G. McDiarmid, Chicago, Ill. Filed September 23, 1905.

820,010. Gasoline Motor.—Ludwig Petterson, Chicago, Ill. Filed June 6, 1904.

820,036. Carburetor.—Herbert A. Burch, Kalamazoo, Mich. Filed March 25, 1905.

820,102. Automobile.—Charles W. Duer, Chicago, Ill. Filed October 23, 1905.

820,104. Pneumatic Tire.—Percy W. Fawcett and Edward L. W. Bellhouse, Sheffield, England. Filed October 25, 1904.

820,110. Means for Repairing Punctures in Pneumatic Tires.—Harry Harrison, Erdington, England. Filed October 4, 1904.

820,179. Mechanism for Connecting Vehicle Axles and Bodies.—John F. Byers, Ravenna, Ohio. Filed December 26, 1903.

820,217. Vehicle Attachment.—James Leith, Sherbrook, Canada. Filed June 9, 1905.

820,222. Internal Combustion Engine.—D. McRa Livingston, New York, N. Y. Filed May 12, 1904.

820,230. Intake Valve for Explosive Engines.—Albert C. Menges, Grand Rapids, Mich. Filed September 14, 1904.

820,238. Explosion Turbine.—Augustus L. Moss, Sandusky, Ohio. Filed March 17, 1905.

820,324. Nut Lock.—James E. Taylor, Sandoval, Ill. Filed November 16, 1905.

Patents Issued May 15, 1906.

820,408. Vaporizing Device for Internal Combustion Engines.—Bernt Garllus, Madison, Wis. Filed July 21, 1904.

820,444. Motor Vehicle.—Horatio W. Southworth, Mittineague, Mass. Filed August 16, 1904.

820,446. Friction Clutch.—George Stahl, Dayton, Ohio. Filed December 14, 1904.

820,583. Carburetor for Hydrocarbon Engines.—Amélie A. Longuemare, Fernand Longuemare and Georges Longuemare, Paris, France. Filed March 4, 1904.

820,673. Tire for Vehicles.—Thomas C. Sanderson, West New Brighton, N. Y. Filed July 14, 1905.

820,636. Electric Ignition Apparatus.—Gustave E. Franquist, New York, N. Y. Filed June 24, 1905.

820,691. Traction Attachment for Automobile Wheels.—George Adams, St. Louis, Mo. Filed January 26, 1905.

820,707. Vehicle.—Murillo Downer, Chicago, Ill. Filed April 11, 1904.

820,709. Motor Vehicle.—Carson Durkee, Vicksburg, Mich. Filed June 12, 1905.

820,712. Internal Combustion Engine.—Hardinge G. Giffard, London, England. Filed April 28, 1905.

820,738. Tire for Vehicles.—Thomas C. San-

derson, West New Brighton, N. Y. Filed July 14, 1905.

820,741. Wheel.—John Sinnott, Philadelphia, Pa. Filed July 10, 1905.

820,742. Motor Sleigh.—Claude J. Sisk, Hopkinsville, Ky. Filed July 11, 1905.

820,797. Spark Igniting Plug.—Robert B. Kuhn, Canton, Ohio. Filed May 10, 1905.

820,832. Lifting Jack.—Freeman D. Tarver, Blanton, Ga. Filed January 16, 1906.

820,874. Friction Clutch.—John S. Jellison, Boisé, Idaho. Filed April 29, 1905.

820,905. Motor Vehicle.—Jacob W. Bird, Townsend, Tenn. Filed July 22, 1905.

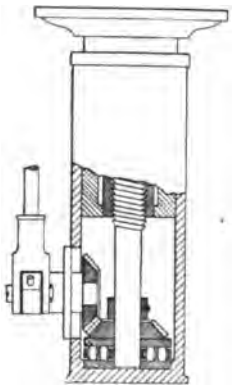
820,916. Speed Indicator for Vehicles, Etc.—Charles Couleru-Meuri, La Chaux-de-Fonds, Switzerland. Filed October 6, 1904.

820,923. Wooden Spoke Wheel.—Thomas Gare, New Brighton, England. Original application filed January 15, 1904, Serial No. 189,173; divided and this application filed July 17, 1905.

Review of Specifications.

811,136. Lifting Jack.—Samuel S. Eveland, Philadelphia, Pa. January 30, 1906. Filed August 23, 1904.

Reduction of friction is one of the chief objects of this invention in the line of lifting jacks. The novelty lies in the

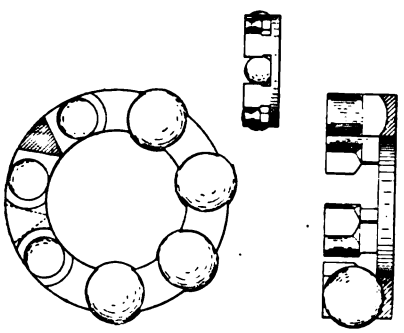


No. 811,136.

introduction of a roller bearing of special construction between the lifting and turning members. The construction is plainly shown in the sketch herewith.

811,708. Ball Bearing.—S. S. Eveland, Philadelphia, Pa. February 6, 1906. Filed September 21, 1905.

The invention relates to an annular ball

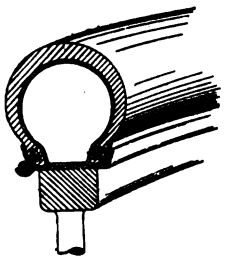


No. 811,708.

bearing in which the concentric bearing members are movably held in proper relation by the balls between them and in which there is a spacer for the balls, to provide for convenience in assembling the parts, and to so construct and arrange the parts that they remain in assembled relation and can be handled in a body. The balls are inserted through notches cut in the rings. The ball retainer consists of a crown toothed ring having the ends of its teeth enlarged and provided with concave radially arranged faces to permit of the insertion and removal of the balls and having the shanks of the teeth cut away and inclined, so as to form, with countersinks in the ring proper, ball sockets into and out of which the balls may be sprung.

816,884. Detachable Pneumatic Tire.—Charles S. Scott, of Cadiz, Ohio. April 3, 1906. Filed March 23, 1905.

This patent, which is assigned to the Goodyear Tire and Rubber Company, relates more particularly to the construction of the rim, which is such that the tire may

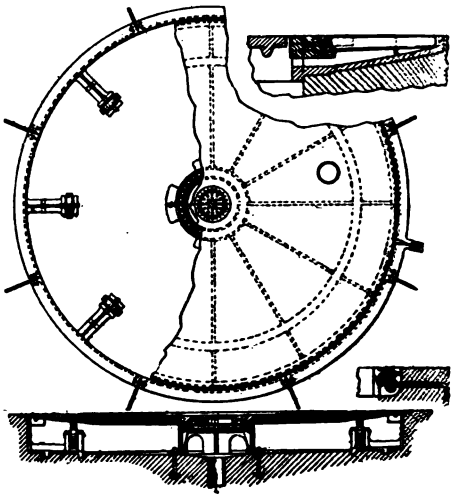


No. 816,884.

be readily removed and put in place. The invention consists of an annular rim flange having an inclined face and a seat on the rim, a wheel rim having a groove near one edge of its upper face, and a contractible locking ring fitted in the groove, the inclined face on the rim flange automatically co-operating with the locking ring to exert a radially contracting pressure upon it, and thereby hold it in the groove upon inflation of the tire. This locking ring may consist of a wire rope or of a split ring of wire or metal and, in fact, an endless wire helix may be employed with considerable advantage.

816,620. Automatic Turntable.—Edward A. Turner, of Chicago, Ill. April 3, 1906. Filed August 7, 1905.

The turntable is dish shaped and provided with a grating at the centre, to adapt it for use as a washstand. The lower side of the table has a flange, an annular track and a grooved annular bearing resting upon balls contained in an annular groove or raceway in the top of a pedestal secured by bolts embedded in concrete. The concrete forms a pit, the bottom of which is dish shaped, and liquids on the table or in the pit are free to flow out through a sewer pipe. The table is also supported on rollers beneath the track on its under side, which rollers are carried on brackets extending from angle shaped pit rim pieces. The table can be held firmly in position by means of a brake. The inventor particularly claims the combination of a rotary wash table, adapted to shed the water



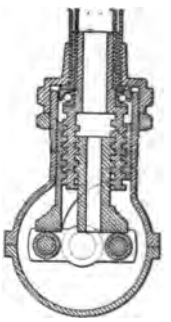
No. 816,620.

which falls upon it, with a pit or pan adapted to pitch the water which it receives toward some proper discharge place or opening.

816,935. Steering Mechanism for Motor Vehicles.—C. M. J. Petiet, of Villeneuve la Garenne, France. April 3, 1906. Filed December 8, 1904.

An irreversible steering mechanism so arranged that wear can be readily taken up.

The steering tube carries at its lower end an extension, provided with right and left handed screw threads on the outer and inner faces respectively, which engage, respectively, with a nut and an internal screw. Each of these latter two parts has an abut-



No. 816,935.

ment or extension bearing upon two rollers carried by a small rocking frame or part, which is rigidly connected to a shaft pivotally mounted in bearings and carrying at its extremity any suitable means for connecting it to the front wheels. The double threaded extension is secured in place by a large nut screwing onto the exterior of the casing, a ball bearing being fitted between the nut and extension. The nut can be secured rigidly in place after adjustment by means of a jam nut.

...THE...

Horseless Age

VOLUME 17 JUNE 6, 1906 NUMBER 23

WINTON MODEL-K

General Funston Used a Winton Exclusively

In a personal letter to Mr. Winton, Mr. J. W. Burchaell, of San Francisco, says:

"I was leaving the garage about half an hour after the earthquake when General Funston took myself and my Winton into his service. And from that moment until the 16th day thereafter we went through fire and flood, smoke, blood, bricks and dynamite; and you may imagine, from a general impression of the character of Funston, the speed and recklessness of our going, helter-skelter, in and out, amidst the greatest imaginable confusion and danger—the streets a mass of stone, window glass and burning timbers, walls falling; soldiers and firemen in a frenzy of work and worry; and all depending upon the little man in the tonneau for direction and assistance. We were wanted in all parts of the burning city at once, and our efforts to be everywhere were certainly strenuous enough to suit the greatest lover of speed that ever lived.

"I never had a puncture—**never touched the machine in the way of repairing it, and never had the hint of an accident.** It was a wonderful record. The General, notwithstanding the untiring efforts of other car men, would ride in no other than my Winton, and I felt so good about it I just thought I would give you and your car the rightful share of the honors."

THIS IS THE HONOR ROLL

Many Winton owners in San Francisco participated in the rescue work. So far as we can learn these are the owners whose names are entitled to a place on the Honor Roll:

R. P. Schwerin
John Breuner
John Brichetto
Frank G. Noyes
A. J. Hechtman
R. A. Crothers
S. D. Rosenbaum
H. C. Tibbitts
J. J. McMahon
E. S. Johnson
C. F. Michaels
F. L. Hansen
Leon M. Hall
Pioneer Automobile Co., 6 cars
C. C. Moore
H. M. Smith
D. E. McCabe
J. R. Burnham
Morris Kind
J. H. Goldman
Frank Johnson
A. Hamerton
M. Geilfuss
H. H. Egbert
F. J. Vetter
John Scott
John Adams
Dr. D. A. Stapler
Dr. W. I. Wilcox
Harry Chickering
Fernando Nelson
Capt. E. E. Caine
D. G. Doubleday
Louis Heidinger
A. C. Burtchael
Harry Johnson
Western Meat Co.
Geo. Tourny
A. D. Bowen
F. Meyers
H. M. Toy
S. J. Eva
W. P. Levy
J. J. Daly
W. B. Reis
P. S. Grant
Richard Meir
Arthur Doe
H. Bogen
J. H. Durst
G. Ratte
A. M. Dollar
G. W. Young

The **WINTON MOTOR CARRIAGE CO.**

Licensed under Selden Patent.

CLEVELAND, OHIO, U. S. A.

Winton Branch Houses in New York, Boston, Philadelphia, Pittsburg, Chicago and London. Winton Sales Agencies in all important places.

The San Francisco Earthquake

Made thousands of new friends for the Automobile and the Commercial Motor Vehicle.
It also proved conclusively the superiority of



Diamond

Wire Mesh Base Construction

For Motor Trucks and Commercial Cars

T. J. Thompson Jr., writes from San Francisco :

"Please rush my order for three Wire Mesh Base Tires which I ordered some time ago.
"The one which you equipped to the rear wheel of my No. 5750 San Francisco Sight Seeing Car, just before the earthquake on April 18th, has proven extremely satisfactory; in fact, after 2,000 miles of the very hardest kind of service on the streets of San Francisco, directly after the earthquake, running over bricks, broken streets, glass, of which these streets as you know are now covered, I find but a very few cuts in the tread. The new endless tire of another make on the opposite wheel, which was applied but a very few days before your tire, is in bad shape, having separated at the base in many places, and I am afraid to start on a long trip or carry a heavy load with it, and since I am working in conjunction with the Red Cross Society, carrying passengers and supplies, my car is needed badly. Therefore, I would thank you to give my order preference.

"Yours very truly,

T. J. THOMPSON, Jr."

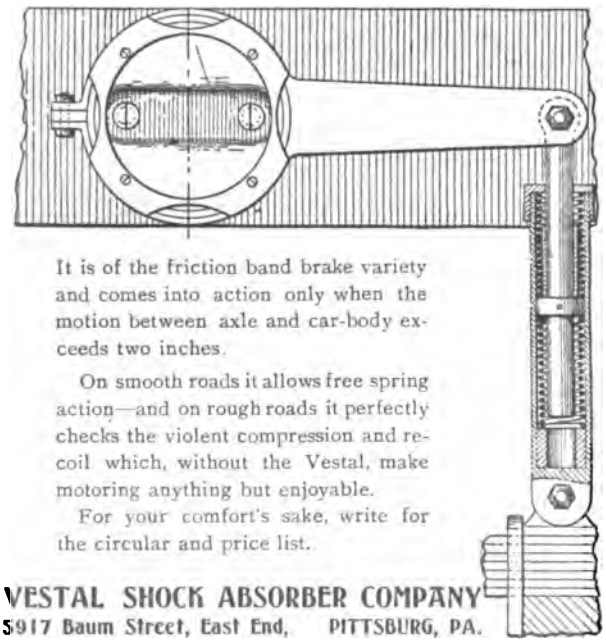
That Was a Test Worth Considering

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to the man whose car is equipped with the Vestal Shock Absorber.



It is of the friction band brake variety and comes into action only when the motion between axle and car-body exceeds two inches.

On smooth roads it allows free spring action—and on rough roads it perfectly checks the violent compression and recoil which, without the Vestal, make motoring anything but enjoyable.

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Enclosed in neat moisture-proof polished brass case and easily attached to dashboard.

Figures plainly seen from seat of car.

Write for Booklet C—the handsomest and most complete instrument catalogue ever published. Proposition to agents.

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Sole Selling Agent for Motor Car Specialty Co.

Dangers Attending the Use of Gasoline Automobiles.

By Albert L. Clough.

Despite the popular prejudice to the contrary, it can hardly be doubted by any well informed person that the gasoline motor car is capable of becoming the safest road vehicle for long distance use that has ever been produced, both in regard to property and personal hazards. Its well nigh absolute controlability, as compared with animal drawn vehicles, is a quality which is far from being appreciated by the general public, but which appeals to the thoughtful student of the matter as perhaps its most valuable characteristic.

Any remarks upon the dangers to person and property attendant upon the use of a gasoline car which this article contains may be regarded as of an alarmist nature by some, but this is as far as possible from being the spirit of the writer. A great many people are receiving and beginning to operate gasoline cars each spring who have had no previous experience in their management. It seems advisable that such motorists should realize that there are certain dangers involved in the use of automobiles, which are readily avoided by the employment of simple precautions, but, on the other hand, may be carelessly incurred unless they are warned against them.

MOTOR STARTING.

It is surprising how many people receive minor injuries and sometimes severe ones when cranking their engines. Under proper precautions the operation is, however, a perfectly safe one. When the motor is to be started the first thing to make sure of is that the car itself cannot prematurely start when the motor begins to run. If a sliding gear system of speed changing is employed one should always see that the gears are in the neutral position, thus completely freeing the motor from the driving mechanism. Furthermore, the lever brake should be set and the clutch thus thrown out of engagement, this affording double security. In case a planetary speed change is employed, the clutch should be disengaged and both the low and reverse gear bands should be loose; that is, the speed lever and reverse or low gear pedal, if one is used, should be in their disengaged positions. It is not uncommon for a car with a planetary change speed gear to start prematurely on account of the "drag" of the low speed band on its drum, although the speed lever or pedal controlling it is in the disengaged position. This may lead to trouble, if the car is headed down grade, and thus it is safe to set the brake before the motor is cranked.

METHOD OF CRANKING.

The starting crank should be so engaged with its ratchet that the effort of cranking is in the form of an upward pull, never a push. If this practice is followed, in case of a back kick of the crank, the handle may, of course, be pulled out of the hand, but no injury is likely to be thus inflicted. If, on the other hand, the crank is being pushed forcibly downward with the arm nearly straightened out, and a back kick occurs, the blow to the arm, the shoulder and the rest of the body may be very severe. Engines mounted under the hood almost always crank in a clock-handwise sense, as viewed from the front of the car; the handle should be grasped with the left hand and the crank engaged with its ratchet so that an upward pull of the hand will throw the engine past the firing point. If it does not start on the first attempt, a new hold of the crank on the engine shaft should be secured, with the right hand; meanwhile one may grasp the spring or some convenient rigid part of the car, in order to assist in preserving the balance. One should be sure that the crank is securely engaged by the ratchet so that it cannot slip off when one is pulling hard, and one should stand far enough forward from the front of the car to be out of the reach of the crank. Cars with engines under the body and planetary gears crank clock-handwise, if starting is effected from the right hand side of the vehicle (looking forward), and the directions above given apply in such instances. If cranking is done on the left hand side of the car (as it rarely is) the right hand is to be used to give the upward pull on the crank, the other hand grasping some part of the car, out of reach of the crank, to steady the body. In case any convenient compression relief device is provided, it should be opened before the engine is cranked.

SAFETY DEVICES.

It is rather strange that more cars are not fitted with a safety device, arranged to prevent the insertion of the crank unless the spark is sufficiently retarded, so as to prevent a back kick. If such an automatic safeguard is not provided, one should always be assured by ocular evidence that the ignition timing lever is in such a position as to give a spark not earlier than on the dead centre. The safest method is to place the spark timing lever in its most retarded position before cranking, unless experience has shown that a slightly earlier position is safe. Occasionally the motor may start and the starting crank ratchet fail to release the crank, causing the latter to whirl around with the engine shaft. One might think that prudence would dictate the shutting down of the motor, the freeing of the crank and a fresh start, but people have more than once been painfully "rapped over the knuckles" in trying to stop the whirling crank with the hand.

If one is always careful about spark position, cranks the engine with an upward pull, stands out of range of the crank in a well braced posture and is sure that the car itself cannot start when the motor does, there is very little chance of personal injury in cranking any engine.

SHUT OFF IGNITION CURRENT.

It sometimes happens that one has to open the crank case in order to make some adjustment of the bearings which requires the hands to be inserted within the case. Under such circumstances it is of the utmost importance that the spark should be shut off with the greatest care both by opening the switch and removing the plug, if one is provided. If in moving the crank shaft with the spark accidentally left on a cylinder should reach the firing position and the motor start, a very serious injury to the person at work upon the engine would be almost sure to result. The writer once knew this accident very nearly to occur. A mechanic was taking up the connecting rods of an engine, with his hands in the crank case, when someone, climbing through the front seat of the car, accidentally brushed against the switch and closed it. The vibrator buzzed, but fortunately the engine did not start. The next time it might have started. It may happen with some cars that one has to put the arm or hand through the flywheel between the spokes. One does not like to think of the consequences if the spark should have been left on and the flywheel moved to the firing position. The "perversity of inanimate objects" is such that, though a motor might have to be cranked a dozen times to start it ordinarily, under such conditions it would probably start on the spark. Whenever work is being done on any part of the car mechanism, especially with a four cylinder car, which starts readily, the spark should be shut off with the greatest care.

GASOLINE INTOXICATION.

One should not forget that if the motor is run for a considerable length of time in a closed stable its exhaust gases pollute the atmosphere to such an extent as to render it unsafe to breathe. Respiration of such vitiated air for any considerable period is likely to produce a condition known as gasoline intoxication, which is characterized by headache, nausea and finally by unconsciousness. There should be plenty of ventilation if a motor is to be run very much in a small stable.

There is very slight chance of a gasoline car taking fire on the road. The few cases of this kind which have been credibly reported have shown that the accident was due to the flame from the unmuffled exhaust reaching the vapor of gasoline which had been spilt. In one case which comes to mind, the gasoline tank "opened up" and the gasoline became ignited from the exhaust. It often seems strange that cars do not catch fire when there is a back explosion through the carburetor, due to the failure of the inlet valve to seat properly, but no instance of this sort ever came to the notice of the writer, despite the fact that such back firing is of very common occurrence.

INFLAMMABILITY OF GASOLINE.

Gasoline has many times been observed dripping upon a hot muffler without its being ignited. The fact seems to be that gasoline vapor, at atmospheric pressure, re-

quires for its ignition a flame or the presence of incandescent material; for instance, white hot metal or the intensely heated vapor which is present in an electric spark. The exhaust flame from the motor, the outrush of flame from the muffler, which follows a muffler explosion, a spark at the timer or one due to defective wiring will ignite the vapor. The same is true, of course, of any other kind of flame, such as that of a match or a blow torch. I have never succeeded in lighting gasoline vapor with the lighted end of a cigar. An iron rod heated to whiteness will ignite the vapor most promptly, but repeated trials of its igniting power, as it cools down, seem to show that below a rather dull red or very light cherry its temperature is insufficient to light the vapor at atmospheric pressure. If anyone cares to try the experiment it will be found that an iron rod which is too cool to ignite the gasoline mixture will still set fire to paper or excelsior. This fact seems rather a curious one in view of the reputation for extreme inflammability which gasoline vapor possesses.

The obviously necessary conditions for a car's catching fire are an escape of raw gasoline from the tank, carburetor or piping and the presence of an igniting agency as above described. If gasoline leaks are carefully avoided, so that there can never be a collection of gasoline and its vapor upon the parts of the car or under it, and if a flame is never allowed near the vehicle, the danger of fire should be almost entirely eliminated. In making examinations of the car mechanism at night while on the road, there is nothing so safe or convenient as one of the small electric flash lights. They are easily carried in the hand and small enough to reach inaccessible parts of the car. A lighted match should never be used near a car, and the vehicle lamps are by no means a safe source of illumination if there is, through any accident, a leakage of gasoline.

FIRE RISK IN THE STABLE.

In the confined space of a small stable there is, beyond question, a certain fire hazard connected with the use of a gasoline vehicle. If there is no escape of gasoline from the tank, piping or carburetor, this hazard amounts to little or nothing. If there is spilling or dripping of the combustible the risk may be of considerable importance. In case there should be gasoline spilt upon the floor, it is quite possible that its vapor might become ignited by the exhaust flame from a "cut" muffler, by a muffler explosion, the spark from an uncovered timer, a stray discharge from the secondary wiring or the spark of a plug, removed from the cylinder for testing. The only permissible manner of lighting an automobile stable, particularly one of small dimensions, is by means of incandescent lamps. For inspections of the car an electric lamp upon a flexible cord is the only safe device.

GASOLINE LEAKS.

A great many operators depend upon the tightness of the gasoline piping and the proper action of the needle valve of the carburetor float chamber, and seldom or never shut off the gasoline supply at the tank. If any leak should develop in the piping or the needle valve should fail to act properly, there might be a very large escape of gasoline in case the machine were left for a considerable length of time before the defect were noticed. The escaping gasoline would rapidly vaporize, and might render the atmosphere of a small stable not only inflammable but violently explosive if it were exposed to a spark or flame. The leak would, in any case, saturate the floor under the car and the air near the floor so that the exhaust flame, a stray spark or possibly a muffler explosion might cause a fire. It is of the utmost importance that the gasoline should be shut off at the tank whenever the car is stabled, and it is a good plan to look under the vehicle for escaped gasoline before any move is made to start it. Gasoline leaking from a car, as stated above, may render the atmosphere of a small closed stable highly explosive, and this is almost the only condition under which the much talked of dangerous explosibility of gasoline is likely to be realized. Much curious misinformation is current as to the explosive qualities of this fuel, and the belief is quite general that a tank or barrel filled with gasoline can explode like a barrel of powder or dynamite. Such a belief is most foolish and no one who understands the subject at all would hesitate on any considerations of personal danger from applying a match to a full tank or can of gasoline. A quiet combustion of gasoline vapor at the mouth of the tank would be the only result of such an experiment and the flame produced could be harmlessly extinguished by placing one's hat tightly over the mouth of the tank. As has been reiterated time and again, gasoline is explosive only when its vapor is mixed with a proper proportion of air. It is combustible whenever a surface of the liquid is exposed to the air.

Danger from fire in the handling of a gasoline car, as previously stated, is incurred only when the fuel escapes from its intended receptacles—the piping and the carburetor. The rule is thus perfectly clear: Do not let it thus escape, but in case it may have done so unknown to one, do not allow a flame or exposed electric spark about the car, especially while it is in a confined stable. Dry sand forcibly thrown upon the fire, or the use of a chemical extinguisher, is the only practical method of putting out a gasoline fire. Good ventilation of a stable while work is being done upon a car which may involve the spilling of gasoline tends to prevent the collection of the vapor in dangerous quantities.

MOTOR RUNNING UNATTENDED.

There is much carelessness to be observed among the owners of motor cars in leaving their motors running while th cars are standing at the curb unattende In this day of easily started engines the should be no excuse for this practic which is illegal in many States. An una tended car, with its motor in operation, a temptation to meddlesome or evil di posed persons to "fool" with the lever and the result of such interference may b serious.

Not only should the ignition switch b left in the "off" position, but the plu should be removed. Otherwise a mer touch of the switch, sufficient to cause it t make contact, may start a four or six cylin der engine. The gear lever should be le in its neutral position and the brake set.

SETTING THE BRAKE.

One very excellent feature of the slidin gear system lies in the fact that the sam motion which disengages the clutch an stops the car also sets the brake. When a car is stopped on a grade the brakes should be left set with great care. It is no enough to apply the brake sufficiently to bring the car to rest and then release it and, finding that the car remains stationary, neglect to lock the brake. A push from a meddlesome small boy or even a strong gust of wind, blowing down the grade and acting upon the large surface presented by the top of the car, may prove sufficient to start it in motion with serious results.

Constructing a Chain Boot.

By W. P. G.

A dry squeaky chain is not only an annoyance to the driver, but it greatly impairs the running qualities of the car and for overcoming this difficulty a special oiling device is in use which has given satisfactory results. A sight feed gravity oiler is placed at some convenient point under the car, and the feed pipe is led to a portion of the chain over the front sprocket with a suitable opening to feed the chain over the outer sides of the rollers. The surplus oil runs off as it passes down over the sprocket and is caught in the engine pan beneath.

For keeping out the dirt and dust a chain boot is used, made in the following manner. The frame for this boot is constructed of five-sixteenths iron for the heavier cars and one-quarter inch for the smaller ones. The clearance between the upper and lower rods is just sufficient to allow the chain to run free without any danger of catching in the cover. The upper end of the rod is fastened to some convenient place on the sub-frame cross braces, and extends down under the body of the car, curves around the rear sprocket and up to and below the place of starting, and is supported from the frame that supports the pan beneath the engine. A collar surrounds the axle outside of the connecting yoke and to this is fastened one arm extending to and joined to the upper frame piece, and a similar piece extends down and is fastened in like manner to the lower piece. The collar has a half section for

amping the arms and collar to the axle. ıd when the clamp so formed is bolted ıst it is held rigidly in position and does ɔt work loose. The distance between the ıpporting arms where they are clamped to ıe axle being greater than at the top, ıey are given the proper bevel to approach ıch other at the top to within 6 inches. his is sufficient to allow for lateral motion ! the chain. The four rods are each con-ɛcted with a turnbuckle for making ad-ıstment through the distance rods.

The arrangement when completed forms rigid skeleton frame work over which a ɔver of any desirable material can be fit-ɛd. The most satisfactory material so far sed for this cover is canvas ducking. This eing cheap, can be renewed often, and a umber can be kept in reserve for use as eeded. A pattern can be easily cut, and he material can be fashioned by a carriage rimmer. The boot is split clear down to he end, for convenience in getting at the lifferential case, and it is secured by a louble flap, buttoned and hooked. The ıpper end is held in place by straps and ıoles necessary for the break rods to pass hrough are fitted up snug with extra flaps.

Carriage curtain cloth might form a ɔover more pleasing to the eye, but I do not think it has the wearing qualities possessed by canvas. Giving the cover a light coat of paint would improve the appearance and make it oil tight, but I have always used it plain, and when it becomes soiled it is given a scrubbing with hot water and ammonia. This arrangement is somewhat difficult to work out the first time, and some obstacle not provided for is constantly met with, and the blacksmith who did the job for me declared he would never attempt another, but after working out the plan once its repetition is a very easy matter. By actual experience it is found that the protection afforded by this somewhat crude arrangement will multiply the time of usefulness of the chain several times, and it prevents the oil being splashed in such profusion over the car.

European Circuit Contest May Not Be Held This Year.

The German Automobile Club has petitioned the Automobile Club of France with respect to postponing the Circuit Européen to a later date. The French club has referred the matter to the international committee entrusted with the organization of the event. The general feeling appears to be in favor of acceding to the suggestion of the German Club, the very sparse number of entries having no doubt considerable weight in this respect. In all probability if the race is postponed it will be until 1907.

On the occasion of the Elizabethan fair at Lincoln's Inn, London, recently, students of King's College rented two motor omnibuses on which forty of them, in Elizabethan costumes, toured the streets to advertise the fair.

The Chemistry of Lubricating Oils.

By T. H. Reardon.

Lubrication, broadly defined, is the art or process which has for its object the elimination of the friction that always results when the surface of one body is moved over the surface of another body. While this is the broad and in fact the only object of lubrication, in order that the lubricant may accomplish its purpose it must possess certain well defined characteristics in order that chemical or physical change in its structure may not unfit it for the duty which it has to perform.

Broadly speaking, there are two general conditions that largely determine the fitness, or the unfitness, of an oil for a particular class of service; these conditions can be referred to particular temperatures, and to the degree of pressure that exists between the surfaces that are moving in contact with each other.

The result of high temperature on an oil is to decompose it, that is, to destroy its structure and split it up into two or more compounds. In case the lubricant is sufficiently stable to resist decomposition it may volatilize, or it may inflame and yield the products of combustion. An oil that is capable of undergoing saponification, in the presence of an alkali and an elevated temperature will be converted into a soap. It is proper to remark here that the condition of temperature is not always essential to the formation of a soap, for in the manufacture of soap saponification by the cold process is extensively employed. The degree of pressure that exists between the surfaces requires on the part of the lubricant a certain degree of viscosity, or in popular language the oil must have a certain amount of body.

Then there is the tendency of an oil to part with its more volatile constituents, known as drying up, the less volatile portion remaining and causing the "gumming up" in bearings, a condition that is both familiar and annoying.

GENERAL DISTINCTION OF OILS.

There are two broad distinctions in lubricating oils, viz., animal or vegetable oils and mineral oils. Mineral oils are very stable, will easily stand temperatures of 650° Fahr. without suffering decomposition, and do not saponify in the presence of an alkali, so such oils are eminently fitted for lubricating purposes under many conditions that obtain in practice.

CHARACTER AND PROPERTIES OF MINERAL OILS.

High grade mineral cylinder oil, for either steam or gas engine cylinders, has a fire test of 650° Fahr. to 675° Fahr., and will not inflame or decompose at the temperature that usually exists under working conditions in a gas engine cylinder, and on this account such oils have the general preference for cylinder lubrication.

Mineral oils are not affected by alkalies; this property is very desirable, for while soap is a lubricant in a certain sense it is not a suitable lubricant for the interior of a highly heated engine cylinder; decomposition products or combustion products are, however, much more objectionable than the formation of a soap in the cylinder; the products of both reactions, together with the injurious effects that follow, will be dealt with under the head of animal and vegetable oils, as it is these classes of oil that yield the products mentioned above.

Frequently such cylinder oils as are mentioned above contain 5 per cent. or 10 per cent. of animal oil, which does not seem to be objectionable; in the writer's opinion the straight mineral oil is to be preferred. The above remarks apply to cylinder lubrication, for the lubrication of bearings animal oil in many cases is very efficient. The viscosity or body of an oil is that particular property that adapts it to light or heavy bearings, for in a heavy bearing if the oil is very thin or lacks body it will squeeze out and allow the two surfaces to come in actual contact with each other, and it should be distinctly understood that in efficient lubrication the surfaces are not in contact with each other, but separated by a thin film of the lubricant.

ANIMAL AND VEGETABLE OILS.

Animal and vegetable oils consist of organic acids in combination with an organic base. The base is usually glyceryl C_3H_8, and the acids usually are stearic, palmitic and oleic, so the numerous oils of this class are essentially stearates, oleates and palmitates of glyceryl.

Tallow consists essentially of glyceryl tristearate. Its composition and its decomposition products are shown by the following:

$$(C_{17}H_{35}COO)\ C_3H_5 + 3H_2O = 3\ C_{17}H_{35}COOH$$

Glyceryl tri-stearate stearic acid

$$+ C_3H_5\ (OH)_3$$

glyceryl tri-hydrate or glycerine.

All the equation is intended to show is that tallow or in fact any vegetable or animal lubricant, is very liable to decompose in the cylinder, into free stearic acid and glycerine.

This result can be looked for with certainty, for in the arts, in the production of glycerine from fats and oils, this particular method of decomposition is employed on a commercial scale These acids while in the combined state are harmless, but when set free they are postively injurious to metallic surfaces, and the compounds that yield them should not enter into the composition of a high grade cylinder oil.

Glycerine is also decomposed at the high temperature that exists in steam and gas cylinders, and the man who wishes to avoid the fouling of cylinder walls and spark plugs had better pin his faith to a good straight mineral oil.

The German automobile tax bill was definitely passed by the Reichstag on May 19, and is now law. It subjects not only resident automobilists, but also tourists who stay more than a certain period, to a quite heavy tax.

Effect of Automobiles on Macadam Roads.

Harold Parker, a member of the Massachusetts Highway Commission, who has been giving considerable attention to the effect of automobile traffic on macadam roads, gives THE HORSELESS AGE the following opinion:

"Just what the final effect of the use of macadam roads by automobiles may be, this commission is unable to foresee, because the time that they have been in general use is not long enough for a full test. My own opinion is that the automobile is a serious menace to macadam and other roads, except those which are paved. From the fact that the automobile moves itself by its own engine and therefore draws upon the material of which the road is made in order to force itself forward or backward, it is obvious that a tendency exists to disintegrate the constituent parts of the road over which it passes. Also, in its passage over a road it creates a vacuum which draws along with the vehicle the dust and finer particles of the material of which the road is composed and sweeps them off the road, thus exposing the larger particles. With the binding materials removed the larger particles are gradually separated by the traffic.

"To obtain some material which upon application to a finished road will tend to preserve the integrity of its parts seems to me to be the desideratum, and this is true not only because the automobile has become so important a feature in the wear and tear of our highways, but from a consideration of its ordinary usual wear as well. The commission has already experimented with oil and other things, to see if it is possible to obtain such a result, but so far the use of oil on macadam roads has not been satisfactory and the commission is unable to determine upon any means, except those ordinarily used in the maintenance of State highways, to preserve them against the destructive effect of the automobiles."

A. A. A. Law Committee.

The following have been appointed members of the A. A. A. law committee: Francis Hurtubis, Jr., Massachusetts State A. A., Boston; J. Jerome Hahn, Rhode Island A. C., Providence; Frank B. Finney, Portsmouth, Ohio; M. W. Van Auken, Utica, N. Y.; James T. Drought, Milwaukee A. C.; Samuel P. Irwin, Bloomington (Ill.) A. C.; Fletcher W. Battershall, Albany A. C.; Charles H. Burras, Austin (Ill.) A. C.; William F. Kimber, New Jersey Automobile and Motor Club, Newark; Albert H. Daniell, Atlantic City A. C.; Warren R. Hickox, Kankakee (Ill.) A. C.; W. H. Chase, Bay State A. C., Leominster; Osborne Yellott, A. C. of Maryland, Baltimore, and Homer H. Johnson, Cleveland A. C.

They will work for uniform automobile laws throughout the United States.

LESSONS of THE ROAD

Motoring in Mexico.

By A. W. W. Evans.

A stranger descending into the Valley of Mexico from the high mountains which surround it on all sides, and looking through the eyes of an automobile enthusiast, would think it a paradise. But after being here a short time he would be compelled to change his mind.

The streets in the City of Mexico are being gradually paved with asphalt. Of course that is good as far as it goes, but one does not want to be always riding about the city, through crowded streets, and running the risk of being taken to the comisaria for running into somebody who did not know enough to get out of the way. There are no rules of the road there, and it is rather hard to tell where to look for pedestrians, as well as for the wagons or carriages. One must keep both eyes and ears open while dodging in and out through the narrow streets.



STEEP GRADE AT ENTRANCE TO EL DESIERTO.

The views in Mexico Valley are magnificent. To the east the snow clad peaks of Ixtaccihuatle and Popocatapetl rear their giant heads some 10,000 feet, each covered with a cap of perpetual snow. The peaks are about 55 miles away, and on clear days they seem near enough to reach on foot in an hour or two. To the southwest is the old volcano of Ajusco, which at one time threw all the lava into the valley. The lava beds near San Angel and Tlalpam prevent making any direct road between the two towns, and one is compelled to go around them three times the distance. Still looking toward the southwest one gets a glimpse of Chapultepec (the hill of the grasshoppers), on which are the Castle of Chapultepec, which is the presidential residence, and the National Military Academy. To the west is the mountain range separating Mexico Valley from the Valley of Toluca. To the northeast one can see the Church of Guadalupe, where the miraculous painting of the Virgin of Guadalupe is, and if one is on high ground he can see on a clear day, some 40 miles away, the Pyramids of the Sun and the Moon, built centuries ago, by whom and for what purpose no one can tell.

But with all these beautiful views, clear skies and the fine, clear winter days, and the cool, pleasant mornings of summer, much cannot be said for the roads.

Though Mexico Valley is about 30 miles wide and nearly 60 miles long, there are no good roads to take a car to the mountains. The Government is at work now building a road so that it will be fit for an automobile to climb over the ridge which separates the valley from the outside world. This road, which is very steep, runs up the mountains, toward the southwest of the city, and after reaching the top it winds down into the Valley of Toluca, and to the city of that name, Toluca, which is the principal city and capital of the State of Mexico, Mexico City being the capital of the republic.

The ride up to Toluca can be made by good machines, and it is an excellent test of the climbing abilities of a machine. Part of the way up one can turn to one side and go to El Desierto, which is one of the most beautiful spots near Mexico City. In the midst of a forest of tall pines one will find the ruins of an old Carmelite monastery, with its small chapels and hermitages in ruins and moss covered, all scattered through this forest of sweet scented pines, and old aqueducts which the monks built to carry water to their hermitages, also more modern aqueducts built by the city government to carry this clear, pure water into the city, 16 miles distant.

The road to the monastery is not a good one, the greatest drawback being the steep grades, some of which run 27 per cent. at



PASSING CHAPULTEPEC CAFE.

least, which, together with the fact that the altitude is fully 11,000 feet above sea level, make it hard for the automobile. Only three machines have succeeded in getting to the monastery so far. A good proof that they were there is the photograph showing the ruins in the background.

Coming back from El Desierto one can coast all the way, and the brakes will give an odor of burning paint or varnish before going very far.

After leaving the forest there is a fine view of the valley, with the city almost at your feet, and the lakes of Texcoco and Chalco just beyond, with the mountains rising up almost from the shores of the lakes. One can also see Texcoco, the city where Cortez, about 400 years ago, put his boats together, after having had them made on the other side of the mountains at Tlaxcala. He had them carried over the mountains and put together at Chalco, so that he might cross the lake to capture the city.

The road to Toluca is the only highway of any length that has received attention from the Government of the Federal District, which will take one any distance from the city, as the monastery is about 16 miles from the city, and Toluca 40 miles. It is steep and winding, but the grandeur of the scenery repays the climb.

The Federal Government has finished a macadam road from the City of Mexico to Mixcoac, which is about 7 miles distant, and they intend to build this road out as far as San Angel, which will give us a drive of about 13 miles. They are building a road more to the east and parallel to the road just mentioned, which will take one to Tlalpam. It is finished now as far as Churubusco, so that the lovers of golf who own machines can run out to the magnificent clubhouse the Mexico Country Club is putting up there. The road to Tlalpam when finished will make possible a run of some 19 miles, and as there is a good cobble road through Coyoacan to San Angel it will make a loop of nearly 35 miles. The Coyoacan road from San Angel passes by the palace of Cortez in Coyoacan, and joins the Tlalpam road at Churubusco.

Besides these roads, which are now being reconstructed, there are the shorter ones, as the Paseo, or the famous drive of the City of Mexico, which is very wide, with double rows of shade trees on each side, and outside the shaded walks on each side is the driveway for automobiles and bicycles exclusively. This drive, which starts at the bronze equestrian statue of Charles IV, ends at Chapultepec, about 2½ miles distant. The centre drive for the carriages is very smooth, but one cannot go at very great speed, for at every quarter mile is a "gloriata," the widening of the drive into a circle, having in the centre a statue, or a large flower bed. As the drive follows this curve of the gloriata, one must slow down.

To the north of the city there is the short drive of about 3 miles to Guadalupe, with a good, hard macadam roadbed, and to the northwest a short macadam road leading over the old causeway which Cortez captured when he was driven from the city. The spot is pointed out where Alvarado made his wonderful leap, which is described in Lew Wallace's *The Fair God*. The house built by Alvarado after the conquest of Mexico is also pointed out. After a ride over a good macadam road one reaches Popotla, or place of the brooms, a small town, where the tree still stands under which Cortez rested when he was driven out of the city by the Aztecs on the night of July 1, 1520. It is related that he reviewed his troops there and wept when he found how many had been killed. The motorist can follow this road out as far as the little town of Atzcapotzalco, making a ride of about 4 miles in that direction. One can go beyond, but over narrow,



THE "TREE OF THE DISMAL NIGHT."



ON THE PASEO DE LA REFORMA.

winding roads, sometimes full of ruts and bumps, and with creeks unbridged, and on both sides deep ditches, each having its row of high maguey plants. If one finds he cannot go on he has to make the turn in this narrow lane or back out.

Strangers, and even the people who live here, like to ride through some of these narrow lanes close to the towering maguey plants, or what in the States is called the Century plant, from which the Mexican gets his pulque, or daily drink.

Automobiling in other parts of the republic is much the same as around the City of Mexico. The hills and the altitude are the greatest hindrance. At the altitude of nearly 8,000 feet it is not possible to obtain the same power from the explosion of gasoline as nearer the sea level, and our gasoline costs us $5 for a 5 gallon can. Then again, outside of the cities, where there are some good country roads, the



DRIVE IN CHAPULTEPEC, WITH CASTLE IN BACKGROUND.

auto can be used only one-half the year, on account of our rainy season, when it rains every afternoon for at least four months. For two months the weather is doubtful, and for the remaining six months, or winter, it is ideal.

There are quite a number of automobiles in the City of Mexico. A number of doctors have them, and there are also several delivery autos and sight seeing machines. But a great many are discouraged, and do not buy machines on account of the cost, besides the gasoline being about $1 per gallon. The protective duty on everything makes a set of tires cost $100 at least. As the Mexican dollar is worth one-half that of the United States the price in dollars is double. Freights and duties are high, and a tax of $8 per month is levied for every carriage, coach or automobile wheel one owns. Still with all these drawbacks the dealers in automobiles are having good trade, and all the dealers and auto owners are awaiting the time when the Government shall have completed the good work in road making that they have started.



ON THE ROAD TO CASTENADA.

The duty on automobiles averages 30 cents per pound, so an automobile weighing 3,300 pounds would pay a duty of $990. This, plus 10 per cent. for custom house commissions, stamps, etc., makes a total of $1,089, and to this would be added from New York State $300 for freight. When this auto is sold a bill of sale must be made out bearing 60 cents in stamps for every $100 value. Thus if an auto is sold for $9,000, the Government gets $54 revenue from either the buyer or the seller for a cash sale. If it is sold on nine months' time (more than two-thirds of the autos there are) a contract is made covering terms of the sale. Notes are made and also a bill. Fifty-four dollars in stamps are placed on the contract, and $54 in stamps are placed on the bill, and 2 cents for every $5 in stamps is placed on same. It is evident that a cash business means less revenue to the Government.

There is little automobile business in the republic outside of the City of Mexico, owing largely to the road conditions. In the City of Mexico there are three modern up to date garages, besides some small places. The garages are equipped with modern tools, and employ expert mechanics capable of even building autos.

A solder for aluminum has been invented, says British Consul Atwell, of Roubaix, by Ferdinand Hecht, of that city. With a soldering iron he can join aluminum together, or join aluminum to copper, brass or iron. The invention is simple, no acids or salts being used. Mr. Hecht exhibited his process before the professors of chemistry of the Faculty of Science, and was awarded a medal.

According to experiments made at Northwich, England, dilute calcium chloride solution is an excellent street watering fluid. The surveyor in a recent report to the local council stated that the solution was an excellent preventive of dust, and considering the length of time it lasts its use comes lower than sprinkling with water.



AT THE ENTRANCE OF THE EL DESIERTO MONASTERY.

THE HORSELESS AGE

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Alcohol as Motor Fuel.

There is considerable conjecture rife as to the probable effect upon the motor car field of the removal of the tax from grain alcohol. That the effect of the free alcohol bill, which will go into effect at the beginning of 1907, will ultimately be to furnish the motorist with an alternative fuel is not to be doubted. How soon and to what extent alcohol will come into use is purely a matter for speculation and will depend upon a number of considerations, both economic and technical.

A great many people have advocated "free" alcohol, more in the hope that its realization would have the effect of preventing the artificial elevation of the price of gasoline than with any serious thought of using the new fuel in the near future. It is quite possible that the possession by the public of an efficient substitute for gasoline will prevent the further "marking up" of gasoline, which has been going on briskly of late, or even that it may lead to a reduction in its price. As to this no one can tell until it has been demonstrated upon a large scale at what price denaturized alcohol can be manufactured and profitably marketed.

How soon alcohol will become an important factor in the liquid fuel field will, of course, depend upon the alacrity with which capital seeks the new industry and the energy with which the sale of the product is pushed. It may be some time before alcohol is as generally to be obtained as gasoline is at the present time, for the problem of distribution of a commodity of this kind is a complicated and extensive one.

Automobile owners are asking the question, "Can I operate my engine with alcohol?" In general the answer must be that any gasoline engine can be operated with alcohol provided a proper carburetor be provided, but such engines which operate with moderate compression pressures will run somewhat less efficiently and develop considerably less power with alcohol than with gasoline. Very few, if any, gasoline vehicle engines, in present use, operate with compressions as high as that advantageously practiced in motors burning alcohol, and thus it is not likely to prove economical or otherwise advantageous to use alcohol as fuel for the average gasoline engine.

The resort to the expedient of raising the compression of a gasoline engine, in order to fit it for burning alcohol, for example, by attaching a plate to the piston head and thus reducing the clearance space, is not likely to prove advisable, as it is not safe, on mechanical grounds, to thus increase the stresses in motor parts above those for which the parts were designed.

It will be interesting to observe whether high compression vehicle engines will be brought out for use with alcohol solely, or whether later on manufacturers will attempt to produce motors capable of economically consuming either gasoline or alcohol. In this latter case a degree of compression compromising between the most advantageous compression pressures of the two fuels might perhaps be adopted with fair results. It is at least conceivable that a construction might be adopted which should allow of the alteration of the compression ratio at will, to allow for the advantageous use of the two fuels in the same motor, which should be designed adequately strong for the compression required by alcohol.

It is certain that gasoline carburetors, as at present used, will not utilize alcohol in a practical manner, but it is probable that vaporizers capable of operating on either gasoline or alcohol can be produced which will presumably be arranged to be copiously jacketed with exhaust gases when used with the latter fuel, since alcohol is stated to require about five times as much heat for its evaporation as does gasoline. Whether gasoline will be used to furnish

gas for the initial explosions in starting and then when the carburetor is heated alcohol be supplied for regular running purposes, or whether some electrical method of heating the vaporizing chamber, preliminary to starting on alcohol, will be resorted to, remains to be seen. The former method would seem the more practical one.

If alcohol is to come into general use as motor fuel it would seem to be very desirable that engines and carburetors should be so designed as to be operable upon either that fuel or gasoline, at will, with slight changes, capable of being quickly and easily made. Likely enough this problem may be successfully worked out.

It is quite possible that alcohol may come to be the cheaper fuel in certain localities, and gasoline more economical in others, so that it would be of advantage for manufacturers to produce cars readily adaptable to either fuel.

The fuel tanks of automobiles, when filled with alcohol, will not under the most favorable conditions suffice for so large a car mileage as when supplied with gasoline. Moreover, in the use of alcohol as a fuel much more care in testing for quality will be demanded than is necessary with gasoline. Alcohol may be adulterated with any proportion of water, without the fact being evident except by a specific gravity test. Its fuel value may be reduced to zero by the addition of water, which mixes with it instead of remaining clearly separate, as it does when added to gasoline.

The fuel question has indeed become of engrossing interest by the "freeing" of alcohol, and interesting developments may be looked for, although nothing of a sudden or revolutionary nature is necessarily to be expected.

Another Charge Against the Automobile.

It is the usual fate of every innovation, whether in transportation or otherwise, to become the scapegoat for the evils which inflict mankind.

The automobile as a new means of road travel has been charged with wearing out the roads and destroying crops by covering them with dust, beside driving other traffic from the highways. The latest crime of which it is claimed to be the instrument is the dissemination of dangerous insect pests. In a bulletin on the gypsy moth, published by the New Hampshire College of Agriculture, occurs the following: "The writer has no doubt that practically all of the infestation of gypsy moth in New Hampshire has been introduced by automobiles, as they are practically the only vehicles, other than railway cars, coming directly from the badly infested region of Massachusetts, and the infestations are found along the main roads and not near the railroads. Indeed, one case has come to our attention in which the owner of an automobile coming from Malden, Mass., removed a half dozen caterpillars from his machine upon arriving at Greenland, N. H., which were believed to be, and doubtless were, those of the gypsy moth." A similar claim is made as to the part played by automobiles in the distribution of the very pernicious brown tail moth.

Just why these caterpillars should alight upon and be carried exclusively by the comparatively few and swiftly moving motor vehicles and not by the enormously more numerous and slowly moving horse drawn vehicles, among which are hay carts with high piled loads which brush the trees as they pass, it is very difficult to imagine.

Perhaps the fact that the agricultural college from which this statement emanates is supported by appropriations secured through the influence of the farming element, which is notoriously hostile to the automobile, may account in some measure for the strong statements of its entomologists adverse to the motor car.

That the charge is a false one is shown by the fact that the gypsy moth has not as yet spread to the White Mountains, to which district a large proportion of the automobile traffic from Massachusetts to New Hampshire takes place. If automobiles are a large factor in the dissemination of these insects they should certainly have been introduced into the mountain region ere this.

It will be interesting to see what obliquity will next be charged to the automobile, whose only real crime is that of being a "new thing."

Method of Scoring in Fuel Competitions.

In another part of this issue will be found an article by one of the competitors in the recent Two Gallon Efficiency Contest, who champions the system of basing the score of cars in such competitions on useful ton-miles per unit of fuel consumed. We have already given our opinion as to the relative inferiority of this system as compared with that based on total ton-miles, but as the subject has been brought up again, it may be worth while to go into it a little more thoroughly.

Attempts have repeatedly been made abroad to organize competitions for determining what might be called the total value of cars, or their desirability from the standpoint of the purchaser. Each feature which has some bearing on the value of the car is made the subject of a test or of an estimate by the judges' committee, and the marks gained by each vehicle in each of these minor competitions are summarized, and the final classing is based on the sum total of marks earned by each car. The practicability of such contests is extremely doubtful, because any method of comparing such features, as, for instance, absence of vibration and fuel economy, or even appearance, must be extremely arbitrary, and perhaps no two purchasers would place the same relative value on these various features.

Now, the system of basing the score in a fuel economy contest on the useful ton-mile developed is very similar to the method of classing in these "general merit" contests, in that credit is given not for fuel economy proper, but for fuel economy and weight efficiency combined. These are two distinct factors, and must be considered separately. When it is desired to move a certain useful load at certain speeds the problem arises: What is the most advantageous dead weight (vehicle weight) for accomplishing this? And the answer depends not only on the fact that the greater the dead weight the greater the power required, and hence, with constant efficiency, the greater the fuel consumption, but there are quite a number of other considerations which enter into the problem. The dead weight partly determines the first cost of the car, it greatly affects the tire wear, and it has a considerable influence on the durability of the vehicle. Reduction of dead weight is very desirable within certain limits, though not so much because it leads to a reduction in fuel consumption; it becomes positively objectionable when carried too far, when it leads to flimsy construction. Increased fuel economy is only a minor advantage of weight reduction or a poor compensation for its disadvantages, and it would, therefore, be quite irrational to judge the value of weight efficiency by its effect on fuel economy.

A system quite similar to that proposed

by our contributor was employed by the New York Motor Club in its last year's "National" Economy Contest, the basis of marking being the passenger-miles instead of the ton-miles, and as a result of the club's experience with this system they have this year discarded it in favor of the basis of total ton-miles. Last year's contest was won by a motor omnibus, and it is easy to see that on the basis of passenger-miles, or useful ton-miles, the small two passenger car has almost no chance as compared with the big multi-passenger vehicle.

Another illustration of the injustice of the proposed system is furnished by the detachable tonneau type of car. Some manufacturers build "straight" two passenger runabouts, and others make almost identical machines of the convertible type which will carry four passengers. With approximately the same fuel efficiency the fuel consumption per passenger-mile or per useful ton-mile would be only about half as high for the convertible machine as for the runabout, and one might, therefore, be misled by the results of such a contest to consider the convertible car a greatly superior machine.

When the classing is based on total ton-miles the weight efficiency no longer enters as a disturbing factor in the results. If one competitor moves a given total weight with a given amount of fuel a greater distance than another competitor, it is proof that the efficiency of the former's power generating and transmitting mechanism is greater. This is an actual engineering result, and it is certainly of some value to know the merits of the different cars on the market in this respect. On the other hand, a test of 50 miles or so is not sufficient to shed any light on the question of what is the best proportion of dead weight to useful load, and this element of weight efficiency should, therefore, be kept out of the formulæ of fuel economy contests.

The Milan Gold Cup Contest.

According to reports to hand at the time of going to press, Lancia was leading in the Milan Gold Cup Contest at the completion of the first half of this event for touring cars. He had not then lost a single mark, which means that his average speed for every stage was exactly 40 km. p. h. (25 m. p. h.). A number of other contestants had less than one minute penalization at this time. The contest so far had been exceedingly severe, owing to the mountainous grades, the bad roads and the inclement weather.

MAINTENANCE AND REPAIRS

Care and Operation of Gasoline and Kerosene Burners.

By Winthrop Waite.

Steam as a motive power for the modern automobile has already progressed to such a degree, involving such radical improvements and so many new forms of construction, that possibly the users of the early cars would hardly recognize the steamer of today. From being unquestionably the most complicated piece of automobile mechanism, with all the troubles that cluster around complication in mechanics, the steam car of today is one of the simplest cars, not only in construction, but also in operation. I refer most particularly to the cars using the flash steam generator in place of the old fire tube boiler, and still more particularly to the steamers that are built on the same modern lines of running gear and chassis design as our most up to date gasoline cars. So that in briefly discussing the care and operation of the most vital parts of the modern steamer, that is, the burner and steam generating plant, due allowance must be made for such readers as have had no experience, or practically little, with the flash system, and in order not to confuse their minds with technical details, it will perhaps be necessary to digress a little here and there to properly present this subject, this digression being explanatory of the vast difference in working between the old and the new methods.

There never has been any engine or motor to equal the steam engine in its most approved forms, from the earliest times of mechanical progress to the present day. Expansion versus explosion, invariably when argued to a finish, ends in a complete victory for the former method of power application to the pistons of an engine. To my mind the gasoline explosive engine owes far less to its own inherent good qualities for its success in the automobile or boat than it does to any defects that have appeared in the steam engine, say, in the past thirty years. But as steam is the only expansive agent worth considering in this connection, and as steam production means the use of two elements, fire and water in proper proportions, and in proper and exact regulation, it must naturally be concluded that whatever defects steam as applied to the automobile may have shown in the past, these defects were not in the engine, but rather in the steam generating plant, which is after all the life and soul of the steam car. By this I do not wish to be understood as taking the position that the steam automobile engine as first used in the early steam cars was ideal, or had reached the highest development, for on the contrary new and vastly better types of steam auto engines are now in use, and I firmly believe there is still room for further improvement; but it is pretty generally agreed among all who have had anything to do with steam that in the steam plant must come the great changes, and most particularly in the manner of burning and vaporizing the liquid fuel, and in the selection of the proper fuel—which, by the way, is not the gasoline of today, but kerosene, or some other substitute not yet found, approximating all of the good qualities found in kerosene, with alcohol as a bare possibility, but not a probability.

This leads us to the very interesting discussion of proper liquid fuels, a subject of vital importance to all branches of the industry, important as viewed from the standpoint of every user, and a subject of considerable economic interest to the world at large. In presenting perhaps a new view of the case, I would briefly state that the steam car will always have the advantage over the gasoline explosive car in the choice of fuels, being enabled when the proper apparatus is finally perfected to use the lower grades of fuel oils with great economy and marked efficiency. For example, I do not believe that kerosene will ever be found to be a fair substitute for gasoline in the internal combustion motor, as I do believe, with some changes in the carburetor, alcohol will be found to be in the near fututre. There is some peculiar deficiency always present in the exploding of vaporized kerosene within a cylinder. These deficiencies make themselves manifest in various ways, as all who have had experience with the kerosene internal combustion motor have witnessed, although I am aware that there are quite a number of successful kerosene motors on the market doing admirable work for stationary uses.

Therefore, as the use of the new fuels comes to be a certainty, and the use of gasoline is discontinued in the steam car, we will all witness still further strides forward in steam. But already there are one or two successful kerosene burners on the market and in daily use, and the number of steam users who are gradually changing over to the cheaper and better fuel is increasing, while the number who would like to change is almost beyond calculation, and the number who did change over long ago, when perhaps the kerosense burner had not reached its present state of reliability, and who have done nothing but find fault since, while still skeptical, I have found are always open to conviction.

The gasoline burner, viewed from the standpoint of the garage man and the person who is responsible for the care of the car, is a very easy proposition. In fact, it requires no care, beyond the tightening up of leaky unions and couplings, and no adjusting to speak of. But this tightening up of leaky fuel lines is very important with gasoline; in fact, if it is neglected dire results are likely to happen. With the kerosene burner an occasional leak of small

proportions need not bother the operator very much, for under no conditions can a kerosene burner get on such a fiery rampage as to destroy the car or injure the person in any way. Speaking of the importance of keeping all fuel feed lines in the gasoline system absolutely tight by frequently going over them reminds me of what happened to some acquaintances of mine a few years ago with one of the early steamers. The party had embarked on a ferryboat en route from Manhattan to Long Island City. It was in the days when fires were obliged to be extinguished, under the Federal steamboat inspection regulations, when an automobile passed on board, but, as we all know, fires were extinguished only when ferryboat employees could not either collect the graft or were too honest to, which latter was seldom the case. The boat was approaching the Long Island City slip, and it is needless to say that the pilot in my friend's car was still under way. The operator started to turn on the main fire, and in some inexplicable way either a tiny leak at a coupling that had developed unnoticed or else a rupture of the fuel line at some point took place, for instantly there was a spurt or stream of fire shot out from under the car sideways and upward for a distance of nearly 30 feet. A small sized panic ensued among the pedestrians and horses, and for a time it looked serious, but the operator had head enough to quickly close his main fuel valve and the fire ceased. A moment more, however, and the car would have been probably so enveloped in flame that it would have been a total loss, to say nothing as to what might have happened to the flimsy old ferryboat. As it was the car had to be towed off the boat to a place of safety until repairs could be made, for no one dared to "hunt the leak with a candle." But with kerosene such a thing could not happen, and so great is this factor of safety that I believe every steam user should, as far as possible, become familiar with the underlying principles of kerosene vaporization, and, if possible, learn of the defects in the use of kerosene due to ignorance of conditions and handling.

This leads me to enumerate the points wherein kerosense and gasoline differ in the burner. To begin with, gasoline practically requires no vaporizing system, as the little loop of pipe coiled around on top of the old fire tube boiler and stuck down through the boiler is so elementary a piece of mechanical construction that it cannot be called a "system." While this method of utilizing the steam heat to gasify or vaporize the fuel works well with gasoline, it will never do with kerosene. Some people who have fooled with kerosene in home made burners have been unwise enough or have lacked the sense to understand that what works in one case will not always apply in another. On the contrary, kerosene, being a heavier oil, that is to say, being entirely lacking in volatability, or in other words in self gasifying qualities, requires vastly more heat, and this heat must be applied constantly and unremittingly while the burner is in operation. Ordinarily before a good, free burning gas can be obtained from the 150 test oil at least 700 degrees of heat must be sent through every atom of the oil. And the hotter the kerosene gas the better the combustion, so that we find we are not overdoing things when we can deliver gas of a temperature of 1,000° and even 1,200° to the mixing tubes, And here comes the problem of the kerosene burner maker, and also the user. Obviously, kerosene then requires a separate and complete vaporizing system, and this vaporizer portion has to be independent or detachable from the burner proper, and must be so arranged that initial vaporization within it will be quickly induced, and when once started the gas must be kept up to the required temperature, and must not lose one iota of this temperature in its passage and delivery subsequently to the mixing tubes. And here also I would call attention to another well known characteristic of kerosene which has simply been ignored by makers and others who have tried kerosene in the steamer, till I wonder not at all that they had very little success with their pioneer efforts. I refer now to the marked tendency of kerosene vapor to condense with astonishing rapidity upon the slightest contact with a lowered temperature, even of slight degree. To guard against this is perfectly simple, in other words, to "insulate your gas" after you have made it is easily done, but it has been ignored by even those who have been tolerably successful with the vaporization stage.

There is another feature connected with the use of kerosene in the steam car that I fear has been overlooked. I have heard many complaints from experimenters that they could not seem to get proper combustion, the burners smoked or emitted clouds of unconsumed gas at times. Kerosene, to my mind, unquestionably requires more rather than less combustion and flue space than gasoline. For my own part, in research along this line I have formulated a general rule of percentage which I can safely recommend to all users and designers of cars intended to operate on kerosene burners, and that is, that from 25 to 33 1-3 per cent. more flue and combustion space is required than with gasoline. And, again, this is a very little trifle to overcome, once thoroughly comprehended. Even the old steam cars can always accommodate a little extra width of stack, and in the modern cars using annular down draft without a stack kerosene can be successfully used with perfect combustion if this rule is followed. In my own car I have an abnormally small stack, entirely hidden from view, discharging 'way at the rear of the car, and a closed bottom on my burner, and I never have trouble from bad combustion.

Carbonization is a large technical word that seems to have stuck in the minds of would-be users of kerosene to such an extent that one of the first, and sometimes the only, question asked in regard to the merits of this or that make of burner is, Will it ever carbonize? It most certainly will, and so will any gasoline burner on earth, to be perfectly technically correct. The consumption of any hydrocarbon by fire will leave a carbon residuum in greater or less proportion, according to how thorough and quick vaporization has taken place. And it is also perfectly true that gasoline will not leave nearly as much trace of this residuum, which is really a sort of by-product, in the burner as kerosene will. But as surely as night follows day kerosene can be vaporized, and the vapor consumed in such manner that the troubles from carbonization will never exceed the same tendency in the gasoline burner. And some of the points not to be overlooked in this connection are to guard against overheating, or excess of temperature during the instant of flashing or vaporizing. For example, if the vaporizer should become white-hot or possibly approach 1,600 degrees of heat (as I have seen happen more than once), a sort of splitting or "cracking" of the oil occurs, which is nothing more or less than a peculiar kind of chemical reaction, and it is sure to produce in the residuum an excess of the hard, black, flinty matter we call carbon, and which plays havoc in fine valve jets and the convolutions of vaporizing coils. On the other hand a steady, well controlled temperature of anywhere from 700 to 1,000 degrees will give uniformly fine results. And to sum up this carbonization question I would state that to attain this result is merely a matter of mechanical construction, and has been and is overcome easily when once the principle is thoroughly understood.

Naturally all of these things make the kerosene burner a more difficult piece of mechanism, involving fine shop work and the use of the costliest and best raw materials in its construction, but by no means a more complicated apparatus than the gasoline burner. But the first cost is greater, and rightly so, for be it understood that no kerosene burner that is of sufficient reliability to command public attention can ever be built and sold for the price of the cheap gasoline burners once used. These latter were generally made from steel stampings, the steel used being scrap stock, or cold rolled, and a burner for its list price included no vaporizing system other than the little piece of pipe designed to run through the boiler, and perhaps a gas valve discharging into a mixing tube. But in purchasing a kerosene burner the buyer must remember that he is getting not only the burner portion but also a complete vaporizing system independent of steam means, a complete starting device, and far better controlling means for the gas than with the gasoline burner. All these things, taken into consideration with the great economy in fuel, which by the way is just about 50 per

cent. less than gasoline, and can be depended upon to do anywhere from 25 to 40 per cent. more work, make, I am quite sure, the kerosene burner at once the most attractive automobile proposition from a viewpoint of low cost.

As to the efficiency there can be no doubt. I have never heard a single word against the use of kerosene on this point. In fact, even those who have been the sorest on kerosene, due to their unfavorale experiences in the past, were only too regretful on this score. I have known of well authenticated cases of 25 miles being accomplished to the gallon with kerosene, and I have before me one case of 27 miles. At 9 cents per gallon, compared to 18 cents, the prevailing prices of kerosene and gasoline, this last performance would seem to equal in money economy the recent showings made by the air cooled gasoline cars on their recent economy tests. But, however, I consider the 27 miles an experience not likely to be repeated by many, and only in the light of extraordinary test. Whereas gasoline now cannot be safely said to average more than 8 to 12 miles to the gallon, kerosene will on the average nearly double the mileage if not always do it, and costs just about half and even less than half as much as gasoline. Therefore is not the achievement of producing a perfectly reliable kerosene burner worthy of best effort and the interest of the entire motoring fraternity, steam and otherwise, who have broad gauge enough to look beyond the limits of their own particular class of motive power?

And as to the care of a kerosene burner. I do not think that a kerosene burner requires any particular care to distinguish it from a gasoline burner in this respect, and I have stated before that beyond the insurance of tight fuel lines the gasoline burner needs very little shop attention. Practice, however, has taught most of us that gray iron is a better metal for burner plates than a steel stamping, and hence in the better class of burners the old steel stamping is being discarded. The steel, being necessarily of light gauge, gives easily to warping and twisting under the intense heat, whereas gray iron is indestructible and keeps its shape. Occasionally gray iron when maltreated will show a very fine crack on its upper surface, but this never puts it out of use or affects its operation in the slightest. Care, of course, should always be taken with any hydrocarbon burner, either gasoline or kerosene, to feed it oil when starting in minute particles, gradually increasing the flow until the maximum is reached. A flooded gasoline burner is generally hades let loose, and most gasoline users I have noticed have learned the little knack of not being in a hurry to shoot raw oil into the mixing tube; but I fear some kerosene users, owing to the absence of any danger therefrom, will be apt to hasten things up a bit in the initial starting. Caution must be used with kerosene in starting as well as with gasoline; the same rules will apply, not because of the danger, as with kerosene that is entirely eliminated, but because if raw oil is inadvertently shot into the mixing tube and the burner proper a mussy and smoky start will be the result instead of the clean, odorless start I know a kerosene burner is capable of when properly built and properly handled. Speaking of this odorless and smokeless quality, I wish to state that it has been within the scope of my experience and research with the use of kerosene to discover that when a kerosene burner is working as it should the odor is practically nil and hardly distinguishable, besides being entirely inoffensive and sickening as the odor from the consumption of gasoline is to many people, either from the burner or the internal combustion motor. Furthermore, I have never, except at initial starting, witnessed the clouds of blue smoke from a kerosene burner that many of our highest grade internal combustion, and especially air cooled, cars frequently leave behind them in. a trail through the city streets. It is my firm belief that perfection in the use of the kerosene burner includes within its scope less odor and less visible waste than is to be seen today on many internal combustion cars.

In conclusion I wish to say that when the time comes, as surely it will, when gasoline will be found inexpedient as a motor fuel, and kerosene will also be found unavailable for use in the internal combustion engine for reasons I have already stated, and alcohol cannot be used with any degree of safety or economy in the burner, that the kerosene burner will come to the rescue of the steam automobile, not as a possibility, but as the only redeemer of what to many of us has been, and still is, and more than ever is to be, one of the most ideal motive powers for the modern automobile.

Testing Spark Coils.

By C. E. Duryea.

Many a motor gives trouble because the spark is faulty and while the appearance of the spark is a fair indication of its value, unless one is testing frequently there is no certainty that this method is reliable. The average man loses his way in the woods and walks in a circle unconsciously because one step deviates from the line of the previous one so little as to be unnoticeable. So the operator of a vehicle, comparing his spark today with that of yesterday, may not be able to recognize the difference, but if he had a method whereby he could compare the spark with that at the beginning of his experience or with the new battery, or new wiring or similar favorable conditions, he would at once be in position to know whether he was getting satisfactory results or not, or whether his coil needed repairing or renewal.

A simple test for a coil is to separate the high tension terminals and note the length of spark. This, however, is not very conclusive, for some coils are provided with internal paths across which the spark can jump without damage to the insulation when the terminals proper are separated far enough to be dangerous to the insulation. Every coil should be so protected, and if a coil is not so protected there is a possibility that the insulation will be perforated and the coil "break down," after which it will never jump as far nor give as good results under high compression as before. A peculiarity of the high tension current is that it leaks at every opportunity to a greater or less extent, and although the spark may not be passing through the broken down insulation, when in ordinary service, there is undoubtedly some loss of current by leakage at this point. This loss is not easy to show, but it undoubtedly exists. In some experiments made in 1897 with very high voltages I lost the entire spark by leakage in very short distances, although no perceptible spark could be seen at any one place. I also found, as have many others, that the spark from a single wire became unpleasantly perceptible if my fingers or other portions of my body came too close. In this case the current was undoubtedly completed through the atmosphere and the leakage of the coil. In these experiments I learned a peculiar fact, viz., that the spark could be carried almost any desired distance without apparent loss if one wire was mounted in the centre of a tube of metal and the other terminal attached to the tube. The length of the tube and wire seemed to make little difference, and the spark would be produced at a spark gap at the end of this combination apparently intensified, as if the surfaces acted as a condenser. Why there was little or no leakage apparent in this arrangement, when it was so clearly apparent with every other arrangement, I never learned. I mention this simply to assist anyone having to carry the high tension current long distances.

The question of import to the operator is the size and heat of the spark in the engine, and while the length that the spark can jump is a fair indication, and the apparent size of the spark is another, it seems to me that the best test is the actual combustion produced by the spark, such as burning a hole through a piece of paper. In order to make a cheap coil tester I fastened four wires to a board, by staples or tacks, with their points equal distances apart, so as to form two spark gaps as nearly alike as possible, one gap being a little closer to the board than the other. These wires formed the high tension terminals of the two coils to be compared. A set of batteries is used for each coil, with an ammeter in the circuit, and the coils are adjusted either to use the same quantity of current or to give the best spark possible, as may be preferred. With both sparks jumping a piece of paper is drawn between the points, which because one gap is slightly farther above the board than the other results in two lines of minute holes burned through the paper so close together that

they may be compared readily. Sometimes these holes are large enough to be examined directly, but in other cases a magnifying glass is needed or the eye can be assisted by holding the paper toward the light and examining the size of the holes by the light permitted to pass through. It seems self evident that the spark which burns the larger hole must be the hotter, and, therefore, more certain to ignite and sure to give the engine more vim than the other. By making a record of the quantity of current flowing, and preserving the slip of paper, the same coil can be tested at any future date, the only likely difference being the speed of the paper as it passes between the points. This has something to do with the size of the holes, but if the speeds are approximately the same the comparison will probably be near enough for practical purposes. It would seem that the holes should vary in distance according to the rapidity of the vibrator and the speed of the paper, but this is not strictly true. The paper is to a slight extent an insulator, while the carbon produced by the first spark is a conductor. On this account there is a tendency for more than one spark to pass through the same hole, and this tends to burn the hole larger than it would be if the paper moved more rapidly. Because of this tendency the method is best adapted to comparing two coils, for the paper moves at the same speed with respect to both, thus giving each an equal chance. Rapidity of spark can be tested by tuning the vibrators to the same pitch, and any possible difference in batteries can be elimiated by alternating them and comparing papers made before and after alternation. Proof papers made with a good coil and battery can be compared with papers made by a doubtful coil, so that the operator may know with certainty whether the spark is weak or not. Care must be taken, however, to use paper of the same kind and thickness and equally dry, and free from perspiration in each case. Of course this test cannot be very accurate, because of the difficulty of comparing the spark holes closely, but it will serve to show a poor coil, or depreciation in the coil, or a weak spark from some unknown cause when other methods, not so reliable, have failed. For example, a few years ago condensers were offered for sale to be used in the high tension circuit for the purpose of intensifying or enlarging the spark. As examined by the naked eye, the spark was larger and whiter and apparently stronger. The snap was more audible and the device apparently a good thing. As a matter of fact the reverse is true, and the condenser has disappeared from the market.

The loss due to a small spark gap is hardly visible, but if the gap be a large one the decreased size of spark is plainly evident.

It seems to me that coil makers and auto makers and users are wrong in their search for economy. The small amount of electricity used costs so little that it is far better to use double the quantity and get a big spark with increased power and decreased gasoline bills than to economize on the quantity of electricity. Whether a coil will run on half an ampere does not interest me. I am willing to provide a source of electricity that will furnish the current if I get in return therefor a spark more or less the size of a cat's eye. Here, again, coil makers have been wrong in the past. They have prided themselves on the length of the spark instead of being concerned about its heat. Length is evidently a matter of volts, but the quantity of the current doubtless has more to do with the heat. A good spark should therefore be short, fat and fiery. Lightning is pretty hot, but when one has seen the porcelain bases of the fuse boxes in a power station melt and flow like water the heat of a current of much lower tension is appreciated. This is why I have favored the make and break spark, although jump sparks are much hotter now than a few years ago.

[Mr. Duryea has sent us a number of the test cards, and the differences in the sizes of holes burnt can be plainly seen, but the marks are too faint to be reproduced.—Ed.]

The Two Gallon Efficiency Run.

By Blank, M. D.

The writer, whose car keeps up a steady mileage of at least 40 a day, is often asked in the club or elsewhere how far he can go on a gallon. His answer has been, in effect, that the manufacturer claims 20, and that he (the writer) can make 25. Recently the question was answered: "I have made 28." A poorly disguised smile of incredulity and a hasty change of subject prevented the explanation that this record was made on dry, level macadam, with no extra passengers.

Consequently when, a few days later, a letter was received from the manufacturer borrowing the rig and its owner to enter in the A. C. A.'s Two Gallon Efficiency Run, the chance was welcomed as a good opportunity to "make good" with an official record.

It was arranged that a man should come up from the factory and spend a week with the car. She was to be put into the pink of condition and tried out experimentally until we knew just what combination of adjustments of needle and air valves, what opening of throttle and position of spark, would carry the most weight the longest distance with the least expenditure of fuel. Owing to a mistake as to the date of the run this pretty plan of preparation dwindled to one afternoon's work on the car and three runs on single pints, on the last of which we made 3½ miles.

Lack of preparation, however, cannot be advanced as a plea. There was really very little to do. A chain which had run 100 miles was substituted for the 8.000 miler which had stretched three-eighths of an inch by measurement, and the time of break was advanced so that the cylinders fired one-quarter inch ahead of the centre measured on the piston stroke. Normally the owner sets the spark about a thirty-second ahead of the dead centre.

Owing to the car's light weight and the preponderating influence of pounds over miles in the formula, everything that could be classed under equipment was piled on, and our preparation was finished. All through the contest it stuck in our craw that 20 pounds more weight would be better than 10 miles more distance.

The manufacturer, the mechanic, the observer and the owner were the load. All except one were big men. Yet the official scales could give us but 30 pounds over the tow, and 15 per cent. of that had to be given up because of our lack of a fourth cylinder. This requirement should have been based, if made at all, on cylinder capacity and not on the number. At least that is how it seems to the writer.

We were drained and inspected. We demonstrated the absence of fuel in tank and carburetor, and offered to prove that we had none up our sleeves. Our entire innocence was certified officially, and then we were provided with two cans of gasoline, each containing 2 gallons. There was no inspector to see whether we poured it in or not, so we were careful when returning the extra can to call official attention to its unbroken seal. Had there been any temptation in this combination of circumstances we might have made a phenomenal record.

We were pushed upon the scales and received our "relief cans." Then we were photographed and pushed off to our start. Taking advantage of this the high speed was thrown in at once, and nothing lost in idle running of the motor. Four times on the way out did we stop the car. Once to sit on a stone wall and eat lunch; once for a general oiling (for we kept her slathered in oil), and twice for purposes we will not particularize, except to say that the condition of the car had nothing to do with the case. All these stops were made on side hills, consequently the crank was not used until we started on the back trip. We were bothered by just one thing, the efficiency of our cooling system. Owing to our rather high gearing, 11 to 3½, to be exact, and the seeming determination of our pump to work overtime, we could not get our motor decently hot. The success of the air coolers in this run, in the light of our experience, carries a useful hint.

In New Rochelle the heavens opened and the rains descended, and in a few seconds we and everything but our raincoats, upon which we were sitting, were soaked. So we continued to sit upon them. The mud was pretty deep, and the grades seemed pretty steep. We had figured that all but one of these grades would be acceptable propositions for our gearing. We would have been correct had it not been for the mud. As it was we were forced to a lower gear seven times. A ratio of 10 to 31

vould have saved this and there was a ten-ooth sprocket in the tool box. Eight or en minutes' work would have put it in ommission. But though no rule prevented s from changing, we decided to keep on s we had begun.

We ran faster than some cars and others utpaced us. Notably a Darracq, which ıade the run in fast time. We tried to ıaintain a speed of about 17 miles an our. We were cautioned by a policeman nce. Twenty miles out we began to pick p stranded ones. Big cars mostly. After o miles our manufacturer breathed a sigh f relief, and announced that he was satis-ied, as all he claimed was 20. Now came nxious moments for the owner, for 10 niles must be added before he had "made ;ood." Fifty miles at last! The owner ıad reached his goal, but not the car. On nd on she hummed, and then, all at once, vhen we had begun to think we were like he brook, the humming ceased, we coasted ı hundred feet or so, pulled out to the side)f the road and were at our journey's end. We were inspected properly and thorough-ly, and sat down to smoke and wait. The ime dragged by. The surveyor gave us our distance as 53½ miles, and we proceed-ed to figure ourselves as beaten by half the cars we had passed stranded miles be-hind us. After an hour or so we emptied our two relief cans into our bone dry tank and started back at a merry clip, reaching the city quickly and comfortably, in spite of getting lost in the dark.

Such was the run from our point of view. A more enjoyable afternoon the owner has seldom spent. He reflected that his car, which weighs but a trifle over 1,000 pounds, had with its three pistons car-ried four heavy men 26¾ miles to the gal-lon, through a hilly country and mud al-most tire deep. Only two cars carried more weight farther, one having four, the other one cylinder. This ability satisfies him. The mechanic and observer also must have had reasons for being happy, as none of us has a single unpleasant thing to say about the management. Of course, with the advantage of "hind sight," we have any number of criticisms, but no fault finding. There is a wide difference between these two things. The owner gained a lot in his education as a driver. He can now add miles to his car's record, for he has learned a trick or two, and is not afraid of any air cooler. He thinks the test a huge success.

It so happens that long before the A. C. A.'s plan was brought to his or the pub-lic's knowledge, the writer, as chairman of a committee, was given the task of devising a set of rules for just such a test. Conse-quently the definite knowledge gained in this run is of value to him. His cogita-tions have been many and long, and the results, modified by the lessons of the A. C. A.'s test, are as follows in regard to sev-eral points:

The practical value of such a test de-serves some consideration. From the man-ufacturer's and agent's point of view it con-stitutes a good advertisement if his car does well, and it does no harm if his rec-ord is not so brilliant as some others. The owner gets some information as to his car's ability, and the prospective purchaser gets a new point to consider. The designer gets little, if anything. The most important point of view is that occupied by the user, actual and prospective. As the fuel item is the smallest in the expense account, the practical value of such test is simply the obtaining of definite knowledge as to how far a car can travel to the gallon under certain definite conditions of load, driving and roadbed. As a measure of compara-tive value between cars of different make its usefulness is, to say the least, doubtful.

When the actual motorist finds his sup-ply getting low and himself far from help, he is not interested in handicaps. Nor do formulas appeal to him. The weight of his car, while it may increase his ton mile-age, detracts from his motor's ability to move his passengers an increased distance, and he cannot regard an increased load favorably. His problem must be solved in terms of passengers, gallons and miles. The dead weight of his car enters the question only as it lessens his engine's ability to do useful work.

This brings us to the point that it is not the motor that should be tested. The place to test an engine is on a block where proper instruments of precision can be used. The ability of a car to move itself and its load to a greater or less distance, on a given amount of fuel, depends on its transmis-sion, its road resistance, its windage, its bearings, its various gear ratios and many other things besides the exact proportion of heat units its motor is able to convert into power.

The matter of handicap has its influence upon our desired practical value. What is a handicap, or better, what will a perfect handicap do? Should it give every con-testant a chance to win? Should it be a tax on superiority or an aid to inefficiency? This depends on circumstances. The cir-cumstances are these in our particular case. We are making a test of one "power" of motor cars. We wish to measure their power to travel on a definite quantity of fuel. If this power is the function of any one part or quality it is that part or quality we are to test. It is conceivable that the result may be affected by other parts or qualities. Under these conditions, to obtain accurate results, it is necessary to so change the power of these other parts or qualities that the car which excels in the especial fea-ture under test cannot possibly lose. We are testing fuel efficiency which we have demonstrated to be a function of all fea-tures of the car, and of no one or two of its qualities, hence it follows that in a test of this kind the perfect handicap is none at all.

So we have demonstrated two points, viz., that we must test the car as a whole, and, second, that a handicap is inadmis-sible.

The test of practical fuel efficiency should be scored in terms of pound or ton miles, a car being considered to constitute an in-tegral whole, and, consequently, no dis-tinction made between models or makes.

On this basis a car weighing 2,000 pounds, able to carry four adult passengers 46 miles on 2 gallons, will be on a parity with another weighing 3,000 and able to carry the same weight of passengers the distance with the same fuel. Other things being equal, the second motor is showing the higher efficiency, but a large proportion of it is thrown away, owing to the extra weight it must move. This is a fault when considered from the point of carrying abil-ity, and the formula should certainly not make it an advantage. But the heavier car may be the better practical machine. Granted. It may be much the better, but not because of its motor's ability to move ton-miles, and for this reason other quali-ties will naturally determine the buyer's choice.

Hence the simple formula: Weight of passengers x miles traveled = score.

If you will apply this formula to the recent run the resulting arrangement of the competing cars will be far more in-structive than the list published.

As already stated, fuel efficiency is a practical problem under touring conditions. Hence touring conditions should dominate the test. The route should be so chosen as to represent the average highway traversed by touring automobiles. Had the start in the late run been at Central Bridge, the course would have been about right. Cars should be equipped as for a journey of, say, a hundred miles, with such paraphernalia as is essential for the safety and comfort of its passengers. Any device of its driver which would, in his opinion, increase his car's ability should be allowed and described in his entry slip. Any trick of driving should be considered legitimate and reported by the observer. In short, let the chauffeur conduct himself in his car's management exactly as he would if he were a hundred miles from gasoline with but 2 gallons in his tank. Cars have been caught in just that situation, cars of all kinds, and the car which can carry its load and give its driver the shortest walk for fuel when its motor dies is the best car, so far as fuel efficiency is concerned.

Explosion Engine Patent Digest.

We are informed by James T. Allen, of Washington, D. C. (Lock Box 2,454, Station G), that he is preparing a "Digest of United States Patents of Air, Caloric, Gas and Oil Engines, 1789-1905," under 207 chronologically arranged subdivisions, which will be in four volumes, about 3,500 pages, 2,034 pages of drawings, 1,000 pages of claims and briefs and 466 pages of indexes, which consists of the patentee's name and a complete list of the citations by number, name and date, interferences and decisions.

NEW VEHICLES AND PARTS.

Improvements in the Matheson Car.

The Matheson Motor Car Company, of Wilkes-Barre, Pa., are manufacturing this season two four cylinder models, a 40 and a 60 horse power one. A complete technical description of the Matheson car appeared in THE HORSELESS AGE of January 18, 1905, and as the present models differ from that then described only in details, only these improvements will be dealt with in this article.

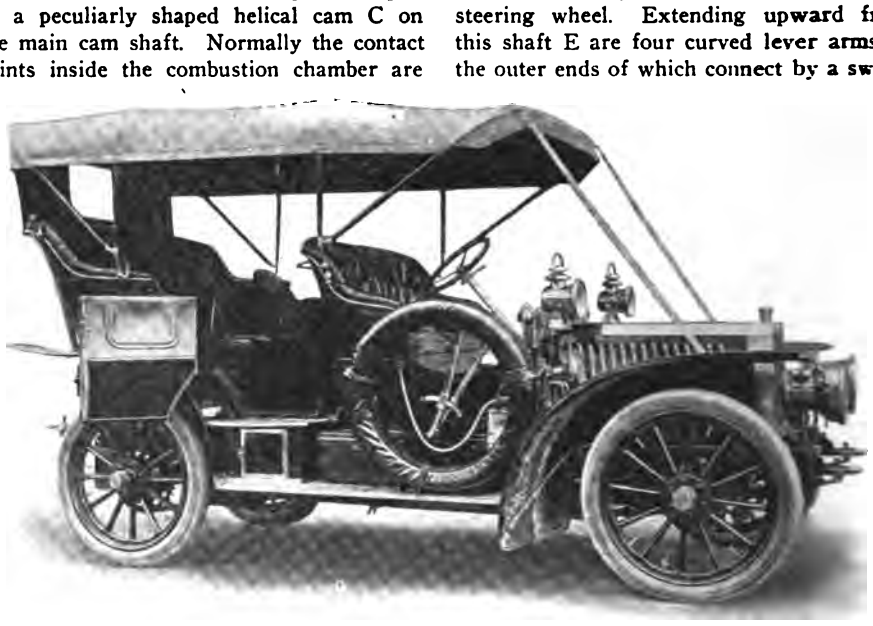
The motor remains practically the same as formerly, except for some slight changes in the valve and pipe connections, which render these parts more readily removable. The circulation manifold connecting to the top of the cylinders is now set at an angle which makes it easier to get at the cap screws holding it in position. The valve operating mechanism has been so changed that in order to take out a valve spring it is necessary to remove only one stud and one pivot bolt.

One of the most interesting improvements is a so called automatic starter, which allows of starting the motor on the spark, the same as with jump spark ignition. It may first be explained that the Matheson motor has make and break ignition, which is fed at the start from a dry battery and in regular operation from a Remy magneto. The ignition circuit is switched over from one source of current to the other by means of a switch on the dashboard.

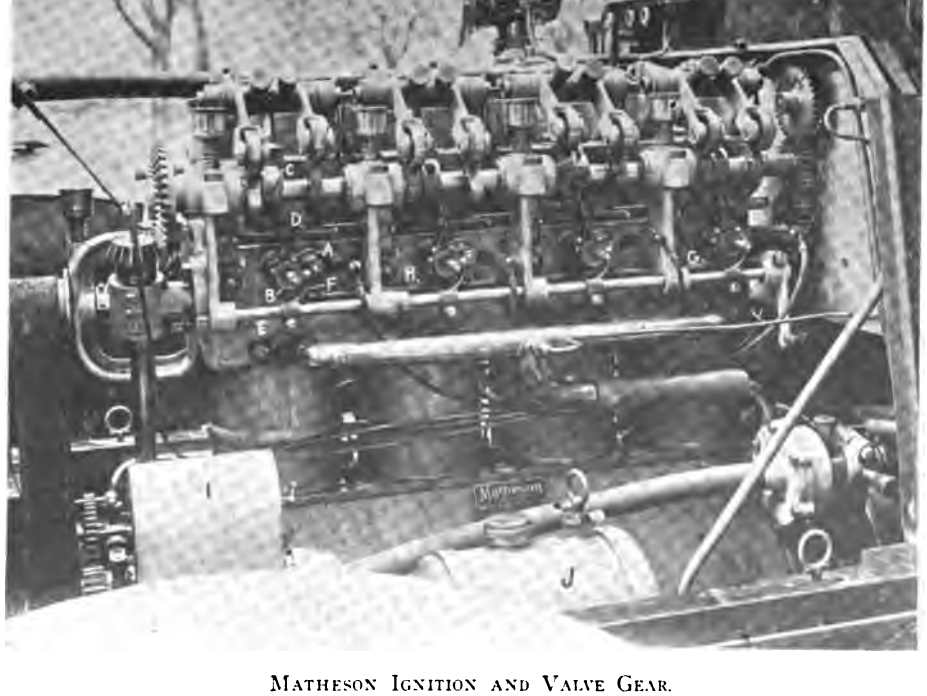
The make and break mechanism is plainly shown in the photographic side view of the engine herewith, which also shows the valve operating mechanism. The stationary ignition terminal A and the movable terminal B are screwed into the side of the cylinder wall, and the movable terminal has secured to its outer end a lever arm of spring steel with a contact nose at its outer end. This lever arm is operated upon by a peculiarly shaped helical cam C on the main cam shaft. Normally the contact points inside the combustion chamber are held apart by means of the coiled spring D. It will be easily understood that the cam C in its rotation, when it strikes the arm of the movable terminal, rocks the latter around its axis and thereby brings the contact points inside the cylinder together. The excess motion after the points are in contact is taken up by the spring arm on the movable terminal. When the cam prominence passes by the nose on the spring arm the latter snaps off and the contact points are separated by the coiled spring D, thus producing the spark.

For advancing or retarding the spark the shaft E is provided, which is connected by a suitable linkage to a finger lever on the steering wheel. Extending upward from this shaft E are four curved lever arms F, the outer ends of which connect by a swivel joint with a sliding block on the movable ignition terminal, by which means this block, which carries the spring steel arm, can be slid in or out on the terminal. It will be readily seen that when the contact arm is thus moved its relative position with respect to the ignition cam is varied, and the spark therefore occurs at an earlier or later period with respect to the revolution of the crank shaft. Not a very great variation in the time of ignition is obtainable in this way, but, as is well known, with make and break ignition no great lead is required. But while the mechanism thus described serves very well for timing the spark it is not so suitable for starting the motor on the spark as the ordinary jump spark timing gear, owing to the relatively small advance of which it allows. It was therefore necessary to devise a special arrangement by which the igniter mechanism can be tripped at any point of the power stroke. This is the device which constitutes the improvement alluded to above.

Underneath the cam shaft and back of the timing shaft E is a small diameter horizontal shaft G, which is driven by spur gears from the cam shaft at the same speed as the latter, and carries four cams so arranged angularly that each of them extends upward during what corresponds to the power stroke in its cylinder. The shaft G extends through the dash and ends in a knob; it is movable longitudinally a short distance, and is normally held in its most rearward position by a coiled spring H surrounding it. When this rod is pushed forward by the driver the cam which



THE 1906 MATHESON TOURING CAR.



MATHESON IGNITION AND VALVE GEAR.

extends upward at the moment engages a projecting portion of the movable electrode and trips the latter, thereby producing a spark in the corresponding cylinder. The shaft G is automatically returned to its normal position by the coiled spring H.

This photo also shows the magneto I at the forward end of the engine, the 2 gallon oil tank J at the side of the crank chamber, and the gear wheel K on the dashboard for driving the mechanical oiler. The latter is replenished periodically from the tank by means of a hand pump fitted into the tank as shown. The motor, it is claimed, can be started on the magneto by cranking.

Another improvement is the provision of a circulation gauge on the dashboard, which is simply a pressure gauge indicating up to 15 pounds per square inch. The writer was told that the normal pressure of circulation is 3 pounds, but that when the motor is speeded up the pressure occasionally rises to 5 pounds. The pump, of the centrifugal type, is seen in the engine photo near the right hand side, and is driven from the engine flywheel by a belt, being mounted on a pivot support, and the belt kept at a constant tension by means of a coiled spring. Owing to this method of supporting the pump, both its suction and delivery connections are made of fairly long lengths of rubber hose.

The leather faced cone clutch has been discarded and replaced with a metallic disc clutch comprising fifty 9 inch circular discs of saw blade steel, half of which are splined to the change gear shaft and half to the drum secured to the flywheel. The clutch is entirely enclosed and operates in oil. The writer was told that it is so controllable as to allow of starting the car on the high gear. With this type of disc clutches trouble is some times encountered, due to the fact that the discs adhere to each other and drag when the clutch is disengaged. To overcome this defect in the Matheson clutch small curved springs are secured to the sides of the discs, which tend to separate neighboring discs and thus prevent dragging, due to adhesion. The rate at which the clutch picks up its load can be varied by using different grades of oil in the clutch casing. If it doesn't pick up quick enough the oil may be thinned a little, and if it is too fierce a thicker oil may be used. The main clutch spring is adjustable, for pressure, as usual.

The change speed gear is of the sliding type, giving three forward speeds and one reverse, with direct drive on the high. All gears are made of chrome-nickel steel, and the shafts are mounted on 7 inch Hess-Bright ball bearings. The face of all gears is 1¼ inches. The gear case has a three point support.

The countershaft brakes are hollow drums filled almost half full of water, by means of a small tube extending into a central opening of the drum on one side. There is a hill pawl on the jack shaft. A regular pressed steel frame is now used, instead of an armored wood frame. The semi-elliptic springs are connected to the frame by trunnion supports, which relieves them of strains due to swaying of the body, and the trunnion of the rear spring also has a sliding motion, thus obviating the need for spring shackles. A Mayo cellular radiator is used, with a fan behind it driven by a large flat belt from the engine.

The driving sprocket pinion has its hub split on opposite sides, and is clamped to the shaft over a key. The key is drilled and tapped to receive a bolt for pulling it out.

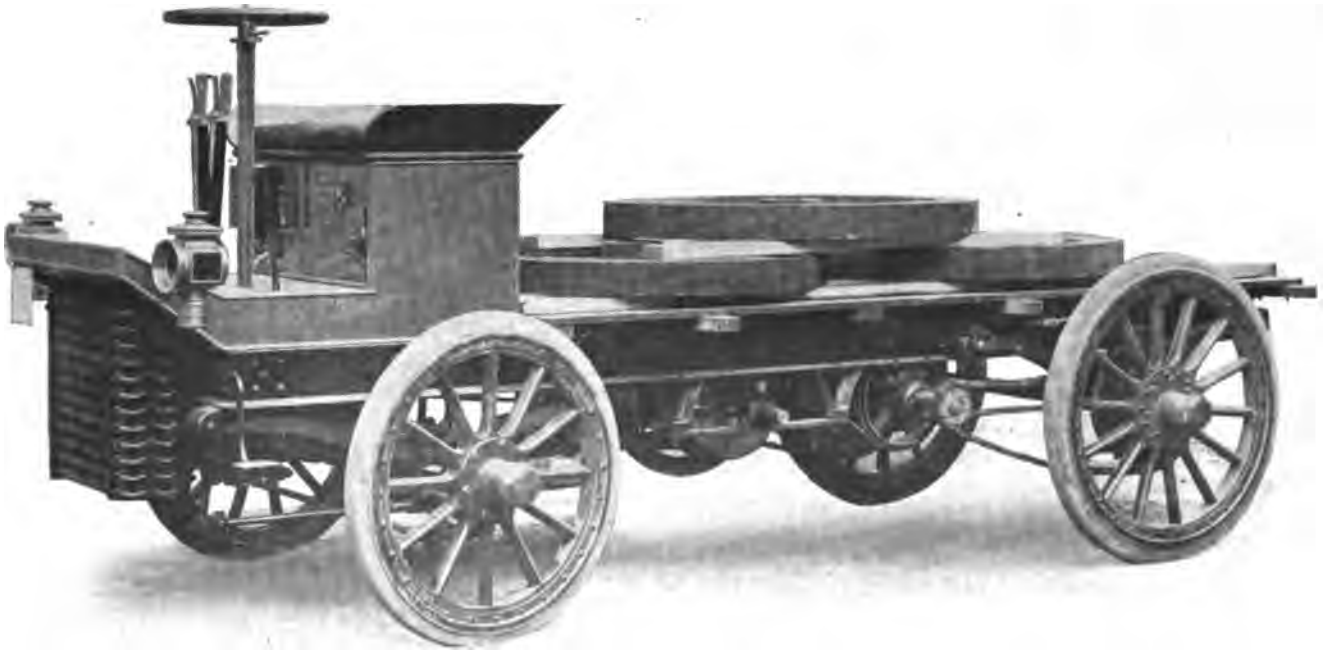
The 40 horse power chassis has a wheel base of 112 inches and weighs 2,600 pounds, while the 60 horse power chassis has a wheel base of 118 inches and weighs 2,800 pounds.

The Eureka Motor Truck.

We are showing herewith some illustrations of a gasoline motor truck built by C. H. Nadig & Bro., of Allentown, Pa., and which will be manufactured by the Eureka Motor Car Company of the same city. The truck is fitted with a double opposed cylinder motor of 5¼ inches bore by 5 inches stroke, rated at 18 horse power. The ignition is by means of a jump spark, which is produced by two coils from current furnished by a Witherbee storage battery. A supply of 18 gallons of gasoline is carried in a tank under the driver's seat, from where it flows by gravity to a Holley carburetor connected to the inlet valves of the two cylinders. The cooling water is circulated by means of a geared centrifugal pump, through the jackets, a large tubular radiator in front under the toeboard, and a 5 gallon tank under the rear of the truck platform. The motor is lubricated by a force feed oiler, with sight feeds on the front board of the driver's seat.

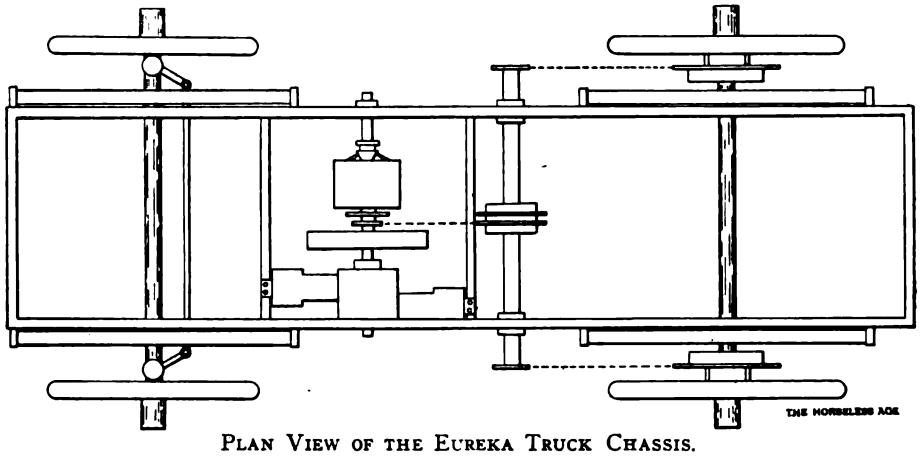
The engine shaft extends across the car and carries a two speed forward and reverse planetary gear, from which the power is transmitted by chain to a countershaft carrying the differential, and from this countershaft the power is transmitted by side chains to the rear wheels. The motor and change gear are hung from the main channel iron frame of the truck by means of four hangers, and by taking out four bolts these parts can be let right down on to the ground. The countershaft is hung in a similar manner and is, therefore, also readily removable.

The frame is constructed of 6 inch channel iron and is supported on the axles



THE EUREKA 3,000 POUNDS GASOLINE TRUCK.

by long, heavy truck springs. The axles are Timken roller bearing truck axles, and the wheels are of the regular artillery type, 36 inches in front and 40 inches in the rear, with 3½ inch solid rubber tires. The car has a wheel base of 9 feet and the regular



PLAN VIEW OF THE EUREKA TRUCK CHASSIS.

standard tread of 56 inches. It is adapted to take any kind of body, either open or closed. The steering is through a vertical column with a wheel on top and a worm and sector of Parsons manganese bronze at the bottom. On the steering post, directly underneath the wheels, are mounted the spark and throttle levers for the control of the engine speed. The change speed gear is controlled by means of one hand lever and one pedal, the hand lever giving the two forward speeds and the pedal the reverse. The car is fitted with double rear wheel hub brakes, actuated by a hand lever and with a countershaft brake actuated by a pedal.

The weight of the car complete is slightly over 3,000 pounds, and it is designed to carry a useful weight of about the same amount. We are told that the truck has shown a speed of 15 m. p. h. on a level road with a load of 3,800 pounds.

Kansas City Six Cylinder Car.

The Kansas City Motor Car Company have added to their line a car with a six cylinder motor of 5⅛ inches bore by 5 inches stroke, rated at 75 horse power. The car is claimed to be the highest powered on the American market, and has a seating capacity of seven passengers. The crank shaft has its cranks set at 120 degrees. The crank case, as well as the change gear case, is made of aluminum, and all bearings are bronze bushed and babbitt lined. The motor has individual cylinders, is water cooled and provided with a flywheel fan and a fan back of the radiator. A Schebler carburetor is fitted and the sparking system comprises a sextuple Splitdorf spark coil, a La Coste commutator, Deplex spark plug attachment, and a direct current dynamo and a storage battery. The inlet valves of the motor are automatic, while the exhaust valves are mechanically operated.

The car has a wheel base of 120 inches and is mounted on 36 inch wheels with 4 inch front tires and 4½ inch rear tires. The frame of the car is of pressed steel and is carried on platform springs. The car is fitted with the Kansas City Motor Car Company's improved four arm clutch, and with a selective type change speed gear, giving three forward speeds and one reverse. The drive to the rear wheels is by side chains. All the gears of the transmission are of steel and case hardened. Engine lubrication is effected by means of a Hancock valveless oiler. The car is sold with a complete equipment, including top, odometer, and extra tonneau seats.

The Adwear Tire Sleeves.

Tire sleeves for protecting portions of tire covers that have been cut or otherwise injured have so far mostly been made either of rawhide or rubber. The Adwear tire sleeve, made by the Adwear Auto Tire Sleeve Company, of North Attleboro, Mass., has the distinction that it is made of chrome-tanned leather, the same material out of which non-skid covers are usually made. This leather is tough and pliable, waterproof, and does not shrink or harden under any weather conditions. At the tread the sleeve is reinforced by an extra thickness of leather and studded with rivets with broad steel burrs. Along the inner edge of the leather sleeve are two rows of patent double clutch steel hooks and the sleeve is laced on with chrome leather. When laced over the injured part the smooth side of the sleeve hugs the tire closely and smoothly, fitting snugly against the rim. These sleeves are made in a variety of widths to fit any make of tire. It is important that the width of the sleeve correspond exactly to the width of the tire that there may be no overlapping of the rim, if too wide, or an opening left for rim-cut if too narrow.

An Agricultural Motor Truck.

The Farmers Automobile Company has been organized at Kansas City, Mo., for the manufacture of an agricultural motor truck for use on large farms and ranches. The engine will be of the four cylinder, 75 horse power type. The length of the truck will be 18 feet and it will weigh over 5 tons. The wheels will have wide tires and resemble those used on traction engines. It is said that it will cost about $5,000.

It is planned to build a vehicle that will go anywhere on a farm and do the work of several horses, such as hauling gang plows and heavy wagons containing farm produce. The officers of the company are: President, F. Burleigh Johnson; vice president, W. H. Caps, of the Kansas City Motor Company; treasurer, Rhine Caps; secretary, W. A. Ellis; sales manager, F. R. Dresback; assistant sales agent, W. A. Wheelock.

The 1906 De Luxe Ignition Plug.

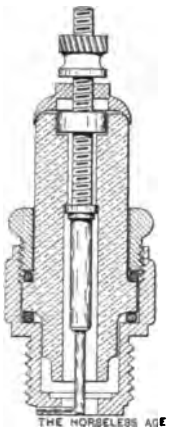
The 1906 De Luxe ignition plug, manufactured by the De Luxe Manufacturing Company, 1513 Seneca street, Buffalo, N. Y., is claimed to be soot, oil, short circuit and fool proof, and to have the advantage of heating up and cooling off gradually, thereby reducing to a minimum the break-



KANSAS CITY SIX CYLINDER CAR.

ıge of porcelains. The plug is easily as-ıembled or taken apart, and the use of cop-ɔer asbestos gaskets prevents the asbestos :ord sticking to the threads.

We are informed that the porcelain ısed in the construction of the De Luxe ɔlug is made of imported clay, from which ıll metallic and foreign substances have



THE DE LUXE PLUG.

been removed. Its grain is very dense, and it is baked at a temperature of 2,700 degrees Fahrenheit. It is asserted that this porcelain may be heated red hot and plunged into cold water without breaking or injuring its glaze. It stands a high tension current resistance of between 125,000 and 150,000 volts before puncturing, it is claimed.

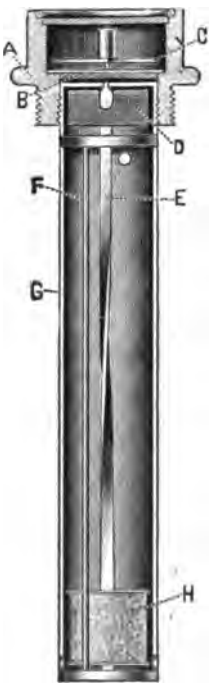
The porcelain core is three-quarters of an inch in diameter at its upper end and 1 1-16 inches at its packing shoulder, and affords a large insulating surface. An air gap runs upward 1½ inches into the core piece, and gives a free circulation of air or gases around the central electrode, preventing it from overheating, short circuiting and cross firing. The wall of the porcelain core is from one-quarter to three eighths of an inch thick. The core does not touch any of the heated metal parts of the plug, but is kept at a distance from the plug shell, with a circulation of air at all points. It is packed with two specially designed copper asbestos gaskets, that do not stick in the threads, and which serve to take up the difference in the expansion and contraction of the porcelain and the steel shell.

The central electrode cannot loosen, owing to the use of an internal imbedded lock nut, to bind the electrode centrally and hold it in alignment with the other electrode. The outer or upper lock nut does not come in contact with the lower nut, but binds on the outer surface of the porcelain core. This construction ensures the retention in its position of the central electrode, even if the upper nut becomes loose, as sometimes happens when wires must be removed.

The screw thread is tapered and cut with a shoulder above the threads to guard against leakage, resulting from broken or stripped threads in the cylinder head, or its being tapped too large. The sparking points are made of a special platinum composition, drawn into .072 inch diameter wire, and claimed to possess a great degree of harness. The fusing point is said to be about 2,600 degrees Fahrenheit.

The Bi-Magnet Liquid Indicator.

The Bi-Magnet liquid indicator, manufactured by Janney, Steinmetz & Co., of Philadelphia, is a device for indicating at a glance the amount of liquid in the tank, and has been applied specially to automobile gasoline tanks. It consists of a brass tube which is immersed in the liquid and filled by it; its upper end is screwed into a top, which is fastened to the tank and which contains a graduated dial and an indicating needle. The dial is marked "Empty," "One-Quarter," "One-Half," "Three-Quarters" and "Full." The dial is covered with a glass plate and is made dust and moisture proof by means of a rubber gasket. Just below the dial is a magnet D. (See cut.) Rigidly fastened to the bottom of this magnet and extending to the bottom of the tube is a spiral rod E, upon



BI-MAGNETIC INDICATOR.

which slides a cork H, which is entirely encased in copper and prevented from turning by a lug on its side which fits into the groove F in the side of the brass tube. As the level of the liquid rises the float rises with it, and as it is prevented from turning it rotates the magnet D. Just above the magnet D, over the dial, is a magnetic needle which follows the motion of the permanent magnet beneath it. The copper covered cork float is claimed to be very substantially made, the metal shell being applied by electroplating, and therefore without joints of any kind.

Padgett's Wheel Rim.

A new detachable rim to facilitate the removal of clincher tires has been placed on



PADGETT'S WHEEL RIM.

the market by J. M. Padgett, of Topeka, Kans., a photograph of which is herewith shown. This style of rim can be put on any wheel which uses standard clincher rims without changing anything. It consists of a band of steel which is curved outward, upward and inward, forming a suitable shape to engage the bead of a clincher tire, and is provided with two holes or recesses and a spring and pin. A concave split ring is shaped to encircle the concave side of the first band and to engage the opposite bead of the tire. In one end of this ring is a hole which comes over the pin and spring of the first band so that the point of the pin enters the hole and retains the ring. To remove a tire it is first deflated and pushed toward the centre of the rim, so that the point of the pin may be forced down against the end of the spring until the flange is free, when it can be lifted out of the concave in the band and removed, so that the tire can now be slipped off by hand. The claims made for this rim are that it is simple, inexpensive and has no turnbuckles or narrow channels to corrode or rust, and that it can be applied to any standard wheel.

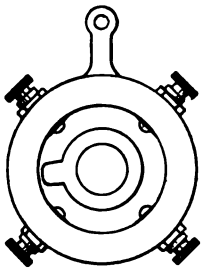
The Providence Spark Coil, Plug and Timer.

The Providence Spark Coil Company, Incorporated, 143 Summer street, Providence, R. I., have brought out a line of ignition apparatus, including a spark coil, a spark plug and a timer. We are informed that the coil is wound with silk covered copper wire on winding machines



PROVIDENCE SPARK COIL COMPANY'S PLUG.

specially designed for the work. The coil is claimed to be moisture and puncture proof, and its insulation is guaranteed to withstand the stress of 20,000 volts. By using a large number of turns in the primary winding, the current consumption is reduced to less than one-half ampere on

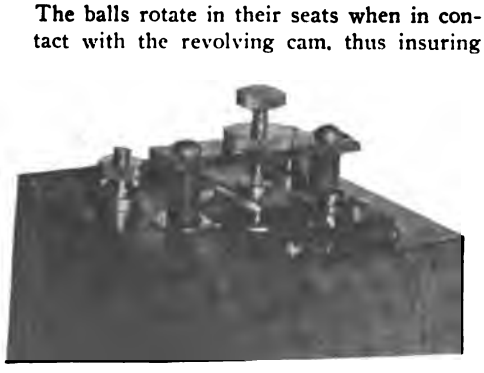


THE PROVIDENCE SPARK COIL COMPANY'S TIMER.

short circuit, and less than one-tenth ampere when the engine is running. The coil is claimed to give satisfactory results until the batteries have run down to two amperes. The vibrator arm is short and light, and has a high rate of vibration, adapting the coil for use at engine speeds up to 3,500 r. p. m. A special marine type of coil manufactured is provided with a cover over the vibrators, which renders the coil entirely moisture proof.

The spark plug of this company has an insulating tube of mica over the central electrode, and mica washers over this tube. The mica insulation is compressed under high pressure, turned down in the lathe and fitted to the metallic shell of the plug in such a manner as to obviate the need of packing. An air space around the central electrode tends to overcome trouble from short circuits owing to deposits of oil or carbon. The spark points are made of pure nickel.

The timer is of the ball contact type, a central rotating hardened tool steel cam making contact with hardened steel balls carried in sockets in the shell of the timer. The balls rotate in their seats when in contact with the revolving cam, thus insuring



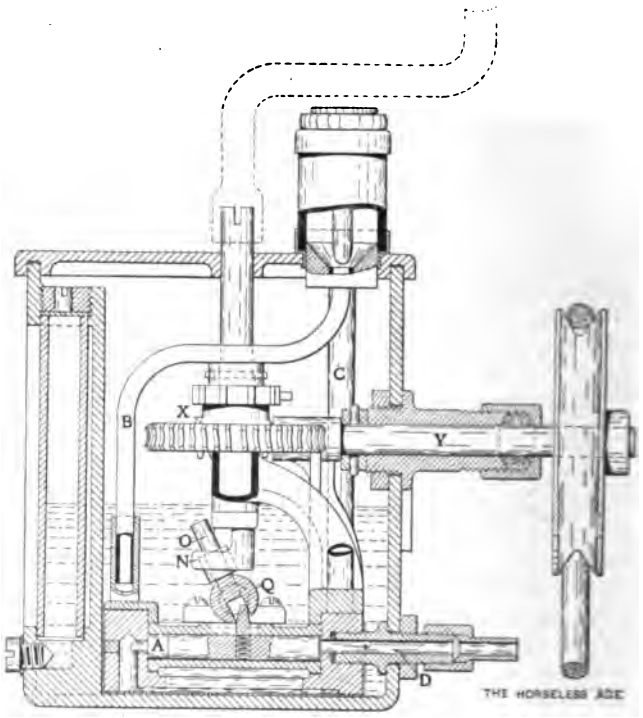
PROVIDENCE SPARK COIL COMPANY'S VIBRATOR.

a good contact and reducing wear to a minimum. The timer is entirely enclosed, and therefore protected against dust and moisture. It is intended to be placed on the end of the cam shaft, or some other shaft, and may be operated either horizontally or vertically.

The Pedersen Mechanical Oiler.

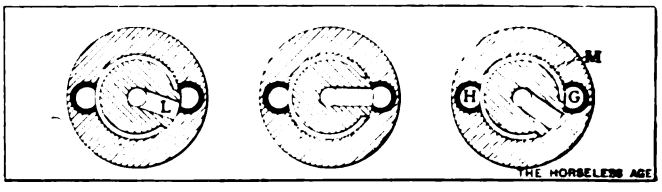
The Pedersen Manufacturing Company, of 636 First avenue, New York, have recently added to their line of gravity and pressure feed oilers a mechanical oiler which is unique on account of its lack of spring, check or poppet valves. This oiler will be known as Type X and can be supplied for belt, gear, ratchet or flexible shaft drive, as ordered.

In general appearance the oiler is very similar to their other productions, and consists of an aluminum case with sight feed glasses at the top and a gauge glass set in one side to show the oil level; the pumping mechanism is submerged in the oil at the bottom of the case. The accompanying figure shows an end view in section. The pumping mechanism consists of a bronze rack with small horizontal cylinders, with solid plungers arranged crosswise like the rungs of a ladder. This rack is a sliding fit between two metal guides in which are a series of oil ports. The rack with its pistons has a reciprocating motion, so that the oil ports are covered and uncovered at the proper time in relation to the stroke of the pistons, which is at right angles to the reciprocating motion of the rack. Oil is drawn into one end of the piston through a port A, the rack then moves lengthwise and upon the return of the piston forces oil up through a tube B into the sight feed, where it passes through a regulator, to be described later. From here the oil is drawn downward through the tube C into the opposite end of the pump, which then moves back to its original position and forces the oil out through the tube D to the engine. The sight feed has no openings of any kind into it, so that no dirt can get in and it is impossible for the oil to siphon over. By reference to the accompanying sectional drawing of the sight feed it will be seen that there are two tubes G and H, one at each side and another tube at the centre. The oil is forced up through G through the regulating plug K and is drawn down through the central tube into the pump to be delivered. This plug K, through which the oil passes, is shown separately, has a hole L which runs into its centre and then downward; it also has a groove M cut almost around its circumference, but not quite touching the hole L. When hole L is exactly opposite the opening of the tube G the oil has a free passage through the centre of the plug to the sight feed, but when the plug K is turned slightly, so that the opening of L does not exactly coincide with that of G, only part of the oil passes through the sight feed, while the rest of it flows around the groove M and empties into the tube H and passes down into the tank. When hole L does not register with G, the entire quantity of

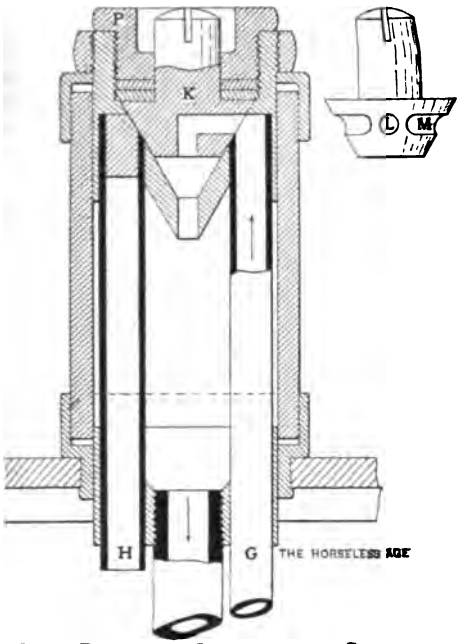


SECTIONAL VIEW OF PEDERSEN MECHANICAL OILER.

oil simply passes back into the main reservoir. This action is clearly shown in diagram form in the accompanying figure, which shows three horizontal cross sections through the plug K. In the one at the right the oil passes up through G around the groove M and down into the tank through H. In the central figure all the oil is being fed directly through the sight feed. In the left hand figure, part of the oil is passing through the hole L while another portion is being by-passed by the groove M. The plug K, as shown in the sectional view of the sight feed, is retained at any setting by means of the lock



THE PEDERSEN LUBRICATOR, SHOWING REGULATING VALVE IN DIFFERENT POSITIONS.



THE PEDERSEN LUBRICATOR. SECTION THROUGH ROTATING VALVE.

nut P, and the sight feed glass may be completely removed without disturbing the adjustment of plug K.

Motion is communicated to the oiler through the shaft Y (see end sectional view) on the end of which is a worm which drives the worm wheel X on the vertical shaft. At the lower end of this shaft is an arm N similar to a crank web with an elliptical hole through it in which is a pin O, which is rigidly connected to the centre of a steel rod Q. This rod is disposed lengthwise on top of the pump rack and is supported in trunnions at each end so that as the arm N revolves with the motion of the vertical shaft, the pin O is forced, for a part of the rotation, lengthwise of the oiler carrying Q, and the pump rack with it, and at the end of this movement it gives an oscillating motion to the rod Q, the under side of which is slotted to receive pins integral with the centre of the pump pistons, so that its oscillating motion forces the piston back and forth in their cylinders, while the longitudinal motion moves the entire set of pumps opposite their proper ports. The number of pistons varies with the number of feeds desired. The upper end of the shaft upon which is the worm wheel X projects above the top of the case and is slotted to fit a small handle, as indicated in dotted lines, which can be placed on this shaft and the oiler rotated by hand independently of the power driving mechanism.

Motor Buggy Invented.

D. G. W. Smith, of Lexington Junction, Mo., has invented a motor car which is being tested at Kansas City. It is driven by a single cylinder, 3 horse power engine, and is fitted with a driving shaft extending from the front to the rear axle, driving all four wheels, which are of the ordinary buggy type with solid tires.

The Webster Tank Gauge.

This appliance is made by the Webster Manufacturing Company, 251 Jefferson avenue, Detroit. Its object is to indicate the number of inches of gasoline in a tank, which may be read from a hand moving over a circular dial. This hand is secured to the upper end of a vertical shaft, on the lower end of which is a spur gear meshing with a crown gear secured to a horizontal shaft. A small rod about 6 inches in length is secured to this crown gear and projects radially therefrom. Upon the end of this rod is a sheet metal spherical float about five-eighths of an inch in diameter As this float rises and falls with the changes in the gasoline level it causes the hand to indicate the height of gasoline in the tank. On account of the great leverage through which the float acts there is little possibility of the gears sticking. All working parts are brass, the dial is silvered, with black figures, and covered with a glass.

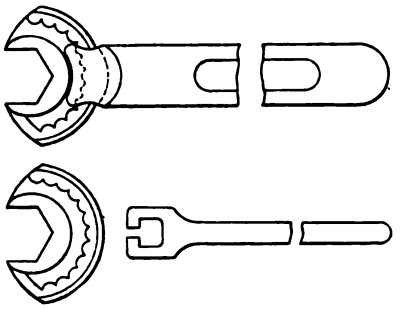
These gauges are supplied in a number of sizes to fit different heights of tanks, and each is said to be mathematically correct. The indication would only be correct, however, with the car standing on a level. It is much more convenient to manufacture gauges to read in inches than in gallons, for the latter would require numerous sizes to be anywhere near correct. because of the many different styles of tanks.

New Type of Body for Northern Runabout.

The cut herewith shows a Northern 20 horse power car with a new design of runabout body. The wheel base is 100 inches, and the mechanical features are the same as the standard car of the Northern Company. The body is certainly of attractive design, and the lines may prove suggestive to amateurs who want something out of the ordinary in the way of a body, and have one built according to their own specifications.

The Pedersen Wrench.

This wrench, the drawing of which was incorrectly placed with a description of the Bay State wrench in our issue of May 30, page 832, is the Pedersen wrench, manufactured by the J. T. Pedersen Manufacturing Company, 644 First avenue, New York. It consists of a separate head and handle, as shown in the two drawings. By means of



THE PEDERSEN WRENCH.

this wrench a nut in almost any position can be successfully gripped, as the handle can be shifted with reference to the head, through about 80 degrees, in any one of which positions it will firmly grip the head. This head has a notched rim, as shown, and the inside of the gripping portion of the handle is also notched, so that although apparently loose on the head, so that it can be shifted, it immediately binds when pressure is applied and the notches mesh. The handles are now made in one piece, but these wrenches will soon be placed on the market in a lighter form, with handles made of two pieces of pressed steel.



The Bay State ratchet and socket wrench, with bushings, described on page 832 of our issue of May 30, manufactured by the Bay State Tool Company, Worcester, Mass.



SPECIAL NORTHERN RUNABOUT.

Alcohol Fuel for Automobile Motors.*

By Karl Fehrmann.

The first practical experiments in the use of alcohol as fuel for explosion motors date back to 1894. In that year the German Agricultural Association instituted a competition for portable kerosene motors (traction engines) intended for agricultural use. In connection with this competition some trials were made with alcohol as fuel in a motor built by J. M. Grob & Co., of Leipsic, but the results were rather discouraging, as the fuel consumption was found to be .839 kilogram alcohol per horse power-hour, as compared with .462 kilogram kerosene. It was, of course, obvious that such a motor could not be used for practical purposes, because it had other and more important problems to solve which fully occupied attention. In spite of this it became possible to adapt the existing gasoline motor to the use of alcohol to such an extent that continuous operation became possible, though a few difficulties in the construction of the motors had to be contended with. I will here only briefly refer to the fact that the Experimental and Training Battery in Berlin has been using alcohol trucks continuously since 1899 and these trucks continue today to run without trouble.

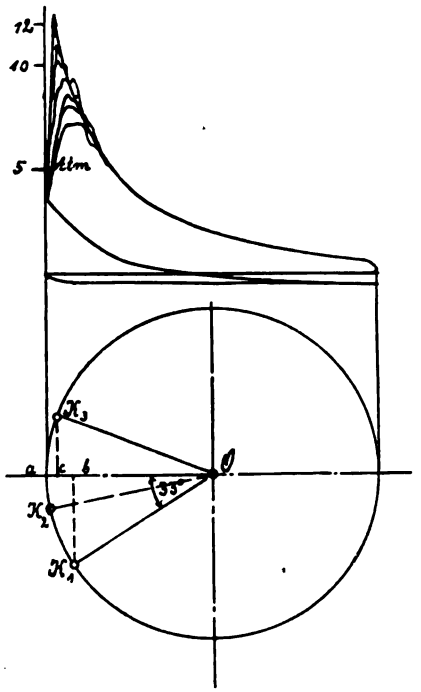


Fig. 1—Indicated h. p., 6.32; temperature of cooling water, 52° at entrance and 71.5° at exit.

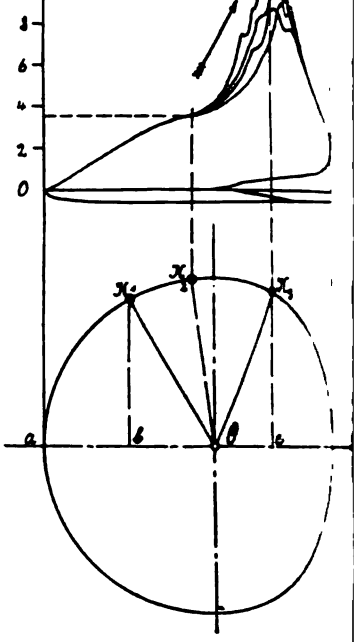


Fig. 2—Indicated h. p., 6.32; temperature of cooling water, 50° at entrance and [illegible] alcohol consumption, 565.7 g. per h. p.

* In view of the fact that a bill has been passed by Congress, removing the internal revenue tax from alcohol for commercial and industrial purposes, and a good deal of interest is being taken in this bill by automobilists for the reason that tax free alcohol may possibly prove a strong rival to gasoline as an internal combustion motor fuel, we believe that this article by Herr Fehrmann, translated from the German, will be found timely and valuable. Herr Fehrmann is chief assistant in the Laboratory of the Fermentation Industries in Berlin. The paper as here reprinted in the translation was read before the German Automobile Technical Association in Berlin on March 17, 1906, and published in the official organ of the association. It will be found that the subject has been investigated quite thoroughly, and that the results show that the prospects of alcohol supplanting gasoline as an automobile motor fuel are not nearly as rosy as is generally thought.—Ed.

subject of continued experiment, practical results were soon achieved. Already in 1897 the firm of Korting Brothers, of Hanover, had adapted its motors to the use of alcohol to such an extent that a nominal 6 horse power motor consumed only .4 kilogram alcohol per effective horse power-hour, at the rather excessive load of 9.93 horse power. The success of the Korting firm soon induced a considerable number of other manufacturers to occupy themselves with the development of the alcohol motor, and in 1901 the German Agricultural Association was justified in instituting a prize competition for alcohol traction engines, with the expectation of a fair number of entries.

The results of the competition were, indeed, quite encouraging. Aside from an obvious improvement in regard to the construction of explosive motors for traction engines generally, as compared with those in the prize competition of 1894, it was found that the alcohol consumption of most of the competing machines was quite moderate. For the normal load it was in many cases not above .4 kilogram per horse power-hour. At that time the alcohol motor could, therefore, be considered a successful competitor of gasoline and kerosene motors, as motor alcohol could be obtained at the very low price of 20-21 pfennig per kilogram.

If the results of the 1902 competition, which, in general, still apply to slow running motors, are made the basis of a comparison between alcohol and gasoline motors, it is found that the fuel consumption of equally efficient alcohol and gasoline motors is about in the proportion of 5 to 4; the alcohol motor is, therefore, able to compete with the gasoline motor as long as the price of alcohol is not more than four-fifths the price of gasoline.

As the applicability of alcohol as fuel for combustion motors is primarily determined by the cost of operation, it was proposed to extend the successful experiments made on low speed motors to high speed vehicle motors, it being well known that in the operation of motor vehicles the fuel cost is relatively a minor item, while with a slow speed motor the fuel is the most important item in the cost of operation.

Early difficulties.

However, in the first attempt to use alcohol in high speed engines, much greater difficulties were encountered, which could not be as easily overcome as those encountered with low speed motors. With the latter the use of tank cooler and of an increased compression had soon furnished the desired results, but in high speed motors mechanical reasons make it impossible to make use of these means, to the importance of which I shall return later. Besides, it should also not be lost sight of that the automobile industry went into the problem much less thoroughly, probably

Specific power.

In order to understand the [illegible] which arise in connection with [illegible] alcohol in high speed motors, [illegible] permitted to briefly outline [illegible] properties of alcohol as motor [illegible] of all, we are interested in the [illegible] can a motor operated with alcohol the same power as a gasoline [illegible]

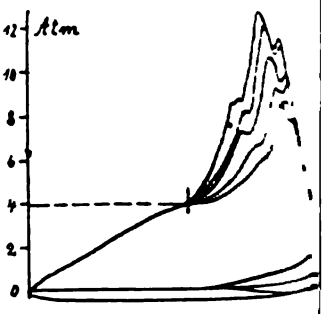


Fig. 3—Indicated h. p., [illegible] cooling water, 9.4° at entrance and [illegible] alcohol consumption, 585.8 g. per [illegible]

same construction and size? This question has often been answered in the negative, on the basis of comparative trials on one and the same motor. The actual conditions may be more closely investigated by the following reasoning: The power developed by an internal combustion motor in general evidently depends only, first, on the quantity of heat which can be supplied to the motor at each working stroke; and, second, the degree of perfection to which this quantity of heat is transformed into mechanical work. It is, therefore, first necessary to investigate whether a motor of given cylinder volume can be supplied with the same heat energy in the form of alcohol as in the form of gasoline. Let us assume we can supply a motor of 10 liter piston displacement with 10 liter air of 15° C. and 760 millimeter pressure, and succeed in completely burning in this air the maximum possible quantity of alcohol or gasoline. The quantity of heat energy supplied to the motor would then be 8.36 heat units in the case of alcohol, 8.19 heat units in the case of gasoline, and 8.60 heat units in the case of benzol.

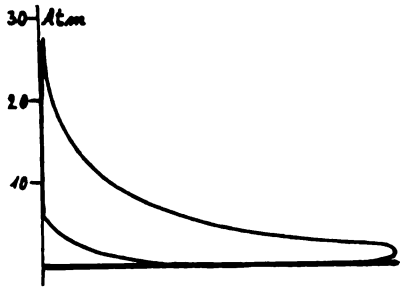


Fig. 4—Indicated h. p., 13.85.

These figures are easily obtained from the following calculation: One kilogram of motor alcohol, consisting essentially of C_2H_5OH plus denaturizing agent plus water contents, requires for complete combustion 6.616 cubic meters air; benzine (C_6H_{14}) requires 12.83 cubic meters air, and benzol (C_6H_6) requires 11.7 cubic meters air. In a cylinder of 10 liters capacity there could therefore be burned

$$\frac{10}{6.616} = 1.52 \text{ g. alcohol}$$

$$\frac{10}{12.83} = .78 \text{ g. gasoline}$$

$$\frac{10}{11.17} = .896 \text{ g. benzol}$$

If the caloric power of one kilog. alcohol is put equal to 5,500 heat units, one kilog. gasoline 10,500 heat units, and one kilog. benzol 9,600 heat units, by multiplying the quantities of fuel thus found with their calorific power the heat energy per working stroke for the different fuels is found as above.

From these figures it will be seen that in this respect there is very little difference between the three fuels, and that alcohol is not inferior to the other two with respect to the specific power of a motor employing it, as long as the thermal efficiency is the same for the three fuels. If, then, in particular cases a smaller specific power has been found where alcohol was used, the reason is to be sought in conditions which have no connection with the fuel, such as faulty construction of the motor. From this consideration little is to be expected from the addition of certain admixtures with the alcohol to increase its heating value, as the air required also increases, and in consequence the amount of fuel that can be burned in a fixed volume is decreased.

AMMONIUM NITRATE ADMIXTURE.

The only method of increasing the specific power of internal combustion engines, aside from the quality of the fuel employed, consists in supplying the oxygen in some other form than as a constituent of the atmosphere. A suggestion in this direction has been made by Dr. Roth, who adds ammonium nitrate to the alcohol. It is claimed that an addition of 8 per cent. ammonium nitrate increases the power of an alcohol motor 10 per cent. If ammonium nitrate is added to the fuel it is decomposed during the combustion and liberates a quantity of oxygen which is capable of oxidizing a certain quantity of the fuel, the same as the oxygen of the air, with the result that the heat developed during the combustion is thus increased. The decomposition of the ammonium nitrate is represented by the following equation: $NO_3NH_4 = N_2 + 2H_2O + O$.

CARBURETORS.

The reason that in the older alcohol motors the specific power was often found to be less than with gasoline motors of the same size is possibly to be found in the fact that these older motors were mostly fitted with carburetors in which the air and alcohol mixture was considerably heated before it entered the combustion chamber, with the consequent result that the weight of the mixture admitted during each power stroke was smaller than with a gasoline motor, in which the air is admitted cold. If it was desired to still obtain a fairly high specific power it was necessary to use a fairly rich mixture, but this adversely affected the thermal efficiency. Aside from this very undesirable quality, there is still another reason why the carburetor in which the mixture is preheated must be considered unsuitable for use with alcohol motors, in spite of the fact that the first real success with alcohol motors was obtained with this type of carburetor. The surface carburetor is designed to completely evaporate the alcohol so that it may be intimately mixed with the air when it arrives in the combustion chamber, and may there behave like a permanent gas. Now, it requires a comparatively large amount of heat to vaporize the alcohol in the surface carburetor, and even if one should succeed in completely vaporizing the alcohol in the carburetor there would still be danger, especially when the motor is first started and the cylinder walls are still cold, that the alcohol be partly recondensed within the combustion chamber, and the starting of the motor be thus rendered difficult. And, indeed, it is found that all alcohol motors fitted with a well developed type of surface carburetor give trouble, particularly in starting. The carburetor must be thoroughly preheated before the alcohol can be sufficiently vaporized. If it is not thus heated, the air can take up the alcohol only in the form of small liquid globules, which very readily precipitate on the walls of the carburetor, particularly if the vaporizing chamber is very large and complicated. In that case the mixture arrives in the motor very poor in combustible material, so that there can be no question of thorough and rapid combustion. All such motors require to be operated with gasoline for a considerable period at the start before alcohol can be resorted to.

SPRAY CARBURETORS BEST.

These difficulties do not exist to the same degree in the simple spraying devices which have now almost entirely taken the place of the surface carburetor. The simplest form of sprayer must be considered the best. As arranged by the Gasmotorenfabrik Deutz, the sprayer is located directly in the air tube close above the inlet valve and behind the air throttle valve. The air passes at great speed by the sprayer and becomes saturated with the injected fuel. The fuel which has once been supplied to the air is absolutely sure to get into the motor cylinder, so that the mixture can only be rendered poor by positively reducing the fuel feed.

At present it is no longer considered important that alcohol be admitted to the combustion chamber in the vaporized state, the vaporization being accomplished within the cylinder itself. This determines, however, one requirement which is most important in connection with the use of alcohol. When the alcohol vapors first strike the cold walls of the cylinder they will condense, and consequently be unavailable for combustion. If, however, the compression proceeds with sufficient rapidity, a large portion of the condensed fuel will be re-evaporated by the heat thus developed, and will be suspended in the air in the form of a fine mist. In spite of this, it is necessary also, with motors fitted with spray carburetors, to start on gasoline, for the reason that when starting by hand the motor does not turn quick enough to insure

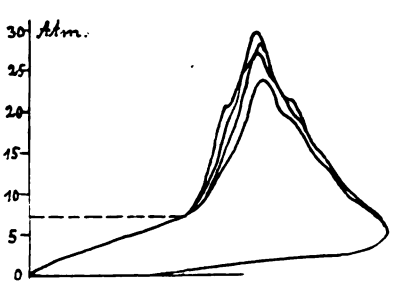


Fig. 5—Indicated h. p., 13.85; temperature of cooling water, 8.8° at entrance and 58° at exit; alcohol consumption, 513.3 g. per h. p. h.

a strong and particularly a quick compression. Besides, it is, of course, also desirable that there should be no condensation and no accumulation of the alcohol on the cold cylinder walls, but that, on the contrary, the cylinder walls should aid in the vaporization. After the motor is once in operation there is no further danger of condensation of alcohol vapors on the walls. In spite of this it has been proven by practically all tests that the most favorable results in the use of alcohol are to be obtained with high cylinder wall temperatures, although with high cylinder wall temperatures one might expect low specific power and an increased loss through the exhaust. In order to realize the important influence of the temperature of the cylinder wall and of the cooling water, it is necessary to enter into the process of combustion.

SHIFTED ENGINE DIAGRAM.

The working cycle of an explosion motor is usually represented by a diagram. The normal diagram of a four cycle motor is represented in Fig. 1. The diagram represents 12 cycles which differ from each other mainly by deviation of the ignition curve. In the diagram not all the curves have been drawn out, as this would impair the clearness. The deviations in the separate curves prove that the combustion in the motor must be quite variable. However, the differences are not very plain in the diagram, the curves all ending in a single line, while the crank shaft passes through the dead centre and travels through a considerable distance. Beneath the diagram the crank circle is drawn in, and the line O—K_1 represents the crank position at which the make and break igniter begins to operate. The radius O—K_2 represents the crank position at which the combustion is probably about completed. While, therefore, the cranks passes through the angle K_1—K_2, the piston only moves the distance *b*—*a*—*c*, which is very small compared with the distance passed through by the crank, which explains the fact that the ignition curves are so close together.

As it is of special interest to study particularly the process of combustion, the diagrams are taken shifted to an angle of 90 degrees, so that the ignition and combustion curves coincide with the maximum speed of the indicator drum. A diagram of this kind is shown in Fig. 2. In the crank circle below the diagram, O—K_2 represents the crank position at which the combustion is completed, while O—K_1 is

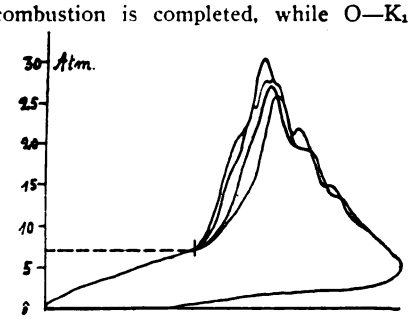


Fig. 6—Indicated h. p., 13.83; temperature of the cooling water, 44° at entrance and 69° at exit; alcohol consumption, 491.9 g. per h. p. h.

again the crank position at which the make and break ignition begins to operate. Before, however, the movable electrode inside the cylinder is separated from the insulated stationary electrode, the crank passes through the distance K_1—K_2. Only at the latter position of the crank is there an obvious rise of the ignition curve, which justifies the conclusion that combustion has begun. It will be seen that the ignition curves spread to a certain extent. The limiting and some intermediate curves have been drawn out. The diagram shows that the ignitions and combustions are not by any means identical, but are, on the contrary, very diverging. This diagram was taken on a 12 horse power Ergin motor using alcohol, at half load. The temperature of the cooling water was 50° C. where it entered the jacket and 70° C. where it left. These temperatures are comparatively low for an alcohol motor, as it is now usual to employ "vaporization cooling" so that the cylinder is constantly surrounded with boiling water.

EFFECT OF COOLING WATER TEMPERATURE.

The combustion is even more irregular if the cooling water (and, therefore, the cylinder wall) is kept at a lower temperature, as may be seen from Fig. 3, which diagram was taken on the same motor under the same conditions. The spread of the ignition curves is even larger in this case, which indicates a very irregular combustion.

At full load of the motor the combustion becomes in general more uniform, and in the ordinary diagram there is mostly almost no deviation apparent, as may be seen from Fig. 4, taken on the same motor as above when running under full load. However, the shifted diagram shows a certain deviation in the ignition, even though of less importance as at half load (Fig. 5). At full load the temperature of the cooling water has also less effect. Diagram Fig. 6 was taken on the same motor under similar conditions as Fig. 5, except with cooling water at a higher temperature, and there is hardly any apparent deviation in the ignition and combustion curves. It is to be remarked, however, that the fuel economy was found to be considerably higher when working with higher cooling water temperatures. This is also partly due to the fact that the composition of the air and fuel mixture varies with the wall temperature, and that in general a richer mixture is employed in connection with high wall temperature. Now, it would seem that the combustion should be more effective with only a small excess of air, so long as no carbon monoxide is produced during combustion, as with a large excess of air there is a greater loss through the exhaust. On the other hand, it has been shown that the losses are sometimes greater with only a small excess of air.

The difference in the fuel consumption with different cooling water temperatures in alcohol motors is also at least partly explained by the fact that in the case of low temperatures not all of the alcohol is completely burned. Thus it was shown by Dr. Mohr that in a test corresponding to diagram Fig. 2 only 44.4 heat units were lost through incomplete combustion, while in a test corresponding to Fig. 3 the loss amounted to 95.9 heat units. Similarly, in a test corresponding to Fig. 5 the loss was 80.9, and in a test corresponding to Fig. 6, 23.0 heat units.

THE COOLING PROBLEM.

Alcohol motors should, therefore, be operated at the highest possible cooling water temperature. In the case of slow speed motors this is easily accomplished by employing the evaporation cooling system, but in the case of vehicle motors difficulties are encountered in this respect, due primarily to the vertical construction of these motors, and also to the fact that a frequent renewal of the cooling water is rather bothersome. My own experience has shown, however, that the evaporation cooling system is also quite useful in connection with high speed motors, as one of

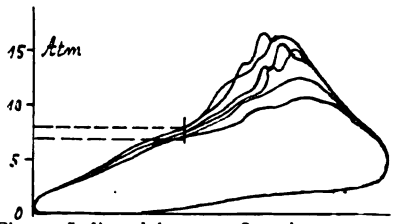


Fig. 7—Indicated h. p., 11.80; air excess, 1.32; alcohol consumption, 486.2 g. per h. p. h.

the vehicles of the Experimental and Training Brewery, the cooler of which had sprung a leak, was, upon my suggestion, fitted with a simple water reservoir which communicated with the cylinder jacket through the circulation pump. The jacket was, therefore, simply connected to a water reservoir from which the water could freely evaporate. However, in order to prevent the necessity for frequent refilling of the water tank, it will probably be necessary to dimension the coolers of alcohol motors in such a manner that evaporation of the water will be prevented, but that the temperature of the water will attain practically the boiling point. In the construction of the cylinder some thought must, of course, be given to the higher temperature at which it is to be operated.

EXCESS OF AIR.

Irregular combustion is also to be expected if the motor is operated with a large excess of air. Fig. 7 shows a diagram obtained while working with an air excess of 32 per cent.; in Fig. 8 the air excess is 21 per cent., and in Fig. 9, 6 per cent., and besides, .4 per cent. of carbon monoxide was found in the exhaust. Diagram Fig. 7 plainly shows the irregular operation of the motor. Even the compression pressure is quite variable, undoubtedly because the power developed during individual working strokes varies, and in consequence the governor which controls the quantity of mixture admitted works irregularly. In diagrams 8 and 9 there is no obvious difference. The combustion curves are quite

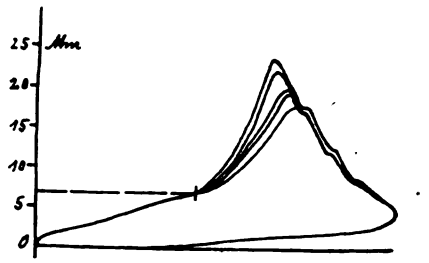


Fig. 8—Indicated h. p., 12.15; air excess, 1.21; alcohol consumption, 450 g. per h. p. h.

close together, yet the fuel consumption is considerably lower with diagram 8 than with diagram 9, which indicates a less perfect combustion in the latter case. I would, however, like to refer here to a special characteristic of alcohol, which is based on the fact that it ignites with comparative difficulty. Although in the test 9 only a very slight excess of air was employed, the generally so much dreaded violent shocks were not noticeable; on the contrary, the motor worked very quietly. One may, therefore, with an alcohol motor take advantage of the possibility of working with a relatively low excess of air without fearing too violent explosion. With other fuels, benzol for instance, this is not equally possible.

As may be seen from diagram Fig. 10, the majority of the ignition curves lie close together, although the deviations in the compression pressure indicate that a comparatively large excess of air was employed. Only a single curve rises abnormally quickly, yet the pressure even in this case did not attain a dangerous value, although it represents an explosion which produced the well known metallic ringing knock in the motor. I will, therefore, be justified in assuming that the occasional knocking in motors is determined less by the value of the maximum pressure in the cylinder than by the suddenness with which the pressure rises.

ACIDS IN EXHAUST.

As another disadvantage of the use of alcohol, it has often been asserted that in the combustion of this fuel acids are produced which attack the cylinder walls and valves with which they come in contact. These assertions have, however, not been substantiated by experience. It is quite true that in the combustion of alcohol a number of acids are produced, among which nitric and acetic acid have been definitely proven to exist. If, however, it is considered that these acids leave the motor while at the very high temperature of the exhaust gases, 400° to 500° C., it will be understood that there is no danger from these acids, as at this high temperature they can only exist in the gaseous form, and can therefore have no effect of any kind. They may possibly attack the walls of the muffler after they have cooled off, but within the cylinder and on the valve seats such an effect would seem to be excluded, and continued operations have also shown that no damage is done by the exhaust gases. Besides, it may be observed that nitric acid is also formed in explosion engines using other fuels, and I have been able to show its presence myself where benzol was used. Probably nobody has so far ascribed any injurious effect on the durability of the gasoline engine to nitric acid. In addition to the acids the exhaust gases may contain unburnt particles of alcohol or aldehyde, which, however, do not produce any annoying smell or smoke.

EFFECT ON INLET VALVES.

While the exhaust gases do not produce any injurious effect in an alcohol motor, experience has shown that the inlet passages, and particularly the inlet valves, are subject to more rapid deterioration than in a gasoline motor. Evidently this is due to the fact that the alcohol passes the inlet valves partly in the liquid form. Although the valve itself is always of such a temperature that the alcohol soon vaporizes, it is yet possible, upon the shutting down of the motor, for alcohol in the liquid form to remain in the valve for an extended period and to attack the metal. The disintegration of the metal may also, perhaps, be ascribed to the fact that the alcohol attacks the metal during its vaporization. For this reason the inlet valve on vehicle motors must be more frequently renewed. On slow speed motors there is less trouble from this source, as the greater mass of metal in the valves, in connection with the high temperature, appears to result in a more rapid vaporization of the alcohol particles. On a slow speed motor the valves may be used for a year or more, but on high speed motors they must be replaced more frequently. At present no method is known of overcoming this trouble, and it would be advisable in the design of motors to look for a material for the valves which is less sensitive to an attack of alcohol, and to make the valve seats interchangeable.

According to the experimental data at my disposal inlet valves of vehicle motors employing alcohol must be ground in about every four weeks and replaced every half year.

IMPORTANT REQUIREMENTS.

In the design of vehicle motors a maximum cylinder wall temperature should be aimed at, and a very energetic ignition, in order that a very rapid combustion may take place. I believe also I am justified in assuming that the shape of the cylinder head, so far as it affects the form of the combustion chamber, is of considerable importance, the best results being obtained if the spark is produced as near the centre of the combustion chamber as possible, and if the combustion chamber is of the greatest simplicity geometrically, so that the flame may be rapidly propagated. I am not in the position to prove this view by experimental data, but I would like to point out that of all the alcohol motors competing in the 1902 competition of the German Agricultural Association, the best results were obtained from a traction engine motor of the Durr Motor Company which was fitted with two pistons in the same cylinder, so that the compression and combustion space was exactly at the middle of the cylinder, and the combustion could be propagated from the point of ignition equally in both directions.

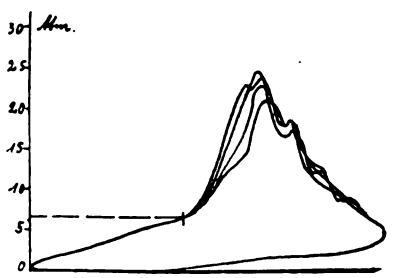


Fig. 9—Indicated h. p., 12.19; air excess, 1.06; alcohol consumption, 477.8 g. per h. p. h.; CO in the exhaust, .4 per cent.

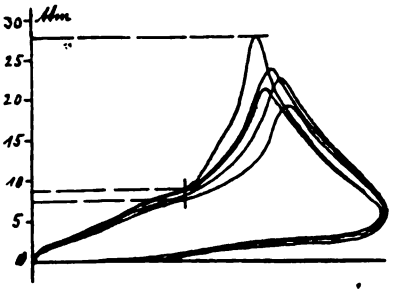


Fig. 10—Indicated h. p., 12.87; air excess, 1.56.

ADMIXTURES.

Other means for rendering alcohol suitable for use in vehicle motors consist in the admixture with the alcohol of other fuels which are calculated to overcome the difficulty of ignition. It has often been proposed to mix alcohol with other fuels of high calorific power, as, for instance, benzol or ergin, and thus to increase its heating value, and above all its inflammability. With slow speed motors, good results have been obtained in this manner, but with high speed motors new difficulties arose as a result of the impossibility of completely burning these mixtures, so that there was a great deposit of soot in consequence of the admixtures. Another method has recently been suggested by Dr. Roth, who, as already mentioned, recommends an addition of ammonium nitrate. In addition to an increased specific power, an increased inflammability and more rapid flame propagation than with pure alcohol are expected from this admixture. I am not in position at present to say what may be the permanent value of these experiments, but it is to be remembered that the addition of materials like ammonium nitrate considerably increases the cost of the fuel, the present price of ammonium nitrate being 1.40 marks per kg., while the addition of gasoline or benzol reduces the price. This circumstance is undoubtedly of the highest importance in connection with the solution

of the alcohol motor problem, for I am convinced that alcohol would already have become much more popular as a vehicle motor fuel if it were not so much more expensive than gasoline. The technical difficulties are by no means incapable of solution.

As the alcohol consumption in stationary motors is about 25 per cent. greater than the gasoline consumption, alcohol could well compete with gasoline as long as it sold at 20 to 21 marks per kg., as compared with 25 to 26 marks per 100 kg. of gasoline. At present, however, alcohol stands at 23 marks per 100 liters, equal to 28 marks per 100 kg., so that the price of gasoline must be at least 35 marks per 100 kg. if alcohol is to be able to compete.

In connection with vehicle motors the conditions for the use of alcohol are even worse, as the advantage of the alcohol motor, due to its higher compression, is not available. The only means of rendering alcohol applicable for this work is to mix it with cheap fuel of high calorific power, to reduce its price. This is quite possible, and numerous experiments have shown that the consumption of such mixtures decreases in the proportion as the fuel value of the mixture increases, a circumstance which may particularly be taken advantage of in connection with low speed motors by retaining a high compression.

COST OF ALCOHOL.

The simplest way, however, to render the alcohol motor economical would naturally be to reduce the price of alcohol itself; but it is hardly to be expected under the circumstances that such a thing will occur, for if the farmer at present sells alcohol at 23 pfennig per liter, he realizes from his potatoes, from which the alcohol is made, about 1 mark per 100 pounds, and this price hardly covers the cost of production. It is possible that the cost of alcohol might be slightly reduced by producing it in very large quantities by improved processes, but this can only be expected when once it is fairly certain that there will be a large permanent demand for alcohol. The reduction of the alcohol price to 15 pfennig per liter, a few years ago, was the result of a large overproduction, which had to be disposed of in some manner, as else the current production of alcohol had to be curtailed too much.

Finally, I would like to point out that the higher cost of alcohol fuel need not prevent its general introduction. It is the foremost aim of the automobile manufacturers to secure a very large demand for their product, and they are all striving for the general introduction of motor vehicles. If, however, automobile traffic is to continue increasing it is of the highest importance that, especially in the large cities, any annoyance due to the exhaust gases should disappear more and more. Now, it has been established beyond question that in this respect the alcohol motor is greatly superior to the gasoline motor. Even though the alcohol exhaust contains some slight residues which could still be burned, these are not of such a character as to unpleasantly affect the sense of smell and the respirative organs, while the exhaust gases of gasoline motors are certainly exceedingly unpleasant. This reason alone will force the automobile manufacturers to pay more attention to alcohol fuel, and it is my personal opinion that the future of alcohol depends mainly upon its hygienic advantages. For if automobiles should be introduced generally, the authorities would, without doubt, be obliged to insist upon compliance with all fair requirements tending to insure the salubrity of the public highways.



FIVE PACKARD 1½ TON TRUCKS OF ADAMS EXPRESS COMPANY, NEW YORK.

Report That Adams Express Company Will Sell Their Electrics.

It is reported on what appears to be good authority that the Adams Express Company have been making systematic efforts to dispose of their electric delivery wagons in New York, Rochester, Buffalo and other cities, in order to substitute gasoline cars of a uniform pattern as fast as the electrics can be disposed of. It is said that their attempts to interest prospective buyers thus far have not met with success, and that they have been abandoned for the time being because they could not obtain what they regarded as reasonable prices.

They are now experimenting in New York with five Packard gasoline delivery wagons, illustrated herewith, besides two imported types which they procured a year ago.

Chief Engineer J. A. Wells, Jr., of the company, stated to THE HORSELESS AGE that they were not ready to make any statement regarding the results of their experiments with motor vehicles, as they do not regard their data as complete. The company felt that the manufacturers were avoiding their duty in not making these experiments themselves, instead of leaving this important work to the users. Regarding the report that the company were endeavoring to dispose of their electric delivery wagons Mr. Wells smilingly declined to make any statement.

It is understood from other sources, however, that the company's experience with electric delivery wagons has been similar to that of most other concerns; that they have been found unreliable, and that they had to be towed to the garage all too often. From the same source it is understood that the gasoline trucks are giving much better results.

May Purchase the Flint Brass Plant.

A Detroit brass manufacturing company is negotiating for the purchase of the plant of the Auto Brass and Aluminum Company, of Flint, Mich., which went into the hands of a receiver some time ago and was later turned over to a trustee for the creditors. The bankruptcy proceedings finally culminated in the sale of the plant to C. J. O'Hara, of Detroit, but the deal could not be consummated because an appeal is pending in the United States Court of Appeals at Cincinnati to determine the equity of the creditors in the machinery of the plant.

Within the past week, however, arrangements have been made whereby Mr. O'Hara is to buy the equity of the creditors or give a bond to protect their interest in the event of the sale of the plant, and he will submit a proposition for the purchase of the equity of the creditors in the machinery to Referee in Bankruptcy Joslin in a few days.

In case the plant is sold to Detroit men, it is understood that the purchasers will transfer their Detroit business to Flint.

COMMUNICATIONS.

The Prejudice Against Motoring.

Editor HORSELESS AGE:

The prejudice against the automobile, which manifests itself in unwarranted arrests for fast driving and the arbitrary imposition of inequitable fines by petty justices in country towns, is simply a symptom of what I call the "knockers' plague"—a disease which breaks out whenever anything of value is first introduced to the public. It is the history of most innovations. The more a new idea appeals to the general public, the greater the opposition of a small minority.

I don't mean to say that the fight against reckless driving is not directed against a real evil that needs suppression. Overspeeding and careless driving by irresponsible and incompetent chauffeurs are dangers that must be kept in check, and should be discouraged by all who have regard for public safety and the development of the automobile. But because some of us violate the ordinances whenever the opportunity presents itself, and most of us succumb to the temptation to do so part of the time, is no reason why those who keep within bounds should be made to suffer, nor is it sufficient reason for encouraging the knockers in their overzealous efforts to kill a good thing.

Many claim that the prejudice against motor cars is growing in the country districts, but I do not believe that there is a popular prejudice against the auto car. On the contrary, I believe it is a general favorite, even among those who cannot afford to own one. But there are two classes of enemies who have joined issues against us; first, those whose business interests have been or may be adversely affected by the development of the automobile business, and second, the habitual kickers, who, having neither directly nor indirectly suffered injury through reckless driving, yet feel themselves aggrieved and denounce motoring on general principles. It is the influence of these people brought to bear upon local authorities that gives rise to all the clamoring for stricter regulations, lower speed limits, and heavier fines.

Now, reckless driving is admittedly wrong, and should be stopped. We all know that if daredevil drivers were given a free rein to go as they pleased there would be an end to the evil soon enough, for one-half of them would quickly be dead or maimed for life, and the other half, tamed by sorry experience, would set excellent examples for the younger generation of drivers. From this point of view it is obvious that the speeding evil, if left severely alone, would naturally wear itself out. But as it is a dangerous practice that cannot be permitted to take its natural course, it is quite right to impose reasonable checks and restraints from the beginning.

Hence it appears that the "knockers" are doing what is essentially a good work, but like many other good things, this may be overdone, and this is the case to such an extent in some localities that these fault finders need supervision to keep them from exceeding the common sense limit.

When the inevitable comes to pass (that is, when the novelty of motoring has worn off) and the dangers of fast driving are more fully realized, and when the growing popularity of automobiles shall have convinced the fault finders that their object is hopeless of attainment, all this agitation will vanish, and most of the present legislation, relating to automobiles in particular, will become a dead letter.

Meantime, the best course to pursue is to go slow and observe the commandments, until such time as the public shall have learned to look out for the motor cars just as they have learned to look out for the railroad trains. BUFFALO.

Lift of Valves.

Editor HORSELESS AGE:

Will you kindly explain in your columns how to figure the velocity of the gases passing through the valves of a gasoline engine? In the article on cams in THE HORSELESS AGE of March 21, 1906, the writer explained how to figure the area of the valve opening for a given lift, but as there is a full opening of the valve during only a small part of the intake stroke, it is not clear how to get at the mean opening.

Also, in figuring the amount of gas drawn into or expelled from the cylinder, please explain whether to include the clearance space each stroke or merely to use the piston displacement. As the entire cylinder, including the clearance space, is supposed to be filled by the incoming charge, it seems correct to include the clearance space in the volume for each charge. Yet there is not that much gas expelled on the exhaust stroke. There would be a vacuum in the clearance space. Please make this point clear.

In the article referred to, the writer gave the formula $\frac{\sqrt{NL}}{132}$ for the inlet lift, and then repeated it for exhaust lift. Is that correct? E. L. T.

[In calculating the velocity of the gas in the inlet and outlet ports the valves are considered to be fully open during one whole stroke. The simplest way is to first find the linear speed of the piston in feet per minute. This is, of course, equal to the stroke in inches times the number of revolutions per minute, times two, divided by twelve. Now multiply the piston speed by the area of the valve opening and divide by the piston head area, and the result is the velocity of the gases through the valve opening. It is obvious that as the same volume of gas that is displaced by the piston passes out through the exhaust valve, the piston speed and speed of exhaust gases in the valve opening bear to each other the same ratio as the valve opening area bears to the piston head area. In calculating the velocity of gases through the valves, a volume equal to the piston displacement only is figured with, as a volume equal to the clearance remains in the cylinder after each cycle and the clearance does not require to be filled again.

The lift for inlet and exhaust valves is the same in most engines, and the same formula may therefore be correct for both types of valves.—ED.]

A Last Word from "Kicker."

Editor HORSELESS AGE:

I read in your issue of May 16 the article of Mr. Williams, and beg leave to make a suggestion to Mr. Williams and Mr. Pembroke, as follows: It's no use to prolong the controversy, because "A man convinced against his will is of the same opinion still." Enough incontrovertible evidence has been presented now to convince any reasonable, well balanced mind that the water cooled gasoline car is superior to any other type. I met a man yesterday who is a steam engineer, and we discussed all these points. He said to me: "I own a steam car because I like steam, because I am a steam engineer; but, candidly, I recommend my friends who ask me to buy a gasoline car, because of its greater simplicity and better adaptation to the needs of nine-tenths of all users."

You can't make some men wise, and it is no use to try, and as one instance out of a dozen in my experience as a salesman and mechanic, I will cite the case of a young man who asked my opinion. I advised him to buy a good water cooled car and not to buy any until he could buy a really good one; that the cheapest good car that I could recommend was $2,500. Yet he went right off and bought a dinky, oil cooled car at $1,800, light, flimsy and cheap. He drove the car four months, and today it is a pile of scrap, and for sale at about $300. I had a very similar experience with a man with a steam car, and he only got wise when last winter he had to put up over $350 for a new boiler and parts, and now that car is for sale.

I have proven to buyers that one must pay a fair price for a good, strong, durable car of the best material, design and workmanship; that it can't be made right for less.

There would be buyers for cars that are one inextricable mass of complications, so I say to all my good friends, let us quit; let these fellows buy trouble if they want to and let them play with their purchase, if they enjoy the strenuous exercise. There are a few who won't listen to logic, demonstration, proven fact, real results, nor even to sarcasm, so let them alone.

KICKER.

plug in my engine. After disconnecting the wire I laid the end on the body of the car. This secondary wire has a spark gap in it midway of its length. I happened to turn on the switch before the wire was connected to the plug and still lying on the body, and was surprised to see a faint spark at the gap. Search for crossed wires or broken insulation proved futile, so I started at the coil to work it out. After disconnecting all wires to the engine and commutator, I placed the spark gap on the rubber mat, connected one side to the secondary post of the coil, the other side of the gap being wireless. Connecting the battery directly to the coil showed a faint spark at the gap. Now, I would like to know how a spark can jump a gap with only one side connected to the coil? Also if all coils show a spark under these circumstances, or if it denotes that this coil is out of order? FRED LOCKWOOD.

[The effect is of an electrostatic nature, and it does not indicate that there is anything wrong with the coil; in fact, it is exactly what would be expected to happen. When the battery is connected to the coil primary, and the current in the primary rises or falls, the potential in the secondary winding is disturbed, being either raised or lowered. In other words, an electrostatic charge is induced in the secondary winding which forms an electrostatic conductor. That part of the secondary connector beyond the spark gap, being disconnected electrically from the secondary winding, remains at its original potential until the difference of potential at the points of the spark gap becomes sufficiently high to break down the resistance of the air gap. Then a spark passes, and the potential af the whole secondary system is equalized.—ED.]

An Official Horse Power Test.

Editor HORSELESS AGE:

A few interested people have contradicted the claims of horse power obtained from the six cylinder Napier engines of 301 cubic inches capacity.

A daring gentleman, evidently without knowledge on this subject, boldly rushed into the breach and made a challenge that he would pay a large sum of money if a Faraday House test was made of the standard 4x4 inch six cylinder engine, and if on this test it would give 40 horse power for two consecutive hours. Up to the time of writing this gentleman has not been so anxious to pay his forfeit as he was to make the challenge, but I inclose you a copy of the actual certificate given by the Electrical Standardizing, Testing and Training Institution of Faraday House, Southampton row, London.

S. F. EDGE.

(Inclosure.)

REPORT UPON NAPIER PETROL ENGINE TESTED AT ACTON, MAY 10, 1906.

accordance with your instructions, we six cylinders 4 inches diameter, the stroke being 4 inches. It was direct coupled to a brake drum and the following test carried out:

The engine was run for 26 minutes while the apparatus was being adjusted, and after a stop of a few minutes the test was started, and continued for two hours four minutes. The average load throughout this period was 43 b. h. p., the maximum load being 45.8 b. h. p. and the minimum 42 b. h. p.

After this test was completed a test was made to ascertain the maximum load the engine could maintain. Over a run of 10 minutes' duration an average load of 47 b. h. p. was maintained, the maximum reading being 48.3 b. h. p. and the minimum reading 45.9 b. h. p.

No allowance has been made for the power consumed by the friction on the bearings of the brake drum.

(Signed) HUGH ERAT HARRISON,
Principal.

Automobile Axles.

Editor HORSELESS AGE:

The writer has noted with interest in THE HORSELESS AGE of May 23 your editorial entitled "Solid Tires and Crystallization of Axles." While you forcibly present the disadvantages of using steel axles you do not suggest a remedy. If steel axles are a source of danger to the owner of an automobile why not entirely dispense with them, especially as a better substitute can be found?

I refer to Parsons' manganese bronze axles, which are as strong as steel and do not crystallize. Thousands of these axles are in daily use, and during a period extending over three years not one, so far, has ever broken. A number of cars in which these axles have been fitted have been in collisions in which all parts of the cars have been broken up with the exception of the axles. These latter have sometimes been bent, but, as stated above, none have as yet been broken.

The more wideawake and progressive of the automobile manufacturers have recognized the advantage of doing away with steel axles entirely, but they naturally do not advertise to their competitors the advantages which they have found in the use of Parsons' manganese bronze axles.

W. P. SMITH,

[In the case referred to in our editorial it was the steering knuckles that broke, not the axle, and steering knuckles are not yet made of bronze, we believe.—ED.]

Irregularity of Air Cooled Motors at Low Speeds.

Editor HORSELESS AGE:

Can you tell me the cause of my engine running unevenly and jerky at slow speed? I have a four cylinder, air cooled car, which runs fine when the throttle is open, yet the moment the throttle is opened the motor speeds up instantly, all the cylinder seeming to take hold. The car runs to run the worst on the level and down a slight grade, while going up grade with open throttle she pulls very evenly. A prefer to drive slowly this is very annoying. READER.

[We have recently heard from a number of owners of air cooled cars complaining that the motors did not fire evenly when throttled down considerably, and it would seem from this that unsteady running at low speed is one of the weaknesses of air cooled motors in general. We are unable, however, to assign any theoretical reason why air cooled motors should not run as well on small throttle as water cooled motors, and solicit the opinion of our readers on this subject.—ED.]

A Hoodooed Auto.

Editor HORSELESS AGE:

Some time since I noticed an article in reference to a large motor car, turned out by a prominent manufacturer, which seemed to be quite stubborn or unruly, and after examination it was found to be No. 13; the article also stated that the manufacturers were willing to sell it at almost any price to get rid of it.

Can you ascertain the name and address of the manufacturers for me?

W. L.

[Our correspondent has evidently struck a newspaper yarn for a report of an actual occurrence. That a gasoline car bearing the number 13 should develop traits of stubbornness is not impossible, but we do not believe that automobile men are so superstitious as to ascribe the cause to the number the car bears.—ED.]

Coasting on the Low Gear.

Editor HORSELESS AGE:

Will you kindly advise whether a car using a planetary gear can be run down a steep grade with the low speed clutch engaged, without putting an excessive strain on the transmission. This method of running down hill is practiced by some drivers to save wear on the brake band.

GEO. W. LEE.

[There is no objection to coasting down hill on the low gear, with a planetary transmission, provided this gear is not thrown in suddenly when the car has attained considerable speed.—ED.]

The German Automobile Association, which is an organization of automobile clubs and corresponds to the A. A. A., according to a vote of its members, has dissolved, and a new organization, with somewhat different constitution, has been formed, a meeting for this purpose having been called to be held at Frankfort on Main on June 5.

LEGISLATIVE and LEGAL

The Legal Aspect of Touring.

By Xenophon P. Huddy, LL. B.

Those who contemplate automobile tours through the various States, in preparing for their tours necessarily have to spend considerable time in preliminary matters, such, for example, as tuning up the machine, providing supplies, extra tires, investigating to some extent, at least, the roads leading to places to be visited, and other matters of detail, but among the most important subjects to which the touring motorist must give his attention is the legal side of his journey. It is quite as necessary for the automobilist to equip himself with the legal information involved in touring as it is for him to be supplied with extra parts of machinery or additional tires for use in emergencies. In fact, if the automobilist has not the proper legal equipment for his journey when he contemplates passing through several States, he is in almost as bad a condition as if a part of the auto mechanism should become damaged to such an extent as to impede its progress.

According to the laws of various States an automobile cannot be driven on the highways without compliance with the statutory provisions. The machine cannot be operated unless the law is obeyed, and although a non-compliance with the law ordinarily involves but little inconvenience, consisting of a fine of a few dollars, or in aggravated cases possibly imprisonment, nevertheless all motorists who claim respect as law abiding citizens are under not only a legal but a moral duty to conform to the law's commands.

What should the automobilist's legal equipment be? This depends, of course, upon where he intends to go. If his tour runs through only two States, then his legal equipment is small, and he needs only to supply himself with the necessities which the laws of the two States demand. However, if the tourist contemplates passing through a large number of the States, then there is a necessity for a much more extensive legal equipment.

The term legal equipment here is used to denote those things which the laws of the States demand from automobilists: Registration, licenses, display of numbers, signals, lamps, brakes and knowledge of the express statutory provisions concerning speed, meeting and passing vehicles drawn by animals, and other rules of the road.

The most necessary requirement for the automobilist to know is whether he may drive into or through a particular State without registering and taking out another license. Some of the States of the Union have provided that non-resident motorists who have complied with the law of their own jurisdiction may come into the State and operate their automobiles without taking out additional licenses, but in many other States non-residents are required to register and take out a license the same as resident automobilists. So it will be seen that it is a very essential part of the tourist's equipment to know in what States he must register and be licensed and to comply with the laws of those States.

Where the law of a particular State provides that all who desire to operate motor vehicles in the State must comply with the statutory provisions covering registration by automobilists, and the licensing of owners or operators, it must be remembered that a non-resident motorist has no right to cross the State's border, even for a very short time, without complying with the law. The question may be asked: "Does the law require me to register and take out a license if I only drive into the State a short distance and return immediately?" Yes, you must register and become licensed, even though you remain in the State temporarily. This seems to be a hard rule, but it is nevertheless the law.

Right at this point of the discussion it is appropriate to mention the legal aspect of touring from the standpoint of interstate commerce. We are all aware of the fact that interstate commerce is within the exclusive jurisdiction of the United States Government. Interstate touring in an automobile constitutes interstate commerce, and there can be little doubt as to the Federal Government's power to supervise automobiling through the various States. Of the extent of this power there may be some doubt. It is certain that no action of the general Government can take away from the States the power to enact police regulations similar to the automobile laws, but it would seem that Congressional action might be authorized and advisable in reference to some phases of interstate motoring.

The displayment of registration numbers is a matter to be carefully cared for by the tourist. If the law of the State provides that only the State number of that particular State shall be displayed on the automobile, then all other State numbers must be removed upon entering the jurisdiction. This must be done at once.

Registering, obtaining licenses, procuring numbers and number plates, all should be provided for before the tour is commenced. It would be a great convenience to automobilists if there could be appointed to the various States agents representing the State registration and licensing authorities for the purpose of furnishing tourists with proper State credentials anywhere in the United States. Why not have foreign State motor vehicle commissioners?

RIGHT OF NON-RESIDENTS TO ENTER VARIOUS STATES.

Below will be found a list of the States which have enacted automobile laws, together with the information whether non-residents are or are not exempt from registering and taking out licenses:

Alabama—Not exempt.
California—Exempt.
Connecticut—Exempt fifteen days, unless convicted of violation of speed law.
Delaware—Exempt forty-eight hours.
District of Columbia—Exempt sixty days, but must register description and designation numbers of automobile, their temporary address and home address with secretary of Auto Board.
Florida—Not exempt.
Iowa—Exempt.
Kentucky—Exempt.
Maine—Exempt if machine is driven by licensed operator.
Maryland—Not exempt, excepting District of Columbia.
Massachusetts—Exempt fifteen days.
Michigan—Exempt if home State extends similar privilege to non-residents.
Missouri—Not exempt.
Nebraska—Exempt.
New Hampshire—Exempt.
New Jersey—Not exempt.
New York—Exempt.
Ohio—Exempt under 1906 law, which, however, is not being enforced.
Oregon—Exempt.
Pennsylvania—Not exempt.
Rhode Island—Exempt.
South Dakota—Exempt.
Tennessee—Not exempt.
Vermont—Exempt.
**Virginia*—Not exempt.
Washington—Exempt.
West Virginia—Not exempt.
Wisconsin—Exempt if home State requires similar registration and have complied.

In the States which have not enacted automobile legislation, non-residents are of course exempt.

Six Counties in Virginia Adopt the New Law.

Richmond, Va.—The Virginia automobile law passed by the recent Legislature has already been adopted by six counties, and the Secretary of the Commonwealth has been notified to this effect. It is provided in the law that it shall not become operative in any given locality until the councils of such towns or the supervisors of such counties shall have formally adopted it. The action of these counties, however, is regarded by the Secretary as premature, inasmuch as the law itself does not become effective until June 13. He does not think the supervisors can adopt it until after that date. He has accordingly notified the supervisors to check their zeal until the date specified.

Under the law it shall be the duty of the owner or driver of every machine run upon any turnpike upon passing a tollgate to

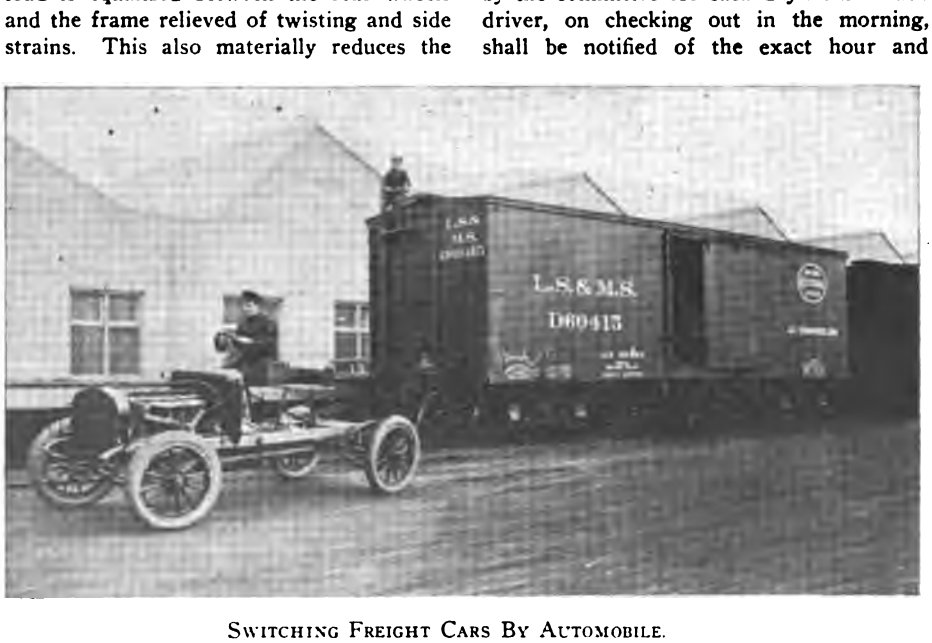
* By Section 14 of the Virginia act of 1906 it is provided that the act shall apply only to counties in the State whose board of supervisors shall, by a recorded vote, adopt the act.

exhibit his certificate to the tollgate keeper, who shall enter the name and address of the owner and the number of the machine, together with the hour and the day of the passage through the gate of the machine, in a book kept for such purposes, which book shall be furnished all the tollgate keepers by the several boards of supervisors. And it shall be the duty of the owner or driver of any machine to produce his certificate for inspection when so requested by the sheriff or any constable or police officer or peace officer.

MILWAUKEE, Wis.—At a recent meeting of forty farmers residing in Green Lake County it was decided to support no candidates for elective offices who do not pledge themselves to strict automobile legislation.

Using an Automobile for Switching Railroad Cars.

Thomas B. Jeffery & Co., Kenosha, Wis., inform us that they frequently make use of one of their models 14 or 15 for towing railroad cars in their shipping yard. Their final testing and shipping departments are adjacent, and along the west front of these buildings extend the loading tracks and switches. These tracks aggregate over three-eighths of a mile, and the loading platform is 16x500 feet, a total of 8,000 square feet. The relative arrangement of tracks and platform is such that twenty cars at a time may be placed for unloading and thirty for loading. Parallel to these tracks is a cinder path used for testing purposes, upon which cars are constantly in operation, and as the railroad company was often rather dilatory in moving the freight cars into position, the idea suggested itself of using one of the cars under test for the purpose. The car is connected by a tow rope to the rear axle of the automobile in such a manner that the load is equalized between the rear wheels and the frame relieved of twisting and side strains. This also materially reduces the wear on the tires, which was at first found to be severe.



SWITCHING FREIGHT CARS BY AUTOMOBILE.

Itinerary of the Glidden Tour.

At a meeting of the touring committee of the A. A. A., held May 31, it was decided that the Glidden Tour would start at Buffalo July 12 and proceed by the following schedule:

DAYS' RUNS.

Dates.	Miles.
July 12—Buffalo to Rochester	75½
July 13—Rochester to Syracuse	97
July 14—Syracuse to Saratoga	154
July 15—Saratoga	—
July 16—Saratoga to Elizabethtown, N. Y.	100
July 17—Elizabethtown, N. Y., to Lake Champlain Hotel	35
July 18—Lake Champlain Hotel to Montreal.	85
July 19—Montreal	—
July 20—Montreal to Three Rivers	94
July 21—Three Rivers to Quebec	81
July 22—Quebec	—
July 23—Quebec to Jackman, Me	112½
July 24—Jackman to Rangeley Lakes	80
July 25—Rangeley	—
July 26—Rangeley Lakes to Bretton Woods.	115
Total mileage	1,029

The weight limit was abolished, and cars with tonneaus built to carry four passengers of all prices and weights may compete.

The entrance fee for the tour was fixed at $50. Entrants may become contestants by so declaring in their entry blanks and making the entire run from Buffalo to Bretton Woods. Entrants for the tour may join the tour at Saratoga or any point west of Saratoga, but those not competing for the Glidden Trophy are subject only to rules governing their registration in and out of official garages and such other general regulations as may be deemed necessary by the touring committee.

It was decided that the system of scoring will be on a time basis. A certain running schedule, based on the maximum legal speed between town and town (with allowances for luncheon, local speed and traffic restrictions, etc.), will be prepared by the committee for each day's run. Each driver, on checking out in the morning, shall be notified of the exact hour and minute when he must reach the following garage control. He will be penalized one point for each minute beyond this set time. Should he arrive before the hour and minute set, he will be penalized two points for each minute in advance of the time allowed. In addition repairs or adjustments on cars in garage will be allowed only on written application, and the contestant will be penalized one point per man employed per minute. On arrival at garage controls and reporting, the cars will be locked up for the night, and visited by their drivers or others only under above conditions. At the close of the tour the lowest score wins.

Entries close July 3 at noon, with A. B. Tucker, superintendent of the tour, at No. 31 West Forty-second street, New York city. Numbers will be awarded in the order of receipt of entries.

Indianapolis Hill Climb.

The Indianapolis A. C. held a successful hill climbing contest on Glen Valley Hill, 8 miles south of the city, May 24. Edgar Apperson, in a 40 horse power car, won two of the ten events. The summary was as follows:

FREE-FOR-ALL CONTEST FOR OWNERS.

1. Apperson, 40 h. p.; Edgar Apperson, driver ..... :31 1-5
2. Buick, 20 h. p.; W. L. Carr, driver..... :41 2-5
3. National, 35-40 h. p.; Wall, driver..... :42

RUNABOUTS, WEIGHING UNDER 1,432 POUNDS.

1. Franklin, 12 h. p.; S. W. Elston, driver. :35 3-5
2. Franklin, 12 h. p.; Harry Stutts, driver. :53 4-5
3. Cadillac, 10 h. p.; Davidson, driver..... :57 4-5

RUNABOUTS, WEIGHING 1,432 TO 2,204 POUNDS.

1. Premier, 16 h. p.; Waltman, driver..... :42
2. Buick, 20 h. p.; Whittle, driver..... :42
3. Premier, 24 h. p.; Brown, driver..... :43 1-5

TOURING CARS, WEIGHING 1,432 TO 2,204 POUNDS.

1. Stoddard-Dayton, 30-35 h. p.; Frank L. Moore, driver..... :36 2-5
2. Buick, 22 h. p.; Whittle, driver..... :46

TOURING CARS, WEIGHING OVER 2,204 POUNDS.

1. Marmon, 30 h. p.; Howard Marmon, driver ..... :40 4-5
2. National, 35-40 h. p.; Clemens, driver.. :45 4-5
3. Peerless, 28-30 h. p.; Stutts, driver.... :47 2-5

STOCK CARS, LISTED $850 AND UNDER.

1. Leader, 16 h. p.; Cherry, driver..... :50 3-5
2. Maxwell, 10 h. p.; Willis, driver..... 1:00 3-5

STOCK CARS, LISTED FROM $850 TO $1,500.

1. Buick, 20 h. p.; Whittle, driver..... :37 2-5
2. Premier, 16 h. p.; Wellsman, driver.... :40 3-5
3. Leader, 20 h. p.; Cherry, driver..... :42

STOCK CARS, COSTING $1,500 TO $2,000.

1. Franklin, 12 h. p.; Elston, driver..... :39 1-5
2. Lambert, 30 h. p.; Lambert, driver..... :42 4-5
3. Premier, 20 h. p.; Hammond, driver.... :43 3-5

STOCK CARS, LISTED FROM $2,000 TO $3,000.

1. Stoddard-Dayton, 25 h. p.; Moore, driver ..... :32 1-5
2. Marmon, 30 h. p.; Howard Marmon, driver ..... :36 3-5
3. National, 35 h. p.; Clemens, driver.... :38 4-5

STOCK CARS, COSTING OVER $3,000.

1. Apperson, 40 h. p.; Edgar Apperson, driver ..... :33
2. Peerless, 28-30 h. p.; Harry Stutts, driver ..... :45 2-5

In England there exists a chauffeurs' school exclusively for time expired soldiers, under the management of an army officer, Major Hawkins, and it is claimed that these soldiers, being sound and disciplined men, with proper training make thoroughly efficient drivers.

The Cleveland A. C. Hill Climb.

The Cleveland A. C. held a hill climbing contest at Gates Mill hill, near Cleveland, on Memorial Day. Fully 150 cars were assembled at the course, and some excellent records were made. The course is just a mile long, with an estimated grade of 12 per cent. F. B. Stearns, driving a Stearns car, carried off the record of the course, driving his car over it in 1m. 23 2-5s.

After the races McInnes and Jenner were disqualified as professionals, so that the prizes went to those making the next best time, as told in the summaries below. It will be noted that this makes Mrs. J. C. Simons the winner of the third event. She was one of the first women to drive in a contest in the West.

SUMMARIES.

Amateur championship of Cuyahoga County, open to stock cars with full equipment, owners to drive—Mr. McInnes (post entry), Reo, 2:14 4-5; Charles C. Ferguson, Pope-Toledo, 2:15; T. J. Wetzel, Stoddard-Dayton, 2:27; W. H. Jenner, Buick, 2:32 4-5; I. J. Bregman, Royal, 3:06 3-5.

Open to stock cars, list price over $850 and not more than $1,500—Mr. Thomas, Reo, 2:07; W. L. Marr, Buick, 2:19 2-5; Mr. Whittle, Buick, 2:27; H. B. Odell, Stoddard-Dayton, 2:38 3-5; Henry Page, Buick, 2:50 1-5; Louis Schmidt, Jackson, 2:58 2-5.

Open to stock cars, list price over $850 and not over $1,500, amateur owners to drive—Mr. McInnes, Reo, 2:08; W. H. Jenner, Buick, 2:38 1-5; Mrs. J. C. Simons, Jackson, 2:43 2-5; H. B. Odell, Stoddard-Dayton, 2:50 3-5.

Open to stock cars, list price between $1,500 and $2,000—Arthur J. Scaife, White, 1:52 1-5; E. M. Springsteen, Franklin, 2:56; Mr. Taylor, Franklin, 3:12 4-5.

Open to stock cars, list price between $2,000 and $3,000—Walter C. White, White, 1:44; Louis Schmidt, Jackson, 1:50 2-5; Frank Adams, Stoddard-Dayton, 2:05; H. S. Moore, Stoddard-Dayton, 2:19 3-5; E. M. Springsteen, Franklin, 2:48 3-5.

Open to stock cars, list price between $3,000 and $5,000—L. B. Stearns, Stearns, 1:40 1-5; R. H. Magoon, Pope-Toledo, 2:04; L. Petrie, Stearns, 2:17; Mr. Owens, Thomas, 2:19; George Soules, Pope-Toledo, 2:25 2-5.

Open to stock cars, list price between $3,000 and $5,000, amateur owners or regular chauffeurs to drive—Mr. Owens, Thomas, 2:15 3-5.

Open to cars weighing from 851 to 1,432 pounds—Frank Adams, Stoddard-Dayton, 1:44 2-5; Mr. Thomas, Reo, 1:59; H. B. Odell, Stoddard-Dayton, 2:35 3-5; Louis Schmidt, Jackson, 3:05; W. S. Schroeder, Franklin, 3:09.

Open to cars weighing from 1,432 to 2,204 pounds—F. B. Stearns, Stearns, 1:24 4-5; A. J. Scaife, White, 1:32 2-5; Walter C. White, White, 1:39 2-5; Frank Adams, Stoddard-Dayton, 1:41 1-5; Mr. Holden, Stearns, 1:55 2-5; G. F. Ruswin, Buick, 2:22; Mr. Whittle, Buick, 2:22 2-5; Harry Page, Buick, 2:29 3-5.

Open to all makers of motor vehicles—F. B. Stearns, Stearns, 1:23 2-5; A. J. Scaife, White, 1:25 1-5; Walter C. White, 1:41; Frank Adams, Stoddard-Dayton, 1:43 1-5; Mr. Holden, Stearns, 1:55 2-5.

Long Island A. C. Withdraws From A. A. A.

By a vote of 19 to 6 the Long Island A. C. last week decided to withdraw from the A. A. A. and the New York State A. A. This action was taken at a meeting of the organization at the club house, 360 Cumberland street, Brooklyn, about forty members being present out of the membership of 400. The principal reason for leaving the A. A. A. was on account of the annual dues in that organization being $1 for each member, without any appreciable benefit being received. No objection is to be made, however, to any member joining the A. A. A. as an individual. Secretary Sidney S. Gorham, of the A. A. A., and President Oliver A. Quayle, of the New York State A. A., were present to explain the workings of the two bodies. They were much disappointed at the vote, but believe the club will eventually come back to membership in both bodies.

Dr. W. P. Richardson, Dean of the Brooklyn Law School, who is one of the most outspoken in favor of withdrawing from the A. A. A., said that although the final vote was small, it represented the majority sentiment of the club.

"A wrong impression has gone abroad," he said to a HORSELESS AGE representative, "in that our action has been construed in some circles as one of hostility to the A. A. A. That is not so, and as a club we will encourage individual membership in the national body. We are also strongly in favor of a State organization. We did think, however, that the $400 or so that was annually paid into the A. A. A. treasury could be expended to better advantage for local automobile improvements."

As a start, $150 was appropriated at the meeting to erect signboards, and a committee, of which Chas. Jerome Edwards is the chairman, has decided to place the first set of signs in the locality of Flatbush, Flushing and neighboring places. A proposition was before the club a short time ago to appropriate $1,000 for signboard purposes all over Long Island, and it is probable that that amount of money will be spent eventually.

A. R. Pardington vigorously denied that a new automobile club will be organized, or that in the event of said organization being formed he will have anything to do with it. He considered the action of the Long Island A. C. inadvisable, as it will "outlaw" them, as he called it, and he believes that in time the club will see its mistake and ask for reconsideration of its resignation. Outlawing means that the club loses its voice in A. A. A. affairs, but most of the members apparently don't care to participate in them.

Thirty People Injured by Explosion of Gasoline Tank.

An automobile accident at Cincinnati on Memorial Day resulted in the injury of thirty people more or less seriously. Dr. J. S. Atkins, his chauffeur, Walter Lavall, and the Misses Bertha and Eugenia Nulsen were coming down a steep grade on Vine street, near Inwood Park, in the doctor's White steamer, while two trolley cars were running in opposite directions. The chauffeur aimed to cross from the right to the left side of the street between the two cars, which were then about 100 feet apart. He misjudged the distance, however, and although the car going uphill stopped, the oncoming car could not be halted, and jammed the automobile into the stationary car. In the collision the gasoline tank of the automobile, containing 25 gallons of gasoline, exploded, wrecking the vehicle as well as the two trolley cars. The people in the motor car were pinioned under the wreckage, and came near being roasted to death, while scorching flames swept through the two street cars crowded with holiday seekers. Eighteen persons were taken to the City Hospital with serious injuries, while at least a dozen more were injured less severely. Dr. Atkins was injured the most seriously. His face, body and legs were blistered fearfully, and it is possible he may die. Walter Lavall, the chauffeur, and the two young women in the auto were badly burned, but their condition is not alarming. None of the street car occupants will die, but both motormen will be in the hospital for several weeks. The heat was so tremendous that paint blistered on houses 50 feet from the scene of the accident. Water thrown on the smoldering ruins of auto and cars seemed to spread the flames, and it was two hours before they were extinguished.

The blame for the accident is placed on Walter Lavall, the colored chauffeur. The automobile had been received by Dr. Atkins about a week before the accident. Lavall, who had been Dr. Atkins' coachman, became the chauffeur before he had acquired a full knowledge of the automobile.

As a consequence an agitation for the examination of chauffeurs has been started. It is claimed that many owners have drivers less than twenty-one years of age, who are as inexperienced as was Lavall. The question of examination will be acted upon in a short time by the city authorities, all of whom declare themselves in favor of such a move. The desirability of automobile ambulances was also shown by the accident. It took four police patrols two hours to get to the scene of the accident, while the automobile of the Salvage Corps returning passed the patrols going. Mayor Dempsey has come out strongly for automobile ambulances, and it is almost certain that the police will have them.

A. A. A. Directors Meet.

On Tuesday afternoon, June 6, the board of directors of the A. A. A. held their monthly meeting. The resignation of the Long Island A. C. was presented and laid on the table. A. R. Pardington tendered his resignation, which was not accepted. A. R. Godder, of the Worcester A. C., resigned as director, and J. D. Coghlin, president of the Worcester A. C., was elected as director in his place. Thirty-five new members and the Washington A. A. were elected. L. R. Spear presided at the meeting. Directors present were G. R. Post, D. H. Morris, A. R. Pardington, W. T. White and G. E. Farrington.

MINOR MENTION



The H. H. Franklin Manufacturing Company are developing a 1½ ton delivery wagon.

J. W. Butcher, of Mt. Pleasant, Mich., of the Mt. Pleasant Body Company, is preparing to move his plant, July 1, to Pontiac, where he will occupy the C. V. Taylor factory.

It is expected that the new bridge over the Raritan River between Perth Amboy and South Amboy will be open to public travel June 15. This will obviate the detour of 33 miles to New Brunswick when driving from New York to Jersey coast resorts.

In a suit brought by Joseph Allan Lancaster, Sheboygan, Mich., against Charles L. Walker, president of the Walker Motor Company, Detroit, he alleges that the representations made by Walker as to the value of stock purchased by him proved to be fraudulent.

The property of the International Power Vehicle Company, Stamford, Conn., was sold at auction May 28 for $50,000 to James H. Cheney, South Manchester, Conn., and T. W. Goodrich and J. W. Downe, New Haven. The Empire Trust Company, of New York, brought the foreclosure suit.

The Buick Testers' Association has been organized at the Buick automobile factory, Jackson, Mich., with the following officers: President, John Trumble; vice president, Glen Breed; secretary and treasurer, Leo E. Emmons. It is a mutual benefit society, and they plan to accumulate a technical library.

The New Brunswick A. A. has been organized at Saint John, N. B., with the following officers: President, Robert D. Patterson; vice president, Frank Rankine; secretary and treasurer, J. Royden Thomson; executive committee, H. P. Chestnut, G. Fred Fisher, W. F. Allison, H. Fielding Rankine, John Sayre and Percy W. Thomson.

The Nielsen Motor Car Company, Detroit, have completed a truck of conventional design which is being tried out by a local retail grain firm. They are building another truck, and have running a runabout of original design, with a single cylinder, double piston, air cooled engine, and separate friction drive to each rear wheel. Mr. Nielsen, the designer of these vehicles, was formerly with the Packard Motor Car Company.

The machinery and tools of the Hussey Drop Forge Manufacturing Company have been purchased by the recently incorporated Cambria Forge Company, Johnstown, Pa., which will begin operations September 1, and continue the manufacture of the Hussey automobile parts. The officers of the new company are: President, W. M. Brown; vice president, W. P. Smith; secretary and treasurer, K. Curt Campbell; general manager, P. L. Hussey.

It is said that a 1907 model of a Stoddard-Dayton car was recently tested on the streets of Dayton, Ohio.

The Cadillac Motor Car Company, of Detroit, have just remodeled their branch salesroom on Jefferson avenue.

J. C. Wilson & Co., makers of automobile bodies, have moved into their large plant in Detroit, thereby tripling their space.

It is reported that Charles M. Schwab has determined to build a $1,000,000 plant for the manufacture of automobiles at Bethlehem, Pa.

We have received a copy of Bulletin No. 3 of the University of Illinois Experiment Station, containing a description of this station by L. P. Breckenridge, its director.

The Manhattan Autocar Company, New York, have equipped their five sightseeing buses with Hartford shock absorbers. Formerly these devices have been used exclusively on pleasure cars.

The Parish & Bingham Company, Cleveland, Ohio, are building a two story extension to their factory, 218x50 feet in size. They are also erecting a fireproof die house and a fireproof oil storage house.

Arrangements are pending for the sale of the Duquesne Construction Company, Jamestown, N. Y., to parties from Erie, Pa., who will incorporate under Pennsylvania laws, and move the plant to Erie.

The manager of the Societa Automobili Fiat-Ansaldi, Turin, Italy, informs us that at the special meeting of the stockholders of that company on April 26 it was decided to change the name to Societa Automobili Brevetti-Fiat, Turin.

The Northern Motor Car Company inform us that in a recent test to demonstrate the holding power of their pneumatic clutch they hauled seven cars at an average speed of 10 miles per hour, with an air pressure in the clutch of 18 pounds gauge, instead of the 60 pounds normally used, without any slipping of the clutch. In a further test, it is stated, the clutch held sufficiently to drive the car when a person blew into the clutch through a tube.

The Safety Tank Company, Central Building, 25 West Forty-second street, New York, gave a practical demonstration of the Snell hydraulic gasoline tank, June 5, at the Commercial Auto and Storage Company, 602 West Forty-fourth street, New York. Their system was approved by Daniel F. Kenny, representing the sanitary bureau of the New York city Board of health, also by Edward F. Horn, of the Bureau of Combustibles of the Fire Department.

Trade Personals.

Henry R. Simpson has succeeded W. B. Fewell as Buffalo, N. Y., manager for the Goodrich Tire and Rubber Company. Mr. Fewell has accepted a position as traveling representative for the C. H. Blomstrom Motor Car Company, of Detroit, Mich.

Walter Boehm, formerly of the Standard Auto Company, Detroit, has been appointed manager of the new branch of the Ford Motor Company at Detroit, which is in course of erection on Jefferson avenue, to succeed H. Y. McMullen, who is now with the Maxwell-Briscoe-McLeod Company, Detroit.

Garage Notes.

The Darracq Motor Car Company have leased the entire building at 1989 Broadway, New York.

The Triple State Electric Company, Charleston, W. Va., have erected a garage on McFarland street.

Plans have been posted for the new garage of the Locomobile Company of America at 249-251 North Broad street, Philadelphia. It will be 36.4x 120 feet in size.

The White Sewing Machine Company have purchased the property at 629-33 North Broad street, Philadelphia, for $75,000 for the erection of a garage with a capacity of seventy-five cars.

The Ramis Automobile Company, Jacksonville, Fla., will move June 15 into their new garage on West Adams street. The building was constructed for Mr. Ramis for the automobile and bicycle business.

F. R. Clarke, manager of the Clarke Automobile and Launch Company, Jacksonville, Fla., has sold his interests to Henry Mohl. The company will be run under the same name, and under the management of Mr. Mohl. Plans for the future are to construct a large fireproof garage to accommodate over 100 machines, and to conduct the automobile business along more modern lines.

New Incorporations.

The Rainier Motor Company, of Seattle, Wash.—Capital stock, $12,000. Incorporators, M. P. Benton, W. G. Norris and Edward W. Herald.

The Waukesha Motor Company, Waukesha, Wis.—Capital stock, $25,000. Incorporators, H. L. Horning, Frederick Ahrens and A. L. Horning.

Triplex Gas Engine Company, Jersey City, N. J.—Capital stock, $100,000. Incorporators, H. O. Coughlan, John R. Turner and Edward B. Merrill.

Vand gift Automobile Company, Jersey City, N. J.—Capital, $200,000. Incorporators, Henry G. Morris, Pedro G. Salon and F. Rodgers Donohue.

Automobile Livery and Express Company, Tacoma, Wash.—Capital stock, $25,000. Incorporators, W. L. Loomis, Fred G. Bordon, Jess F. Russell and Virgil Elmer.

Brod-Barbier Auto Ignition Company, New York City.—Capital stock, $10,000, to manufacture automobile supplies and appliances. Incorporators, W. F. Wund, T. Broderic and A. Barbier, all of New York city.

The General Vehicle Company, Kerhonkson, Ulster County, N. Y.—Capital stock, $1,750,000, to manufacture and deal in all kinds of motor vehicles. Directors, Phillip S. Hill, Charles H. Clark and Edward T. Magoffin, of New York city.

Automobile Outing and Transportation Company, Baltimore, Md.—Capital stock, $50,000, to conduct automobile transportation business. Incorporators, Chas. H. Harig, Reginald S. Opie, Lindsay C. Spencer, Jack Q. L. Smith, Jr., and Addison E. Mulliken.

Trade Literature Received.

The Look Electric Company, Chicago, Ill.—Circular of Look sparking batteries.

Olds Motor Works, Lansing, Mich.—"A Busy Man's Text Book on Automobiles," by F. L. Faurote.

The No-Ko-Rode Company, 225 Dearborn Street, Chicago, Ill.—Booklet, "How to Run Your Motor Car at Less Expense."

E. C. Walker Company, 1905 Logan Street, Louisville, Ky.—Catalogue, "Everything for the Automobile and Motor Boat."

Hancock Manufacturing Company, 144 East Erie Street, Chicago, Ill.—Booklet, "The Hancock Valveless Force Feed Lubricators."

New Agencies.

Charleston, W. Va.—The Triple State Electric Company, Pope-Waverley cars.

Philadelphia, Pa.—W. N. Knox, president of Knox Commercial Auto Company, Wayne cars.

...THE...

Horseless Age

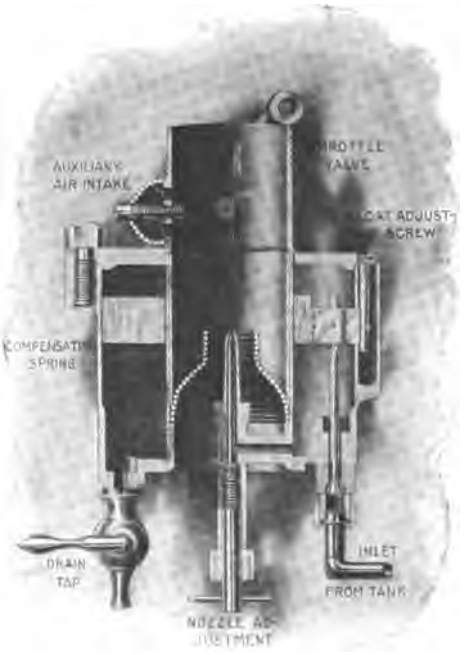
VOLUME 17 JUNE 13, 1906 NUMBER 24

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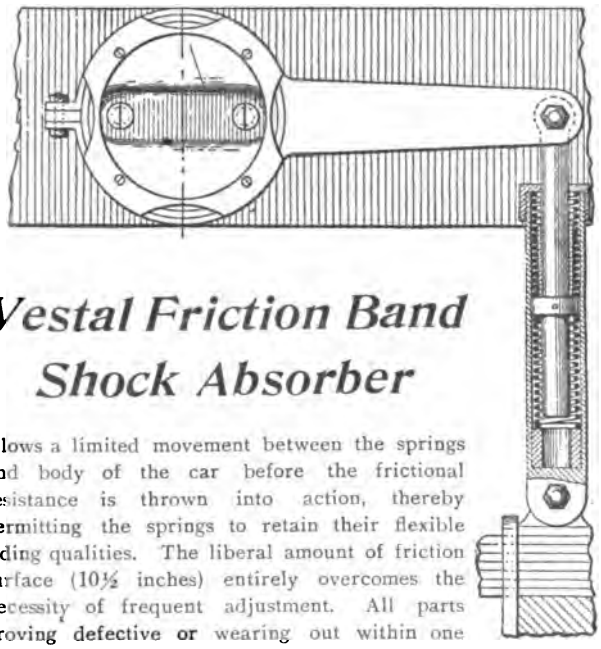
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Speed Indicating and Recording Devices.—III.

By E. S. Foljambe.

THE CHICAGO SPEED RECORDER.

The accompanying photograph shows the general appearance of the speed recorder recently placed on the market by the Chicago Pneumatic Tool Company. The instrument is an adaptation to automobiles of the company's velocimeter, which has been in use on locomotives for many years.

This device comes under the class of slip-back liquid tachometers, the liquid employed being oil. It consists essentially of a gear pump at the bottom of an oil well, which forces oil through a connecting passage into the lower portion of a cylinder containing a movable piston. The gear pump is driven by either friction, belt or the usual flexible shaft from the front wheels, and runs at a speed in proportion to the speed of the vehicle. The pressure of the oil raises the piston against the action of two coiled springs, one of which is shown. These springs are hooked to the end of a yoke which passes through a slot in the piston rod. The cylinder is bored slightly tapering, so that the piston is a snug fit when in its lowest position, but leaves a gradually increasing annular space between it and the walls as it rises, which allows the oil to leak so that the pressure is maintained nearly uniform for all positions of the piston. The oil which leaks by returns through a port to the pump well. The motion of the piston is utilized to operate a marking point which records on a ribbon of paper, and also to pull a fine silk cord which passes over suitable sheaves through tubing to the indicating dial, which can be placed in any convenient position on the dash or in the limousine, while the indicator mechanism can be placed on the running board or wherever it is found most convenient.

The flexible cord is attached to a hook on a small guide at the end of the piston rod. This guide moves between two vertical supports, being provided with two small grooved wheels resting against the supports. The cord passes under the small pulley just below the hook, through a tube in the side of the case and over a sheave

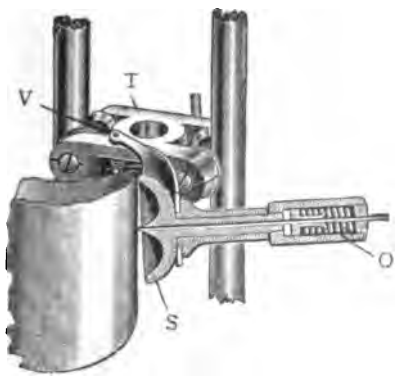


Fig. 2.—Recording Mechanism.

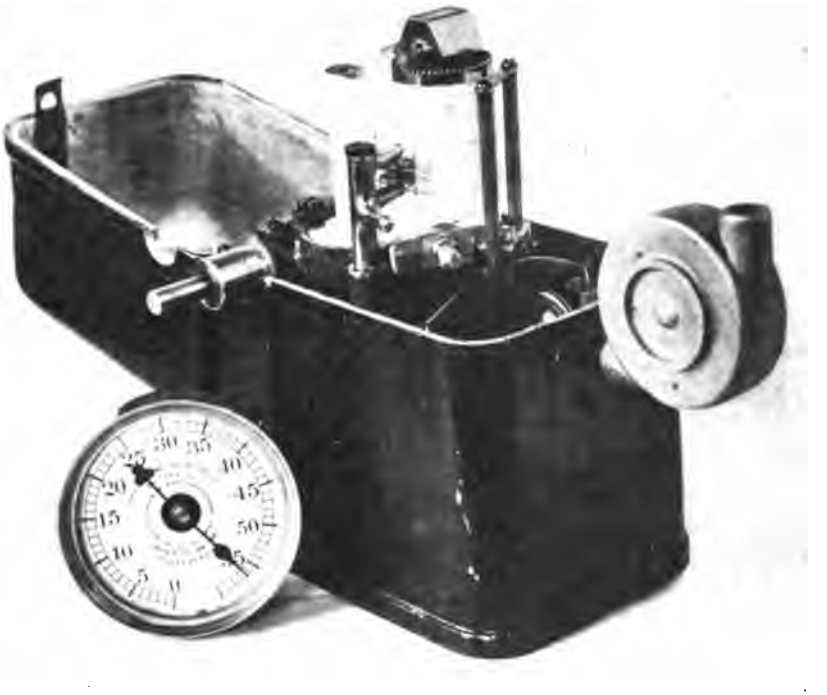


Fig. 1.—Chicago Pneumatic Tool Company's Speed Recorder.

encased as shown. From here it passes through suitable tubes and sheaves to the dial.

The recording mechanism consists of a small soft brass wire, which is carried in a holder moved by the guide at the end of the piston. Its point is spring pressed against a paper ribbon, which is unwound from one spool, passes over a vertical metal cylinder and is wound on another spool. The ribbon is made of paper similar to that used for engine indicator cards, and is ruled with horizontal lines, the spaces between the lines each representing 5 miles per hour, so that as the piston rises the stylus marks a curved line on the ribbon, making a permanent record of the speed of the vehicle. The central drum is positively driven at a rate of one-half inch per mile by a worm and worm wheel at the bottom, and the gear shown at the top meshes with its upper edge, which is cut like a crown gear and drives the odometer. The paper ribbon is held firmly against the central drum by a small friction roller, which is pressed against it so that the paper conforms to the motion of this drum, which is uniform. The spools from which and on to which the paper is wound are also driven, but not positively, so that they can slip to accommodate themselves to the speed of the paper.

The accompanying drawing, Fig. 2, shows the pencil holder in section. A small spring O forces the wire against the drum, and the disc S, only one edge of which bears against the drum, rotates as the paper passes beneath it, so that the wire is also rotated, and consequently the point wears evenly and makes a uniform line. T is the guide carried by the piston, and the support for the marking wire is hinged to this guide at V, so that it can be swung out of contact with the drum. The spools on which the paper is wound are of wood, and the end of the paper is slipped into a slot on the receiving spool. The spindles on which these spools are placed are slotted, and contained in the slot is a piece of spring wire which bulges outward, so that when the spool is forced over it is a tight fit, yet it will slip before the paper will tear. An odometer of well known type is located at the top of the central drum, and the cover is provided with a small window so that its indications can be observed.

The dial mechanism, which, as before stated, can be placed in a different position from the main part of the instrument, is illustrated in the accompanying drawing, Fig. 3. The silk cord which operates it enters at A and passes over a small pulley and around the sheave B, which it moves and to which it is fastened at C. Another silk cord D is fastened to the sheave B by being knotted on the under side and passing up through a hole. It then passes around

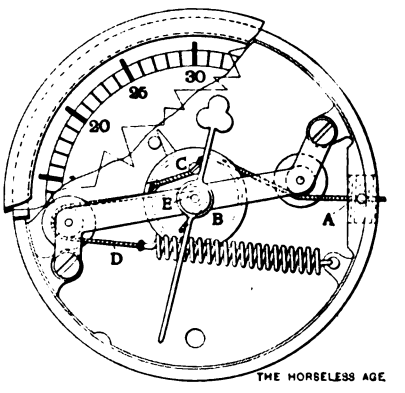


Fig. 3.—Dial Mechanism.



FIG. 4.—ACME AUTOMETER.

a tapered spindle E, at the end of which is fastened the indicating needle. The end of this cord, after passing around another small pulley, is fastened to the spring, as shown, so that the pull of the cord which enters at A is resisted by this spring. The small spindle E around which the second cord is wound is made tapering, so that the pull of the spring will be as nearly constant as possible, the diameter on which the cord is wound decreasing as the tension of the spring increases.

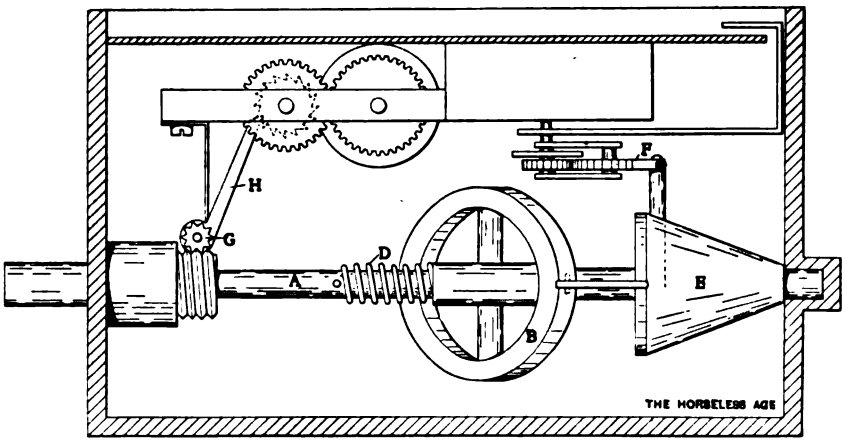


FIG. 5.—SECTION OF ACME AUTOMETER.

THE ACME AUTO METER.

A new speedmeter has just been placed on the market by the Acme Auto Meter Company, 442 Water street, New York. This instrument, the data of which was received too late to be placed in its proper position in this series, operates on the ring governor principle. The case is made of brass, and is about 4½ inches in diameter. From the face of the instrument can be read off the time, the speed and the trip and total mileage. The mechanism is driven in the usual manner by a flexible shaft, which connects at the bottom.

Referring to the sectional view of the mechanism, the difference between this and other ring governor type instruments, already described, resides principally in the method of transmitting the motion from the governor ring to the indicating needle. The usual shaft A extends through the instrument, and has mounted upon it a governor ring B in such a manner that the spindle of the ring is constrained to turn with the shaft, but can also move lengthwise thereof, carrying with it a sleeve C, whose motion is resisted by the coiled spring D. At the extreme end of the shaft is mounted a cone E, which is splined so that it revolves with the shaft, but is also free to move longitudinally. This cone and the governor ring are connected by a link, as shown, so that the motion of the ring is communicated to the cone. Bearing against the side of the cone is an arm with a roller upon it; this arm is rigidly fastened to a gear segment F, below which is a spring which keeps the arm in contact with the cone. The gear segment meshes with a short train of gears which operate the indicating needle on the face. At the left end of the shaft is shown the worm which drives the small worm wheel G, eccentrically mounted upon the shaft of which is the pawl H, driving the ratchet wheel which operates the train of gears for the odometer. This pawl, being eccentrically mounted, will operate its ratchet wheel for either direction of motion of its shaft, so that the record on the odometer is accumulative, no matter in which direction the instrument is run. The figures of the odometer mechanism are on drums instead of discs, and a thumb button, shown at the right on the outside of the instrument, is so arranged that by pressing it inward it disengages the driving mechanism of the odometer, and by giving it a single rotation it turns each of the drums to the zero position.

The clock has an eight day movement, and although it is housed in the same case it is distinct from the other parts of the instrument.

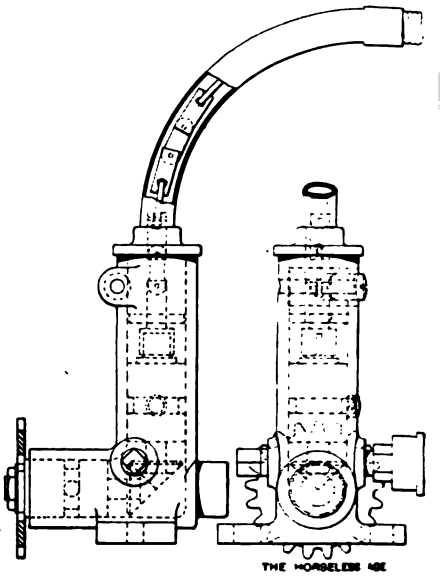


FIG. 6.—WARNER AUTOMETER DRIVING GEAR.

THE WARNER AUTOMETER.

In the autometer built by the Warner Instrument Company, of Beloit, Wis., the trip and total odometers are placed on one side and provided with the usual reset by thumb button. The instrument is driven by a special flexible shaft made of individual links, as shown in the accompanying drawing of the bevel gear drive. The small pinion meshes with the large pinion on the front wheel and drives the shaft through bevel gears, so that the shaft is in a vertical position as shown. The advantage of this arrangement over that of having the shaft connected directly to the small pinion without the bevel gears is that the shaft is not bent when the road wheel is turned sharply to the right or left. The shaft is also curved less and swings free of the car. These small gear shafts are encased in a light aluminum housing and are clamped to a universal bracket.

The principle of operation of the autom-

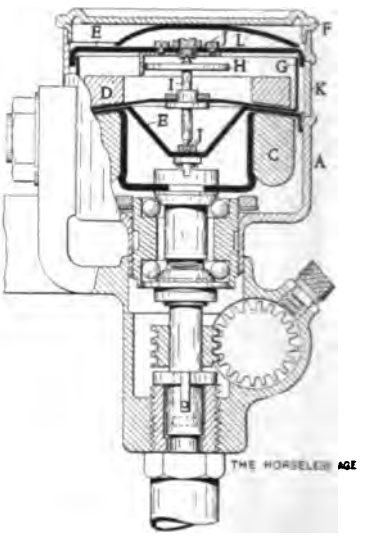


FIG. 7.—WARNER AUTOMETER.

eter is that of magnetic drag. The instrument is driven by the usual flexible shaft from the front wheel, and the odometer is operated by the worm wheel N and worm M on the central shaft. This shaft runs on ball bearings and carries rigidly connected to it at the top the annular permanent magnet C, above which is a ring of

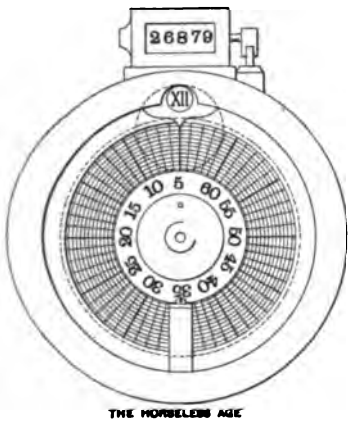


FIG. 8.—BULLARD SPEED RECORDER WITH RECORD CARD.

soft iron D, mounted on a small shaft, the ends of which are hardened and run in jeweled bearings J. Between the magnet and ring is a dish-shaped shield E, which supports the lower jeweled bearing and prevents air currents caused by the revolving magnet from affecting the ring above. Fastened to the soft iron ring is a cup-shaped aluminum piece G, around the outside of which are engraved the figures which indicate the speed in miles per hour. Through an opening in the outside casing, covered by the glass K, the figures indicating the speed can be seen.

The annular magnet is in reality a bar magnet bent into a ring so that the poles are almost touching.

When the magnet is rotated the lines of force passing from its north pole through

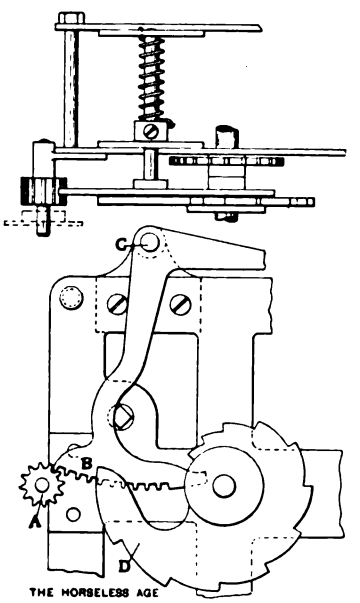


FIG. 9.—DETAIL OF BULLARD RECORDER.

the aluminum disc to the soft iron ring and back to the south pole of the magnet are deflected, and an inductive effect is produced which tends to rotate the disc and ring. This rotation is opposed by a hair-spring H, which returns the disc to zero when the magnet is stationary. As the turning effect is in proportion to the speed of the magnet, the spaces between the figures on the dial can be equal from the lowest to the highest reading. Furthermore, the figures can be of good size, as the dial has a length equal to the circumference of the instrument. If for any reason the instrument should need readjusting, it can be done by simply screwing the ball bearing and the magnet C nearer to or farther from the ring D, in which case the effect is either increased or decreased. This is very seldom necessary, and is then done by the makers. It is claimed that the instrument is extremely accurate and so sensitive that it will show on the dial a change in speed of one-fifth of 1 per cent.

THE BULLARD SPEED RECORDER.

Another class of speedometers, referred to as timers, comprises instruments which have stop watches attached that are started and allowed to run while the machine covers a known distance, the hand indicating by its position not the time elapsed but the rate of speed corresponding to that time. Then there are speed recorders in which a regular clock mechanism is attached, which moves a disc or dial on which the actual distance is recorded as it is traveled. An example of this type of instrument is the J. H. Bullard speed recorder, a cut of which with the cover removed is shown. It consists of a combined clock, odometer and speed recorder. The recording mechanism makes a record on a detachable card of the time and rate of speed per minute of every quarter mile traveled. Also a trip and mileage record for the season. This recorder depends for its action upon a positive drive by means of a train of gears, and is claimed by its makers to be mathematically correct. Fig. 8 gives an idea of the face of the instrument. At the top is an odometer of the usual form, and just below it in a small circular opening can always be seen a figure representing the hour of the day. The figure directly below the hour on the central dial indicates the minutes past the hour. Each space between the radial lines on the movable card represents a minute, the spaces between the circular lines represent the hours, and as twelve of them are exposed, each card is good for a twelve hour record, when a new card can be substituted. Each hourly record is made in one of the annular spaces by a small needle which punctures the card for every quarter of a mile traveled, and gives a stronger perforation every fourth time, indicating a mile, so that a perforation in every other space formed by the radial lines represents a speed of 7½ miles per hour; one in each space, 15 miles an hour; two perforations in a space, 30 miles per hour; three in a



FIG. 10.—MECHANISM OF BULLARD INSTRUMENT.

space, 45 miles per hour, etc. This record is read counter-clockwise. The perforating device is actuated by the motion of the car, and the record discs are rotated by a clock mechanism, so that when the car is not running the card will show no perforations for that time. This, it is pointed out, is a valuable check on the performance of rented or commercial vehicles.

The record discs are fastened to the minute arbor of a regular clock movement, and the usual sleeve of this movement, which rotates once in twelve hours, is used to operate a cam, as described later. The plate against which the record card is clamped by a thumb nut carries a pin which enters a hole in the card and makes it possible to



FIG. 11.—MECHANISM OF BULLARD INDICATOR.

place it always in the correct position with reference to the numerals. The figure in the small circle indicating the hour is instantly changed at the end of each sixty minutes. This is accomplished as follows: The dial with the hour figures is secured to the top of a vertical shaft A (Fig. 9), which carries at its lower end a pinion in mesh with the rack B on the arm pivoted

at C. The end of this rack bears against the periphery of a cam D, which has twelve steps and is rotated by the clock sleeve which ordinarily moves the hour hand, as above mentioned, so that at the end of each hour the rack B moves suddenly as its end drops off one of the steps of the cam under the action of a spring, and this gives a quick rotation to the shaft A and brings

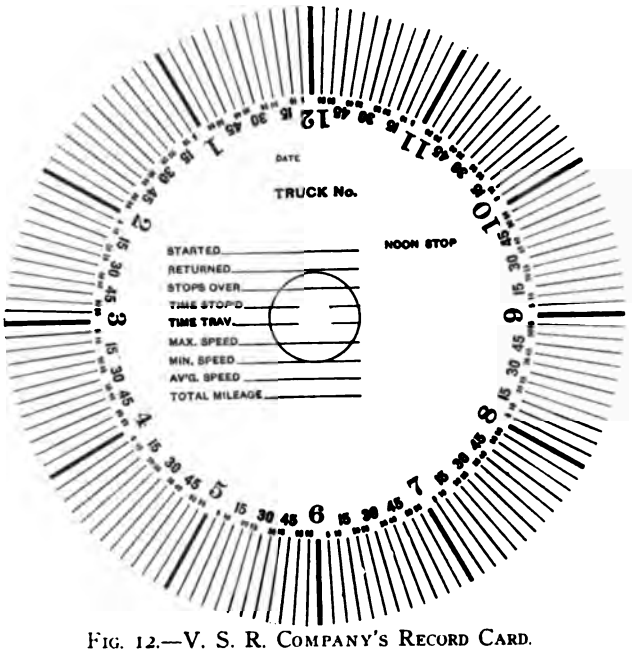


FIG. 12.—V. S. R. COMPANY'S RECORD CARD.

the next hour number under the circular opening in the dial face. By means of an arm and a push button the end of the rack B can be replaced on the step cam for another twelve hour record. If not reset its end rests in a groove E, and the rotation of the cam does not affect it.

Fig. 10 shows the mechanism back of the clock, which operates the odometer and the punch. The usual flexible shaft from the wheel is attached at A and rotates, by means of a small worm and worm wheel, the train of gears and the quadruple cam B, which in turn moves the pivoted lever C and hammer D. As the lever snaps off of each of the cam projections the coiled spring shown causes the hammer to hit one side of the pivoted piece G, the other side of which drives the punch into the record disc. The punch is, however, instantly returned so that the slow rotation of the disc does not catch it. The outer end of lever C, each time the other end passes over the long projection of the cam, pushes the curved arm to operate a plunger in the bronze guide H and registers 1 mile on the odometer, at the same instant that a deeper perforation is made on the card, and while recording the total mileage it also records the mileage for the trip. This also operates as a check, for if the card should be intentionally removed and the car run without it, the reading of the odometer for the trip would not agree with the trip record on the card, which would show that it had been tampered with.

The instrument is encased in brass, and is about 4½ inches in diameter. The claims made for it are that it is perfectly accurate at all speeds, gives a continuous and permanent record of the speed of the car, and also the length of stops, as well as the exact time at which each stop was made, thus doing away with all guesswork.

THE V. S. R. COMPANY'S RECORDER.

Another recording instrument is that of the Vehicle Speed Register Company, with New York offices at 1269 Broadway. They are operating a novel system of checking the movements of delivery trucks, which has been successfully used in connection with horse drawn vehicles, and arrangements for its application to commercial motor vehicles are now being made.

The recording instrument consists of a twenty-four hour clock, a rotating dial and a punch mechanism operated by the rotation of the wheels of the vehicle, which perforates a record card indicating the speeds and distances traveled. On the hub of the wheel is fitted a cam-shaped projection, which at each revolution forces inward a plunger with a steel roller at its end. This plunger operates a spider pivoted at the middle of the instrument and carrying a pawl at each end, which engage the teeth of a large ratchet ring with a projection at one point of its circumference. The pawls are so adjusted that the ring makes one revolution for each one-eighth mile traveled, and at each revolution this projection comes under and raises a little plunger, the upper end of which carries a needle which perforates the revolving record card. At the end of each hour the clock mechanism, by means of the rotation of an eccentric pin and link connected to the perforating needle, moves this needle so that the perforations will come in the next concentric circle on the record. The concentric circles mentioned are not shown in the card illustrated. If the instrument is run for more than twelve hours consecutively, the punching mechanism begins over again so that the record will be kept for twenty-four hours, the location of the perforations indicating what has taken place. If the vehicle is stopped, no perforations are made, and the time and duration of the stops are recorded in a very similar manner to that of the Bullard instrument, previously described.

These instruments are not sold, but are rented to truck dealers, and are usually placed on the rear axle in a locked steel case so that the drivers cannot have access to them, and are taken care of, wound, cleaned and the records removed each night by the representatives of the Register Company. The record cards, one of which is shown in the accompanying cut, are taken to the company's office, and a complete report sheet is compiled for each instrument and delivered to the truck owner before the drivers start out in the morning. One of these report sheets is herewith reproduced. In this way the exact time the truck started, how far it went, how fast it was traveling at any given time, the number of stops made, the exact time and duration of each stop, the total distance covered in any trip, and the total time consumed for each trip is known. As this report is received before the men start out in the morning, it enables the owner to reprimand any driver for misconduct on the previous day, or to warn him not to do certain things which he deems unadvisa-

Date:

REPORT SHEET

THE VEHICLE SPEED REGISTER COMPANY.

To THE RANKIN DELIVERY CO. OF NEW YORK, NEW JERSEY AND CONNECTICUT. MARCH 2, 1906.

	No. of Wagon	Started from Stable	Returned to Stable	No. of Stops over 10 Minutes	Time consumed in Stops	Time consumed in Travelling	Maximum Speed Miles per Hour	Minimum Speed Miles per Hour	Average Speed Miles per hour	Total No. Miles Travelled	MID-DAY STOPS:	Stops of Unusual Length
TRUCKS	26	1:15p	11:55p	3	1:55	8:45	6	3	4.37	38½		6:15–6:50
	30	12:40p	10:50p	6	6.10	4:00	12	3	6.01	24		2:35–4:30 | 4:55–5:45 | 6:50–6:15 | 6:25–8:25 | 8:30–9:05
	32	12:35p	10:45p	10	6:00	4:10	9	3	5.88	24½		12:45–1:25 | 2:15–2:40 | 3:50–4:40 | 5:30–7:30 | 7:50–8:2 5
	33	No report, no charge										
	39	12:35p	11:35p	11	6:05	4:55	12	3	5.58	27½		2:35–3:05 | 3:20–4:15 | 4:20–5:02 | 5:30–6:05 | 6:20–7:10 | 7:15–8:25 | 8:30–9:05

FIG. 13.

ble. In many cases these reports show that the work done in different territories is not well distributed, or that in certain territories altogether too much distance has to be covered. Sometimes it is discovered that the men are idling away their time at resorts and then driving at a reckless speed



FIG. 14.—MONITOR SPEED RECORDER.

in order to make up the deficiency, and under such conditions accidents are likely to occur, and the owner is held responsible.

THE MONITOR SPEED GAUGE.

The Monitor speed recorder, a front view of which is herewith shown, is a device of the gauge type. Referring to the cut of the recorder, it will be seen that at the lower part is a removable card upon which an inked record is made by the arm shown, while in the upper portion is the pointer indicating the speed, and an odometer totaling the distance. The record card is rotated by a clock movement, and the record is made on it in ink by the pen at the end of the arm at the right. The rotation of the car wheel is not communicated to the instrument, but is used to operate a make and break mechanism in connection with a current from either storage or dry cells. The making and breaking causes the electric magnet at the left to draw, and by spring release an arm which operates the ratchet wheel seen in the middle at the top, so that this wheel turns in proportion to the speed of the car. To the axis of this ratchet wheel is fastened the indicating arm. Although the make and break mechanism runs continuously as long as the car is moving, the ratchet wheel is interrupted in its motion every thirty seconds, and returns under the action of a spring in its hub to its original position. The pointer continues to show the speed of the last thirty seconds, unless it is advanced by the speed being increased, but if the speed is decreased it does not drop back until after the next release has taken place.

The releasing mechanism is also electrical, and consists of a small two pointed cam on an arbor of the clock mechanism in the lower part of the instrument. This cam operates two electrical contact levers, one of which falls four ticks of the clock before the other, and causes the electromagnet at the right to raise the arm out of contact with the ratchet wheel which it operates. When the second lever falls the contact is broken, and that release completed, so that the arm again engages the ratchet wheel. The odometer or cyclometer shown at the top is operated through a pawl and ratchet wheel and two bevel gears driven by the mechanism connected to the car wheel, and is so arranged that it will continue to run regardless of the speed indicator, the clock and recorder.

The recorder consists of a clock rotated card clamped to a disc by a clip, as shown. On this a spring pressed pen M at the end of an adjustable arm makes a continuous record of the rate of speed; the pen arm is pivoted at its middle point and operated by the thin horizontal rack at the top which meshes with a pinion on the axis of the main ratchet wheel.

One advantage which this instrument possesses over most others is that, being electrical, it can be located at any distance from the wheel or in any position desired.

Apparatus for Testing Speedometers.

The judges for the speedometer trials carried out in March last by the British Automobile Club decided that the makers' statements as to the accuracy of their various instruments could not be accepted as a basis upon which to make awards for the performance of the various devices upon the road. It was essential that if any instruments received the "hall mark" of the club as to their accuracy, a series of separate laboratory tests should be made, and for this purpose a special and quite novel apparatus was constructed, at considerable cost, whereby each instrument could be tested for accuracy under exactly similar conditions and in such a way that no question of the manner in which the tests were carried out could be raised, either by the competitors or the general public.

Those persons who have had any practical experience with time keeping to minute fractions of a second, and particularly the wonderful results attained in astronomical observations, are aware that in a long series of records account has to be taken of the "personal equation" of the observer and calculation made accordingly. To obviate all possibility of any personal error which might be due to the stopping or starting of a stop watch and revolution counter, which might introduce the combined errors of two persons, it was decided that the whole series of operations for testing the devices should be governed electrically from start to finish.

The whole of the apparatus, together with the speedometers to be tested, was mounted upon a rigidly supported table and the annexed illustration shows every part of the arrangement. To the right of the table a substantial vertical oak beam carries a flat oak board to which the recording dials of the speedometers are rigidly mounted by suitable iron brackets. The testing apparatus proper consisted of the following parts: A clock with small hour and minute hands, the seconds hand revolving around the whole circumference of the dial and having a dead beat movement for every fifth of a second. In connection with the clock are two electromagnets, these applying and releasing a special type of counting gear every minute, off the same contact, through the medium of a reversing switch worked by hand. The counting gear cannot be seen in the illustration, as it lies horizontally behind the motor; the various indicating wheels are each driven by worms, and the main driving spindle of the counter carries a slipping clutch which gradually picks up the motion and at a certain speed



APPARATUS FOR TESTING SPEEDOMETERS.

is positively locked to its driver, the electric motor. A means is provided by which the counter can be set back to zero after any test, and also a brake to check the inertia of the parts when released.

The electric motor is arranged to drive up to the highest possible speed which any of the instruments is capable of recording; an adjustable wire resistance is in the circuit and the speed is kept constant by a brake acting on the extreme edge of a large face plate, which also forms a flywheel. On the other end of the motor spindle to which the face plate is attached, is the clutch connection for the counter. The motor can be driven in either direction by means of a reversing switch, the motor and counting circuits being cut out simultaneously by a double pole switch on the main electrical circuit.

For the purpose of carrying the ends of the flexible shafts which would be normally driven by the spur wheels or friction devices bolted to the automobile road wheel a series of extension brackets were constructed, one for each instrument, so that the driving ends of the flexible shafts could be brought up against the motor face plate in the manner best suited for each device.

The extension bracket is mounted upon a cross slide which can be moved along a horizontal bed to and from the face plate in an exactly similar manner to the method by which a tool is fed up to the face of work on a lathe; an angular movement could also be given to the cross slide, thus allowing for universal adjustment in every direction and providing a ready means for adapting the different types of driving gear.

The method of taking a test was as follows: The motor was started up, the counter having been previously set to zero and the clutch taken out of engagement; the resistance was gradually cut out of the circuit, and simultaneously the cross slide carrying the driving end of the flexible shaft was gradually fed up against the face plate. When the pointer of the speedometer had reached the place on its dial giving the speed that was to be tested the operating switch was put in so as to simultaneously start the clock and the counter. At the end of one minute the switch automatically took out the clutch and the brake on the edge of the face plate was also applied so as to stop any further revolutions being recorded. The number of revolutions per minute were then read off the counter, and the accuracy noted in relation to the revolutions of the automobile wheel, and the speed in miles per hour at which the speedometer was being tested during that particular minute.

Regulations are now being formulated for the forthcoming British trials of commercial vehicles, for which purpose a joint committee of the A. C. G. B. I. and the Motor Van, Wagon and Omnibus Users' Association are sitting. It is proposed that these trials shall take place in February and March next, the entry list to be closed on November 30.

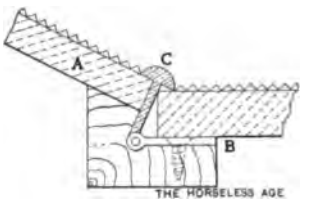
Aluminum in Place of Wood.

By E. J. B.

The depreciation of a pleasure car depends to quite an extent on its appearance after it has been in use. The parts affected may not necessarily be important to the correct performance of the car, but when they have a worn out look at the end of the season they detract from its value. An example of this may be found in the front floor boards and toe boards of a large majority of cars.

If any of the flexible coverings are used, such as rubber matting, the frequent movement of the driver's feet in manipulating the foot pedals soon wears it ragged in places. If no covering is used the wood easily splinters about the pedal slots and becomes water soaked and oil spotted. In either case this part of the car presents an untidy appearance and is very difficult to keep clean.

In new cars this construction can be avoided, and in old cars overcome, by the substitution of cast aluminum plates for the usual wood flooring. If carefully made, these plates require very little fitting to give a tight, substantial floor which



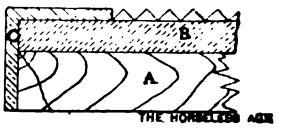
A, toe plate; B, foot plate; C, brass hinge.

can be easily cleaned, will not wear out quickly, and is very neat in appearance.

For cars with slanting toe boards, the toe plates should be cast in one piece, containing the pedal slots, and then sawed as necessary to allow assembling around the pedals. This method insures the figures or corrugations, which may be cast in the plates, to match. As the supporting points for these plates are comparatively near together, one-quarter inch in thickness is sufficient to carry any ordinary load it is subjected to.

The floor plate should be about three-eighths of an inch thick, as it will, at times, support the weight of the passengers in the front seat. Diagonal ribs will also add to its stiffness. The sides of this plate may rest on projections from the sills of the body and the rear edge supported by a light cross angle. The joint between the toe and floor plates should rest on a light cross timber on which is screwed one leg of a special hinge, the other leg passing between the plates and ending in a bead similar in shape to that shown in the sketch. By moving the floor plate back a little, both that and the toe plate can be easily removed.

The running boards may also be covered by one-quarter inch thick aluminum plates and trimmed with brass molding of angle



A, running board; B, aluminum plate; C, brass molding.

section. Solid aluminum running boards are heavier and more expensive and give no better results than plates mounted on wood. A section through a running board of this built up type is shown in the sketch.

A cheap and satisfactory way to make the patterns for these plates is to mount rubber matting which has a suitable corrugated surface on wood plates of the required thickness. The sharp corners on the rubber stand the wear of molding better than if formed in wood.

An Interesting Relic.

Among the curiosities that attract the attention in Buffalo, N. Y., is the first car built by the George N. Pierce Company, a 2¾ horse power motorette, which occupies a conspicuous position in the centre of the Pierce Company's display rooms on Main street. This little car, with an honorable record of over 50,000 miles of running to its credit, although still in serviceable condition, has been retired and now ranks among one of the most valuable of the Pierce Company's assets. It is not for sale, and many times its actual value in money would be no inducement to part with it. This motorette was built in the fall of 1900, and after a few months' general service for demonstrating purposes was entered in the first endurance run of 1901, from New York to Rochester, from which contest it emerged covered with glory. It will be remembered that the road and weather conditions were extremely unfavorable, and this "baby car," as it was termed by the drivers of competing cars, was laughed at, as being too light for the undertaking. The motorette went over the course with the best of the larger cars, passing many that got stuck in the mud or had broken down on the road, climbed hills with credit, and finished with a good record that it has maintained to this day. The car has always been in the service of the George N. Pierce Company, and for some months prior to its retirement was used by the shop hands for freight work.

An English county judge recently decided that an action brought against a peer for the hire of a motor car by his "infant" son must be dismissed, as a car can hardly be reckoned one of those "necessaries" for a person *in statu pupillari* for which the parent may be held responsible. For the present the rising generation must be content to regard motoring as a "ready money business," as it is probable American judges will take the same view.

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Devoted to Motor Interests

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Dealers' Commission.

Some four years ago, when the agency system of selling cars was first generally introduced, the agents' commission was fixed at 20 per cent., and it has remained at this figure ever since. Some agencies handling popular makes of cars in good territories have made out well on this commission, but we believe we are justified in saying that the majority of agencies have led a precarious existence. It must be remembered that out of the 20 per cent. commission must be paid the freight on the car, rent of the premises, advertising, help, etc. If in addition it is considered that the active season in the business lasts for only three or four months, it will be understood that the net profits to the dealer after all expenses have been paid are quite low, and that the opportunities in the agency business are limited, particularly where competition is keen, as in New York.

With the increasing competition in the leading automobile markets the dealers have increased their selling efforts, and their expenses have been increased in proportion, while sales have not always grown in the same ratio. In New York city, for instance, a very large number of sales establishments have within the past year opened on Broadway, where rents are very high, and the same migration to the most prominent business centres seems to have taken place in other cities. The New York dealers, moreover, a short time ago held an open air show at a race track in the vicinity, which, if reports are to be believed, was more productive of expenses than of sales.

Considering all these facts, it is perhaps not surprising that the New York agents are finding it difficult to run their business on a remunerative basis, and are about to make an effort to exact a larger commission from the manufacturers. The subject was discussed at a recent meeting of the local dealers' association, and a general meeting of the association is to be called at an early date to take action in the matter.

It is extremely doubtful, however, whether an effort to secure a larger commission than is paid to dealers in other parts of the country will be successful. It matters little to the manufacturer where his cars are sold, and he has no reason for spending more to sell them in one locality than in another. It is true that New York dealers do considerable advertising in the newspapers of the city, but agents in other cities do the same thing, and such advertising does not bring the manufacturers any business, except through the local agents.

The increase in the selling expense is coincident with, and no doubt a result of, the development of the automobile along lines of luxuriousness. If the present development could go on indefinitely; if a larger and somewhat more powerful model could be brought out each season, and the price be raised each time a couple of hundred dollars, the manufacturers could probably afford to allow a somewhat greater commission. But the future of the industry lies in another direction. In order that the automobile may become popularized, prices must come down, and especially must the selling cost be reduced, so that the greatest possible proportion of the price represents manufacturing cost. If an industry is to enjoy stability, the selling price of its products must be closely proportioned to their manufacturing cost; if the price of the products represents mostly selling cost, the prosperity of the industry is bound to be shortlived.

The solution of the problem of making the agency business more remunerative is probably to be sought in a partial reorganization of the business. Instead of handling only a single car, as is now frequently the case, the dealer should have a round line, so that when there is little opportunity for selling touring cars he could call on doctors, collectors, real estate agents, etc., exploiting the merits of his business runa-

bouts, and the line might even include trucks and delivery wagons. In this manner the volume of business done in a season could be materially increased without appreciable increase in the running expenses of the establishment.

A "Triumph of Invention."

From Detroit we learn of a double engine car which has recently made its appearance in that city. In a prospectus issued by the "exclusive manufacturers" of this car, high economy and great reliability are claimed as the special advantages, both features being claimed to be 100 per cent. It is explained that in case one engine should become disabled while out on the road, the other would carry the car home by using the low gear on all hills. This reminds us that a similar argument was used when two cylinder cars were first offered in place of single cylinder ones—that if one cylinder should fail, the other would furnish all the power necessary to complete the trip. Since that time it has, however, been learned that it is by no means always the cylinder, nor even the engine, that fails—there are interruptions in service due to the clutch, the change gear, the axles, the tires, etc. If any of these parts should give away on the double engine car, the extra engine would not avail, and as presumably these parts are, as on other cars, subject to derangement, the reliability can hardly be 100 per cent. To secure even approximately such a degree of reliability it would obviously be necessary to travel with two complete cars of which one, when disabled, could be taken in tow by the other, and it would not be surprising if some professional promoter should next favor us with such a convertible tractor-trailer combination, calculated to entirely do away with delays and repairs on the road.

Increasing Export Business.

The automobile export figures for the past few months show a very material increase over the same months last year, and indicate that there is a growing appreciation abroad of the quality of American automobiles. The shipments have recently been especially good to Canada and Mexico, which, with the United Kingdom, are our best customers. The automobile trade of Canada and Mexico is now almost entirely in American hands. One reason why our neighbors prefer American machines is undoubtedly the greater facility for obtaining repair parts expeditiously; besides, neither country is known as unusually wealthy, and most of their residents capable of purchasing automobiles must content themselves with cars of moderate price, of which class they find a greater variety on the American market than elsewhere. The continued and increasing demand for American machines in Canada brands as a libel the statement of a delegate to induce British automobile manufacturers to patronize a Canadian show, viz., that 3,000 American cars had been sold in Canada, and the owners were anxious to dispose of them at any price, as they could get no service out of them.

A factor that will undoubtedly have some influence in extending the market for American cars abroad is the fact that so far as external appearance goes most American cars are now almost identical with the standard foreign type, and therefore do not conflict with the foreign buyers' idea of how a car should look. Reports of the enormous development of the automobile industry in this country, so far as productive capacity is concerned, have also been spread abroad, and have no doubt added to the confidence in American machines. The history of American automobile exports has been one of steady, gradual growth; there have been no booms and no slumps in the popularity of the American car abroad, and it is to be hoped that the business may continue to grow in this same manner.

The Glidden Contest Conditions.

We notice that for this year's Glidden Tour the same basis of competition has been adopted as was used in the recently run Gold Cup Contest of the A. C. of Milan. In order to secure a perfect score a car must complete each stage exactly in a predetermined time; if it arrives either too early or too late it is penalized—two marks per minute in the former case, one mark per minute in the latter. This system evidently is the result of the search instituted by the A. A. A. some time ago for some basis of competition which would lead to a single winner and bring out the good qualities of the cars.

From the result of the Gold Cup Contest it may resonably be expected that the method will meet the former requirement; that is to say, it is most unlikely that more than one car will finish the whole contest without any marks of penalization, or that a number of cars will incur the same minimum number of penalization marks. But that the method will meet the second requirement, that of ensuring that the best car wins, is less certain. In order to win the contest a car must, of course, make a good run, and its achievement will entitle it to be classed among the best of the competing vehicles. But it is to be expected that if there is a fair number of entries there will be quite a number of cars that will incur no other penalization during the whole run than that due to error in judgment as to time on the part of the driver. At least this is what occurred in the Gold Cup Contest, where a number of cars were penalized less than one minute in a total distance of some 2,500 miles. If a number of cars set out to run a distance of 2,500 miles in a certain specified time, and all finished within one minute of the exact time, it would be foolish to claim that any superiority had been proven by the car that came nearest the exact time over the others. The better record is due simply to better judgment or skill of the driver, and a car which secured, say, sixth or seventh place under these conditions, having finished, perhaps, within a minute of the exact time, would hardly get sufficient credit for its performance.

It is, indeed, to be expected that under the present conditions a greater proportion of the total entrants will achieve approximately perfect records than under the old rule of penalizing involuntary stops, only that now the records will be approximately equal and perfect; whereas, when stops were penalized they were absolutely perfect. The new rule will probably lend additional interest to the contest from a sporting standpoint, as what position the car will occupy in the final classing will depend more on the driver than on the machine. In the same proportion as the sporting interest grows, the practical value of the contest decreases, however.

The difficulty of finding a satisfactory basis of competition which will insure that the most meritorious car wins is undoubtedly due to the fact that at the present time there are a great many cars on the market of such marked excellence that they will withstand perfectly any reasonable test to which they may be subjected—cars that will run 1,000 or 2,000 miles without any involuntary stop. The practical value of such contests as the Glidden Tour lies, therefore, more in the opportunity for determining which cars belong in this class and which do not.

MAINTENANCE AND REPAIRS

Carburetor Troubles.

By Frank S. Hanchett.

Perfect carburization is a matter of much moment in the operation of the automobile motor, and sometimes requires much experiment to attain. The novice, especially if not fully informed of the nature of the duties which the carburetor has to perform, generally finds it necessary to call in the help of an expert to secure the desired result. Therefore a few words in explanation of these points may not come amiss. The principle on which the carburetor works being that of the siphon, i. e., the indraught of the air creating a partial vacuum in the mixing chamber which causes the gasoline to spray out of the nozzle, and, mingling with the air, to be carried along to the cylinder as gas, it is obvious that anything which will interfere with the air current or tend to prevent the formation of the vacuum will destroy the gas making ability of the machine. In connection with this it may be stated that frequently carburetors are found with a screen in the air intake pipe for the purpose of keeping out dust and small particles of dirt. This screen must necessarily be fine meshed, and, owing to this fact, must be watched to prevent clogging. If oil is allowed to get on the screen dust will cling to it until the screen becomes almost a solid plate, and in this event no adjustment of the air control will serve to make the machine right until the obstruction is removed.

OBSTRUCTED AIR INLET.

This subject recalls to mind a rather peculiar incident in connection with a carburetor failure through loss of ability to draw air, which may bear repeating. While en tour an acquaintance of the writer drove through a small town where there was a considerable quantity of dead leaves strewn on the street. Suddenly while moving along at a good rate of speed the motor ceased to work, and the car stopped. Careful investigation disclosed no defect whatever in any part of the mechanism, so at last, in sheer desperation, the operator cranked the engine over, and it immediately started and continued to run in its former perfect manner. The operator, who was of an inquiring turn of mind, was so worried over this combination of circumstances, which seemed to admit of no explanation, that upon reaching the end of his day's run he conducted a very rigid investigation for the cause of the trouble. This time he was rewarded by finding in the drip apron a dry leaf, which carried on its face the oily imprint of the end of the carburetor intake pipe, showing that the leaf whirled up by the draught of the moving car had been sucked against the end of the pipe, cut off the air and destroyed the explosiveness of the mixture, thereby causing the motor to stop, whereupon the leaf fell from the end of the pipe, leaving the engine free to start when cranked over in the usual manner.

"A PIECE OF WASTE."

Another case was one in which the carburetor operated in an irregular manner, performing fairly well at low speed, but seeming to furnish insufficient gas at the higher speeds. This action was found to have been caused by a piece of waste which had apparently gotten into the intake pipe through carelessness in wiping, and been drawn into the mixing chamber, where it operated to choke up the throttle valve opening at high speed, the pull of the suction stroke being strong enough at that time to draw the waste into the throttle port.

WATER IN GASOLINE.

All gasoline contains more or less water, which, if not taken out by straining the gasoline through chamois skin at the time of filling the tank, will eventually find its way into the carburetor, and if not drawn off at weekly intervals will, when a sufficient quantity has collected, be carried over to the cylinder with the air, and, the mixture being non-explosive, will cause an engine failure. Trouble from water is of more frequency in winter than in summer, and should the water freeze in the bottom of the carburetor the result will be either to stick the float valve or actuating arms, or cause an intermittent firing of the engine, the explosions ceasing totally for a few seconds and then suddenly commencing again, only to cease as suddenly as they started. This is caused by the ice taking up so much room in the float chamber that there is not space for a sufficient body of gasoline, in reserve, to maintain the proper height of the liquid in the spraying nozzle. The engine ceases to fire when the level gets too low and is unable to re-commence until enough gasoline has flown in from the tank to regain the proper height.

STARTING IN COLD WEATHER.

Another winter trick of the carburetor is to fail to vaporize properly in starting the engine, owing to the air being too cold to absorb the proper quantity of oil. This can be overcome by heating up the intake pipe of the carburetor, wrapping it with waste and pouring hot water on the waste. I have heated the intake pipe with a gasoline torch, being careful to keep the torch away from the carburetor and end of the intake pipe.

THE EXHAUST AN INDICATOR.

The perfectly adjusted carburetor furnishes a gas which gives an exhaust after combustion that is entirely colorless and odorless. A discharge of black soot from the exhaust pipe, accompanied by a strong odor, as of a smoking lamp, intensified, denotes the presence of too much gasoline. This can be more clearly demonstrated by opening the relief cocks on the cylinder when the engine is running. The flame which shows at the moment of explosion should be a bright, incandescent blue; should it be dark red and accompanied by sparks, too much gasoline is indicated; on the other hand, if the flame be yellowish, it means too little gasoline. The similarity between the carburetor and the ordinary kerosene lamp is very strong. If a lamp smokes, one naturally turns it down, as the smoking is due to the fact that more oil is furnished the burner than the oxygen which the burner is getting can consume; but if the lamp must be turned so low in order to stop the smoking that insufficient light is produced measures will naturally be taken to increase the supply of oxygen until enough is being introduced to burn all the oil necessary to produce the proper amount of light. Just as it is necessary to experiment in order to ascertain what height of wick will give the best light, so it is necessary to experiment with the carburetor adjustment until the best possible adjustment is reached.

METHOD OF ADJUSTMENT.

Starting with the needle valve which controls the gasoline supply to the spraying nozzle slightly open, and the air intake valve at its widest, and gradually closing the latter while opening the former, remembering that a change of a fraction of an inch in the position of the needle valve may sometimes be the difference between success and failure, and cranking the engine for each new adjustment, has been found to be as practical a method as can be used where nothing is known of the proper relative position of the valves. Once an adjustment has been attained at which the engine will start, it is a very easy matter to find the adjustment at which the engine will give the best speed and the most power when the throttle is at its smallest practical opening and the spark retarded. The writer once saw a carburetor, which through looseness of binding nuts had slipped out of adjustment and stopped the engine, worked with for over an hour by the driver, who had been told by his predecessor that the needle valve was turned one and one-quarter turns open, when the real amount of opening was only that which was given by two notches on the edge of the wheel handle of the valve, each notch being about one-eighth of an inch wide. The proper adjustment was discovered when the experimental adjustments were carried on in the manner previously described.

BLAMED UNDESERVEDLY.

The carburetor is frequently blamed for imperfections in the motor operation that arise from entirely different causes. A case in mind is one in which the owner of a large car called on the writer for advice as to the make of carburetor which would restore the car to the power and speed it had when first purchased. From the statements made by the interested party it developed that the machine had gradually fallen down, in spite of having had the carburetor changed twice, both carburetors used being of the best makes on the market. Suspecting some

other cause for the trouble than poor carburation, the supply pipe was taken down at the point of connection with the carburetor, and the flow tested by opening the stop cock in the pipe. This was found to be very weak, despite the fact that the storage tank was more than half full. Search was then made for obstructions, and a screen of whose presence the owner was entirely ignorant was found to be badly clogged. When this was taken out and cleaned, and connections once more made, the engine had all its old time vim and speed. This is a good illustration of one of the reasons why many people find the automobile so expensive to maintain. Changing the carburetor, which was done at no slight expense, had no effect on the trouble whatever, all that was needed being a working knowledge of the mechanism in question, helped out by a small amount of experiment, said knowledge to be obtained by a little conscientious study of the construction of the gasoline system and carburetor.

LEAKY FLOAT.

A miss or intermittent explosion coming from a weak spark is also quite frequently laid to the carburetor, when the trouble is entirely in the battery or wiring. A metallic float which rests on top of the operating levers, which actuate the float valve, has a tendency to puncture on the bottom from wear at the point of contact with these levers. This can be prevented by occasional tinning over, or, in other words, spreading a thin layer of solder over the surface of the metal with a soldering iron. In doing this care must, however, be taken that not enough solder be applied to add to the weight of the float in any marked degree, as this would deprive it of some of its buoyancy, necesitating a larger amount of gasoline in the chamber to lift the float from the levers, thus producing too high a level of gasoline in the spraying nozzle, bringing about flooding of the carburetor.

Four versus Six Cylinder Cars.

We have recently received two communications on the advantages and disadvantages of six cylinder cars from prominent manufacturers. The one on the advantages of the six cylinder car, from the Ford Motor Company, may be regarded as an answer to the other, from the E. R. Thomas Motor Company, which was published in some papers last week and was therefore undoubtedly known to the Ford Motor Company at the time they issued their letter. It may be pointed out that the views expressed in these two letters are represented to be those personally held by E. R. Thomas and Henry Ford, respectively. The E. R. Thomas Motor Company, it may be remembered, built a six cylinder racer for last year's Vanderbilt Cup race, and Henry Ford also built a six cylinder racing machine in the first place. It may perhaps be considered significant that a manufacturer of four cylinder cars issues a statement why he does not manufacture six cylinder cars.

E. R. Thomas admits the greater uniformity of torque and greater flexibility of six cylinder engines, but does not deem these advantages a compensation for the accompanying disadvantages, which he explains as follows:

"It is obvious that six cylinders weigh more than four, and hence the weight is greater on the front axle. The four cylinder car is easier to steer, is easier on front tires and is more comfortable, as the car being lighter in front will surmount obstacles with less jar and strain.

"Six cylinders require 10 or more inches longitudinal space in front of the dash in excess of that necessary for four cylinders; hence a six cylinder car requires 10 or more inches of increased wheel base, allowing the same tonneau room. The longer the wheel base, the longer and heavier construction is required to withstand the increased road strains.

"Six cylinders of equal piston area as a four cylinder will develop much less power than the four, owing to fifty per cent. increased friction of the two extra cylinders and cam bearings. The loss in general results is large, owing to the two extra pistons, the weight of the extra pistons and connecting rods working against the compression on the uplift, of two extra valves, and the fact that in addition to the loss of power generated great weight is added to the car by reason of longer wheel base and extra parts..

"Six cylinders require a longer and comparatively heavier crank shaft, and its liability to twist, spring and break is greatly increased. Accordingly more and larger bearings are necessarily required.

"The complications and troubles of six cylinders, compared with four, naturally increase fifty per cent.; but they seem to increase in a greater ratio. Timing of the engine is an instance; then come the more complicated systems of wiring, of lubrication, of cooling, of getting the proper mixture and distribution of the gas from the carburetor. Much more gas and cylinder oil are consumed for the amount of power, and there is much more battery consumption, and also fifty per cent. more attention to the motor is required.

"The problem of most manufacturers is to simplify, for the more complications the greater number of wearing parts, the more certain eventual increased annoyances and expense, and hence we regard the six cylinder car more of a fad than an ideal for the average touring car."

In reply to the charge frequently made by those who still advocate the four as against the more modern six cylinder type of motor car, Henry Ford has the following to say:

"The six cylinder motor not only is not heavier than the four cylinder one of the same power, but, on the contrary, is even somewhat lighter. Without authentic power tests at hand, the only way to compare the powers is to compare the piston displacement of each. Compression and speed being equal, the difference between the two will be so slight it may be considered a negligible quantity.

"The six cylinder Ford motor is rated at 40 horse power. The cylinder dimensions are 4½x4½ inches bore and stroke respectively. The total piston displacement in the six cylinders is therefore 360.5 cubic inches. Four cylinders having the same piston displacement would need to have a bore and stroke of 5½x5¼ inches respectively. (Motors of these dimensions are ordinarily rated at 50 horse power.) A four cylinder motor of the above dimensions would ordinarily have a flywheel of 20 inches diameter and weighing not less than 140 pounds. The Ford six cylinder has a 16 inch flywheel, weighing 65 pounds. By increasing this diameter to 20 inches the flywheel need weigh only 50 pounds, or 37 pounds if the diameter was 24 inches, the usual size in single cylinder motors. In short, the weight may be decreased to any desired amount by increasing the diameter.

"Road clearance being an object a small flywheel is used. If the four cylinder maker wanted the same road clearance and so reduced his flywheel to the Ford diameter—16 inches—he would have to put 175 pounds of dead metal into it to get the same results as he gets with his 140 pound 20 inch wheel.

"That the six cylinder motor of same total piston displacement is lighter than the four of same power is shown by the following: The two extra cylinders in the Ford weigh, with valves and all attachments, exactly 56 pounds. Two extra pistons and connecting rods complete, 17 pounds. The additional length of crank shaft and aluminum base is exactly compensated for by the necessarily larger diameter of parts in the four with its large bore and longer stroke. We then have 73 pounds of extra weight due to the addition of the two cylinders, which is, however, offset by 75 pounds reduction in the flywheel weight necessary for this type of motor. This leaves an advantage of 2 pounds for the six cylinder.

"But the larger cylinders necessary to produce the same power in four that we get from six would weigh fully 25 per cent more each than the smaller ones—they must not only be larger but the walls, water jacket spaces, pistons and other parts also must be larger. Consequently, the six cylinder motor is 25 to 30 pounds lighter than the four cylinder of same power.

"An even more convincing demonstration would be to weigh a six cylinder motor on the same scale as a four cylinder of the same capacity."

The German Automobile Club at its last meeting decided to organize a scientific competition for carburetors and cooling devices, in which undertaking it will be aided by the related Technical Association.

NEW VEHICLES AND PARTS.

Some Features of the 1906 Carter Cars.

Since the general description of these cars (see Vol. 17, page 320) was written some detail changes have been made, and drawings illustrating various parts have been obtained.

The use of band brakes upon the rear wheels has been discontinued, and internal brakes, inclosed from dust and mud, are now used. The brake shoes are faced with camel's hair belting and expanded by cams. They are operated by the right foot pedal, which is retained in any desired position by a ratchet.

The front axle is a single I section casting of Parsons' manganese bronze. The pivots are of the Lemoine type, the thrust being taken on ball bearings. The pivot levers are forced on taper squares on the lower end of the pivots and held in place by brazing and by riveting over the ends.

The tank outlet, shown in Fig. 1, provides a simple means for giving a warning when the gasoline supply is low. A is the bottom of the tank, and B a round dish-like casting, within which are two tubes C and G. Ordinarily the fuel is taken through tube C, but when its level reaches the top of this tube, and warning is given that the fuel supply is low, there is still 1½ inches of gasoline in the tank, which may be used by opening globe valve I. Any sediment in the gasoline tends to collect in B, and may be drained off by removing plug H.

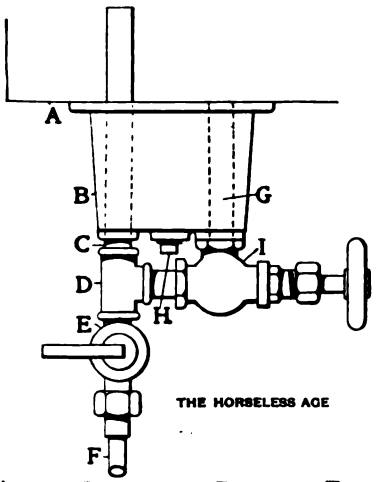


FIG. 1.—OUTLET AND DRAIN OF TANK.

In view of the fact that the recent Two Gallon Efficiency Contest seems to show that the sliding wheel and disc friction drive possess about an average degree of efficiency for light cars at low speeds, it may be of interest to show some details of the Carter car speed changing device, which is of this type.

The driving shaft and disc are shown in Fig. 2. The three studs A are secured in the flange of the flywheel, and drive the disc through the spider C, which slides on the rear end D of the crank shaft, and is keyed and pinned to shaft E. Upon the rear end of this shaft is forced and keyed the driving disc F, which is made of an aluminum composition, and 20 inches in diameter. The thrust from the friction wheel is taken on a circle of three-quarter inch balls G, mounted in a hardened steel cup, which is forced into the bronze case L; the hub of L extends through the bracket J, in which it is free to slide, but it is held from turning by a feather. On its rear end is fastened a collar, with two projecting pins on which are rollers I. Through slots K K in bracket J pass bolts which secure it to a heavy I section cast steel cross member of the frame. Upon pins in the rear end of bracket J is mounted the forked lever H, whose lower ends are cam shaped and whose upper end connects directly to the left foot pedal. Pressing this pedal forward forces the cam faces of H against rollers I and presses disc F against the friction wheel. The leverage ratio from the pad of the foot pedal to the disc is about 18 to 1, and the movement of the disc is one-eighth to three-sixteenth inch. The collars M control the adjustment of bearing G; and the relation of cam lever H to rollers I may be adjusted by moving bracket J in slots K. Disc F is normally held out of engagement by springs B.

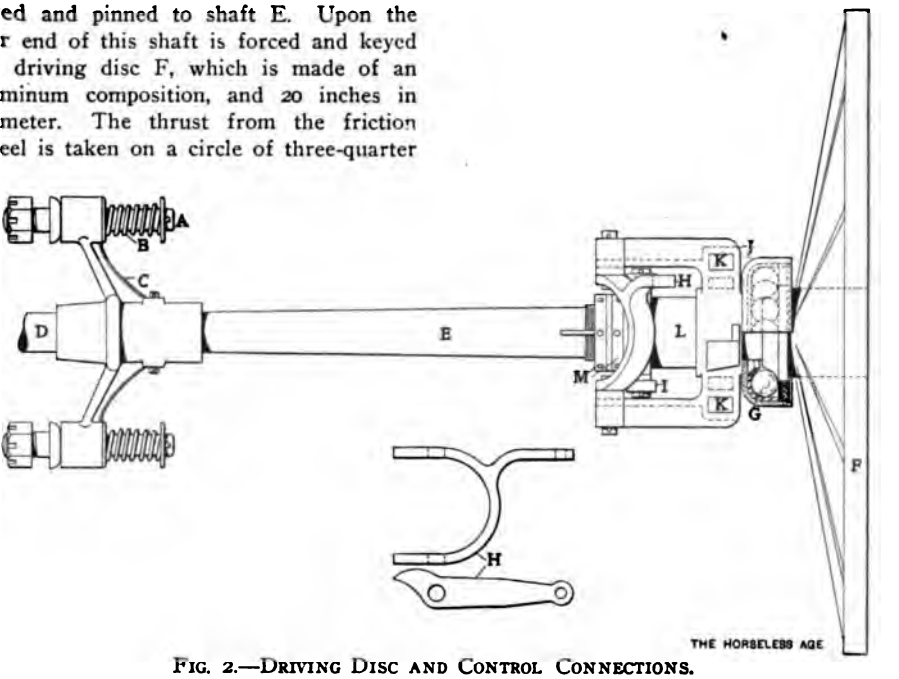


FIG. 2.—DRIVING DISC AND CONTROL CONNECTIONS.

Fig. 3 shows the sliding friction wheel and shaft, as it would appear looking from the rear of the car toward the front, when in the high speed position. The friction ring A is 20 inches in diameter by 1⅝ inches face, and seven-eighth inch thick. It is made of a paper composition, and is clamped by screws between a flange on the wheel rim and a forged steel ring, projecting one-quarter inch beyond the flange. This wheel slides on a feather on shaft B, and can be moved to the right until its hub reaches shoulder I on the sprocket hub.

The ends of shaft B run in American roller bearings, mounted in bronze balls F, which are held from turning by pins not shown. These provide for flexure of the shaft caused by pressure of the disc and pull of the chain, which forces act together.

Spherical cases D are fastened to brackets H, which are riveted to the frame in such a manner that they may be adjusted up and down or from front to rear as required. It has been found important that the centre line of the disc shaft produced should pass through the centre line of shaft

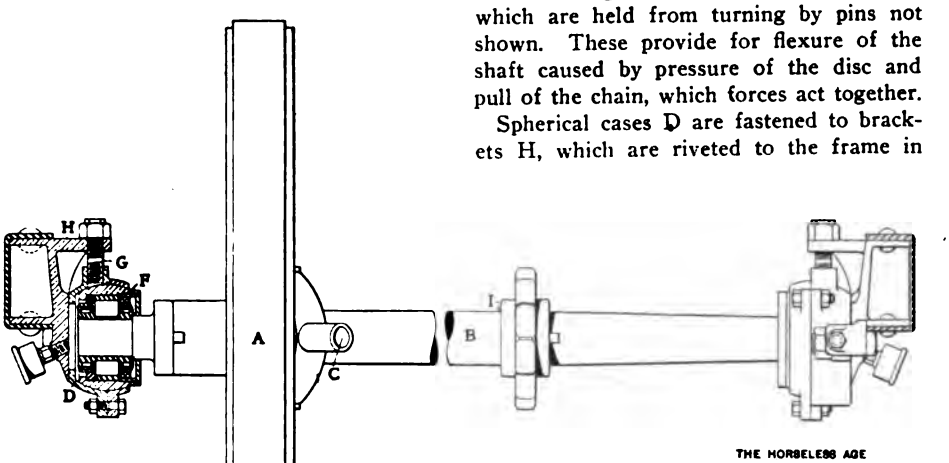


FIG. 3.—FRICTION WHEEL AND SHAFT.

B; otherwise the friction wheel will tend to "crawl" in or out on the disc. With this adjustment properly made there is no need of fastening the friction wheel in position, and no locking device is provided on the hand lever.

The paper filling is guaranteed to wear for one year, and a new one is furnished for $2.50.

The Meiselbach Gasoline Motor Trucks.

The A. D. Meiselbach Motor Wagon Company, of North Milwaukee, Wis., are building a 2 ton truck and a 1 ton delivery wagon, which are said to be of such construction that they can be operated by any truck driver of ordinary intelligence.

The delivery wagon has a wheel base of 84 inches, a gauge of 56¼, and is fitted with 36x3½ rear and 32x3½ front side wire solid rubber tires. A maximum speed, loaded, of 15 miles per hour is claimed. Special designs of bodies to suit different conditions can be fitted to the chassis.

The gasoline motor is of the double cylinder opposed horizontal water cooled type, of 5 inches bore and 4½ inches stroke. The valves are 2⅛ inches in diameter, and the valve stems are supported in guides 5¼ inches long. The piston pins are of tool steel, 1¼ inches in diameter, and with 2¾ inch length of bearing. The crank shaft is of 1¾ inch diameter and is supported in babbitt metal end bearings 5 inches long. The motor measures 19¼ inches in width by 31 inches in length over all, and weighs complete with flywheel 370 pounds. The crank case is fitted with cover plates on top and bottom.

The wagons are fitted with a bevel friction change speed gear, as illustrated in the view of the chassis herewith. It will be seen that the gear comprises two beveled friction discs, with three beveled friction pulleys on the driving shaft between them; also, quick acting end thrust boxes for controlling the motion of the discs, and lever and pedal connections for operating the device. By the arrangement employed the alignment of the driving shaft is not altered when the friction cones are forced into contact with the friction discs. Within the hubs of the friction cones are ball bearing thrust journals which take up the thrust due to the pressure at the frictional surfaces.



CHASSIS OF MEISELBACH TRUCK, SHOWING FRICTION DRIVE.

As the two side discs engage diametrically opposite points of the friction cone they are driven in opposite directions. The shaft of the left hand disc transmits its motion to a parallel shaft in front of it by means of an enclosed pair of spur pinions which remain constantly in mesh, and from the latter shaft and the shaft of the right hand disc the power is transmitted to the two rear wheels by chains. The most rearward friction cone, which slides on a sleeve on its shaft, is forced against the side discs by means of a hand lever. It will be noticed that the discs have stepped beveled surfaces, and that there are two cones adapted to engage with the outer one of these surfaces, the rear one of the two giving the slow forward speed and the forward one the reverse speed. The high speed forward is obtained by means of the cone engaging with the inner beveled surfaces of the friction discs. The friction gear combines the functions of a friction clutch, change speed mechanism and differential gear. The makers state that the problem of the proper frictional surfaces has been the subject of experiments extending over a long period, and that the frictional parts last three years, and can be renewed at a cost of $1 each. The change speed gear also serves the function of a double acting brake, by engaging two of the speeds at the same time. We learn that this gear will also be placed on the market separately.

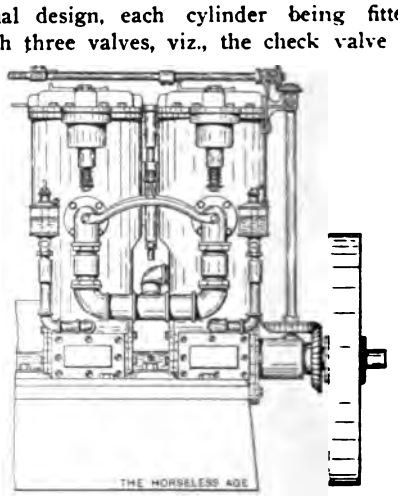
The rear axle of the 1 ton delivery wagon is a steel forging of 1¾ inches square section, and fitted with Timken roller bearings. The rear wheel driving sprockets are crucible steel castings, cut with forty teeth for a chain of 1¼ inches pitch and five-eighth inch roller. The front axle is of 1⅝ inches square section and of Timken make. The rear springs are of the platform type, while the front springs are semi-elliptic and contain seven leaves each.



THE MEISELBACH GASOLINE MOTOR TRUCK.

The Arrow Two Cycle Motor.

The Buffalo Auto Truck and Motor Company, 37 Mississippi street. Buffalo N. Y., manufacture under the Eckhard patents a new type of two cycle gasoline motor in various sizes up to 80 horse power. The engine is of somewhat unusual design, each cylinder being fitted with three valves, viz., the check valve A

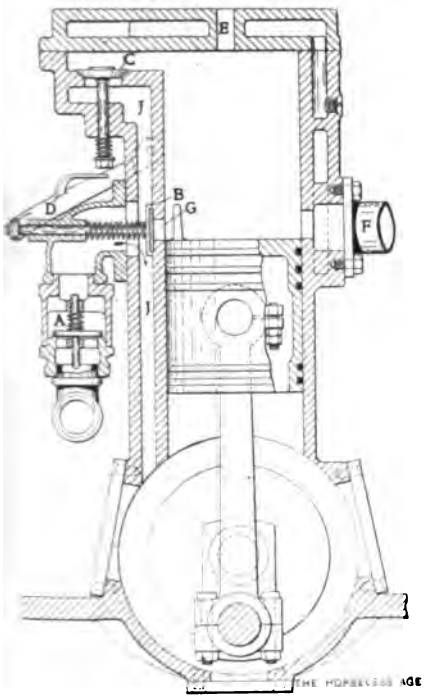


SIDE VIEW OF TWO CYLINDERS OF BUFFALO ARROW MOTOR.

in the inlet pipe; the throttle valve B which controls the inlet port in the side wall of the cylinder, and the governing valve C. The operation of the motor is as

llows: When running at light load, when ıe piston is at the bottom of the stroke nly the exhaust port F is uncovered, the ılet port G being closed by the throttle ılve B. During the upward stroke of the ston a slight vacuum is produced in the ank chamber, and a charge is drawn in ıst the check valve A and through the in- t passage J. At the end of the upward roke the check valve A closes, and dur- g the downward stroke of the piston the ıarge is compressed in the crank cham- er. When the compression pressure in ıe crank chamber reaches about 5 pounds er square inch, the governing valve C pens, and part of the charge from the ank chamber is forced through this valve ıto the combustion chamber, where it is ompressed during the next upward stroke f the piston and fired at about the end f the stroke by means of a spark plug crewed into the cylinder head at E. The aximum compression in the crank cham- er is about 10 pounds per square inch.

In case it is desired to increase the ower, the throttle valve B is opened by neans of the link D, which controls both



Section of Buffalo Arrow Motor.

it and the governing valve C. Then the charge from the crank chamber will enter the cylinder through the port G, and a larger charge will be admitted, there being less or no throttling effect. The upper end of the link D slides on a vertical guide rod secured to adjacent cylinders. The throttle valve B is, of course, opened by moving the upper end of this link downward; by moving it upward, the ignition is first cut off and then the control valve C is opened, so that a charge passes into and out of the cylinder with each reciprocation of the piston, without being ignited. In this manner one pair of cylinders can be cut out at will, and the other pair operated singly. Great flexibility and high fuel economy are claimed to result from this method of control. The link D is connected to a finger lever moving over a quadrant, and the valves can therefore be regulated accurately and positively. As the spark is cut out before the control valve C is open, there is no danger of explosions occurring in the crank chamber when the engine speed is throttled down. The normal speed of the engine is 600 r. p. m., and the throttle control is said to allow of speeds as low as 100 r. p. m.

The motor is built with either jump spark or make and break, but the makers recommend the make and break as being more reliable. The cylinders are water cooled, and the water connections are so placed as to insure a fairly even temperature of the cylinder walls.

Among the different sizes of engines manufactured is a four cylinder 40 horse power fitted with make and break ignition. This motor has cylinders of 7 inches bore by 8 inches stroke; a flywheel 20 inches in diameter, a 2⅛ inch crank shaft, and a base 16 inches wide by 41 inches long; it has a normal speed of 450 r. p. m., and weighs complete 750 pounds.

The New Hartford Universal Joint.

The Hartford Automobile Parts Company, of 438 Asylum street, Hartford, Conn., has brought out a new type of universal joint for shaft drive cars which embodies a new application of an old and well tried principle. As will be readily perceived from the illustration, the joint has no centre block or spider, but consists of double arm driving yokes with spherical or ball ends, these ends fitting into sockets in an annular ring. This socket ring is made in halves, and each pair of half sockets is slotted sufficiently to admit the neck of the balls, and allow an angular movement of the yokes of 15 degrees either side of the normal. It requires four half rings identical in construction for each complete joint, either pair of halves being of necessity assembled with the breaks at right angles, so that when bolted together the four parts become a rigid ring. As a reinforcement and to hold in place the pressed steel enclosing casings, an outside steel flanged ring is fitted. The casing is all metal and consists of two semi-cylindrical covers closing over caps fitted to the driving hubs, the joint being made grease tight by means of felt packing.

Many advantages are claimed for the application of a pair of ball and socket joints to obtain a universal drive. Besides the fact that a spherical bearing will work under a greater pressure per unit of area, with less friction and less danger of cutting than a cylindrical bearing, attention is called to the impossibility of the friction loss in this form of joint increasing with the load. Many types of joints of light construction, the bearings of which are in perfect static alignment, show an appreciable loss of power when subjected to load. In the Hartford joint no such cramping effect is possible, it being evident that free motion would not be interfered with, even if shock or overload were sufficient to bend the driving arms somewhat. It is also pointed out that the construction gives great strength by carrying the weakest point of the system far out from the centre, thus decreasing the breaking strain.

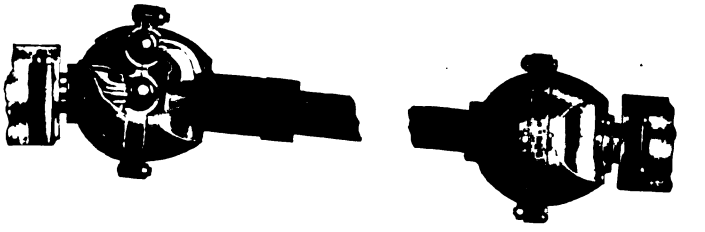
All parts of the joint are of steel, and are interchangeably machined. The driving yokes are forged from carbon or nickel steel, according to specifications, the ball ends being case hardened. The socket rings are forged from tool steel and spring tempered, the combination of metals resulting in a bearing of high quality. Ample provision is made for efficient lubrication. An annular groove is cut in each spherical socket, with large channels connecting to



Parts of Joint.

the grease chamber. The rapid revolution of the joint forces the grease directly onto the friction surface of the balls.

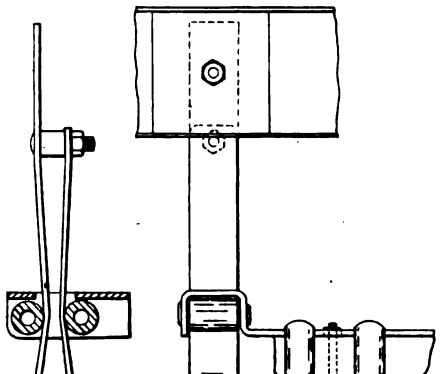
A London garage offers to undertake the entire up-keep of a 28 horse power car for $125 a month, or $1,500 a year. The car must be bought from the firm in the first instance, and the annual mileage allowed is 6,000 miles—above that an extra charge of 18 cents a mile is incurred; but these conditions fulfilled, the owner is relieved of all responsibility under every head, and the car is always at his disposal for the sum named.



The "Hartford" Universal Joint.

The Shippey Shock Absorber.

Geo. E. Shippey, 220 First street, Pittsfield, Mass., has recently been allowed a patent on the shock absorber here illustrated. It is simply a flat spring which is

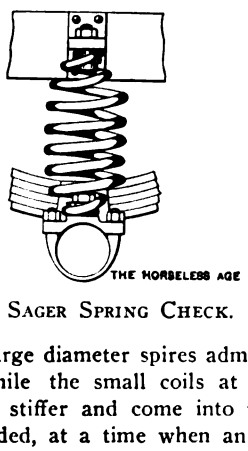


THE SHIPPEY SHOCK ABSORBER.

fastened to the body of the vehicle, the spring working between two rollers in a holder which is attached to the vehicle spring by a clip. The shape of the spring allows free action of the springs to a certain point, when a gradually increasing resistance is offered. A set of these shock absorbers has been in use for the past six months, and is said to have proven very satisfactory.

The Sager Equalizing Spring.

J. H. Sager Company, Rochester, N. Y., manufacture a simple device for modifying the action of vehicle springs, as illustrated by the line drawing herewith. The device does not comprise any frictional parts, but consists simply of a coil spring of the barrel pattern with an eye at each end. One end is fastened to the axle, while the other end is fastened to the body or upper frame work. The barrel spring pattern has the advantage over other types of coil springs,



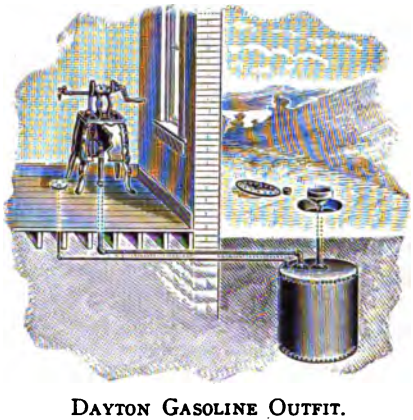
SAGER SPRING CHECK.

that the large diameter spires admit of easy action, while the small coils at each end are much stiffer and come into play only when needed, at a time when an overload is applied or a violent rebound occurs. The spring is so designed and placed that it acts in the capacity of both a compression and tension spring, changing automatically with the up and down movement of the body of the car.

For runabouts, touring cars and light delivery cars the coils are 7 inches in length over all, with an outside diameter of 3½ inches, and made of crucible spring steel, oil tempered, and varying in gauge as follows: ¼ inch, 9-32 inch, 5-16 inch, 11-32 inch, ⅜ inch and 7-16 inch, according to the weight and capacity of the car. For heavy commercial motor trucks of 2 ton and upward capacity, the coils are 10½ inches over all, and 4 inches outside diameter, and made of one-half inch rod and upward, according to the weight and carrying capacity of the car.

The Dayton Gasoline Storage Outfit.

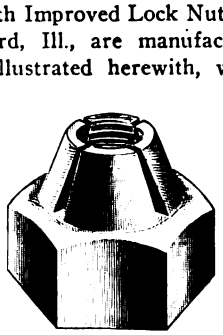
The cut shows the Dayton gasoline storage outfit, made by the Boyer-Radford & Gordon Tank and Pump Company, of Dayton, Ohio, and represented in New York by H. E. Dobson, of 120 Liberty street. The outfit was described in our Garage Number, but the cut was inadvertently omitted. A special feature of the outfit is the automatic registering device which enables the owner to tell what amount of gasoline has been drawn from the tank during a certain period.



DAYTON GASOLINE OUTFIT.

The Smith Improved Lock Nut.

The Smith Improved Lock Nut Company, of Rockford, Ill., are manufacturing the lock nut illustrated herewith, which they



claim to be specially adapted for automobile use. The nut is all in one piece and can be taken off and put on the bolt in the same way and just as easily as an ordinary nut. It is made of steel, and tapped all the way through, then the conical projection is slotted and slightly compressed, and the nut is then tempered, which gives it a strong grip on the bolt, and it is claimed that it can never come loose, and yet may be easily removed or put on with a wrench. These nuts are made with the standard threads and fit any common standard bolts.

Infringement Suit Under Maybach Gear Shifter Lock Patent.

The Daimler Manufacturing Company, Steinway, N. Y., have filed a bill of complaint in the United States Circuit Court, seeking to enjoin the Corbin Motor Vehicle Corporation, New Britain, Conn., from the use of a method of interlocking shift gear mechanism, which is alleged to be an infringement of one of the Maybach-Daimler patents, which are now controlled by the American Daimler Company. Patent No. 686,100, which was issued to W. A. Maybach November 5, 1901, describes a slotted locking plate which is actuated by the shifting lever to hold in position two or three shifting bars, while the remaining shifting bar is free to move under the control of the lever which communicates with it by means of a rack and pinion construction. With the transverse movement of the lever the locking plate is moved in such a way as to check or release the proper bars by engaging the slots cut in their under side. The specifications further include the use in this combination of the gridiron segment and the rack and pinion shifting mechanism for actuating the bars. They do not, however, constitute a claim for the use of either individually.

The Corbin Motor Vehicle Corporation assert that the construction claimed to be an infringement has been covered by an earlier patent. They say that they have been prepared for a number of months for this suit. The attorneys representing the Daimler Company are Houston & Houston, 38 Park Row, New York city, and the attorneys for the Corbin Company are Bartlett, Mitchell & Mitchell, 41 Park Row, New York.

In England some experiments have recently been made in the use of kerosene in an internal combustion engine with concentric inlet and exhaust valves, the latter inside. The ordinary carburetor is used, and the engine is started with gasoline, but after a moment's operation the kerosene is turned on, and the sprayed kerosene is claimed to be vaporized in passing around the heated exhaust valve. The tests were made on a Parsons engine, and showed a fuel consumption of one-tenth gallon per horse power hour.

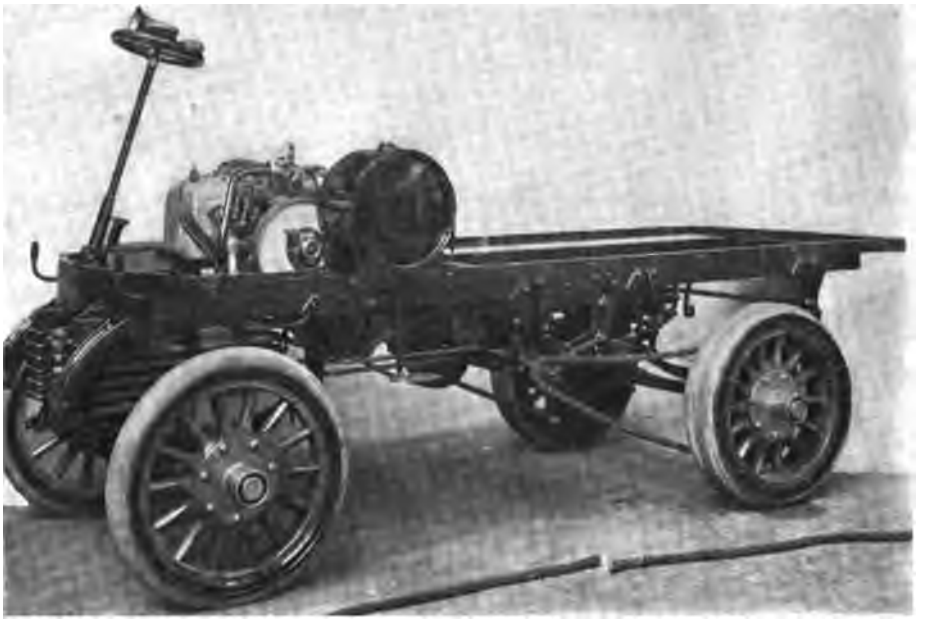
In retaliation for the recently passed anti-automobile legislation (automobile tax bill and automobile indemnity bill) some German automobilists are withholding their contributions to the German Navy Union, a patriotic association endeavoring to promote the development of the German navy.

Commercial Applications

Motor Tower Wagon for Trolley Line Repair.

During the last five years trolley tramcars have been laid down extensively in the streets of all the large cities and towns in Great Britain, and many of these lines are owned and operated by the local authorities. For repairing the frequent breakages of the trolley wires it has hitherto been the custom to keep a pair of horses constantly harnessed to a tower wagon at two or three points along the various routes, to run out immediately in response to a telephone message. Such a method entails not only considerable loss of time but also of revenue, particularly if the breakdown happens to be more than a mile away and anywhere near a terminal.

In the city of Glasgow the cars are owned by the corporation, and they have recently purchased a motor tower wagon which has been so successful that some more are ordered. The complete vehicle illustrated was designed and built by the New Arrol-Johnston Car Company, Ltd., of Paisley, and has many special features. The motor is a two cylinder horizontal, water cooled, with two pistons to each cylinder, and is situated in the fore part of the wagon. The water and gasoline tanks are behind the dashboard, and the radiators are placed in front of and below the frame, but are kept some few inches within the line of the front spring hangers, so as not to be injured in case of collision; as in all the commercial vehicles constructed by this company the radiators take the form of a triangle, the apex pointing to the rear of the vehicle and the base being toward the front. every one of the gilled tubes therefore receiving the full benefit of the air draught. The transmission is by a leather faced cone clutch, three forward speed and reverse gear box, differential within gear box and countershaft carrying two side drive roller chains. The pedal brakes on the countershaft are doubled and are of huge dimensions, as many of the streets are steep; a side lever actuates two internal expansion brakes within drums bolted to the rear wheels. The frame is pressed steel, and carried high above the wheels to enable adjustments of engine, etc., to be made without discomfort.



ARROLL-JOHNSTON CHASSIS FOR TOWER WAGON.

(Note how steering column is brought to front edge of frame to economize space.)



GASOLINE MOTOR TOWER WAGON.

The arrangements for the tower are novel; all parts of this except the working platform are made of angle steel, properly braced and strengthened. The tower rests on a platform over the rear wheels and is really in two sections, each section being 12 feet high, thus giving a total lift of 24 feet when the inner one is raised by a winch on the wagon floor. The platform is erected on a hardened steel turntable, and is carefully balanced, so that it can be swung round horizontally in any direction and locked by a single screw down handle which operates a set of wedges. This revolving platform has been found of great service in busy thoroughfares, as, instead of the vehicle standing in the middle of the road and blocking one line of horsed traffic, it can be drawn up at the curb and the platform turned out at right angles to the wagon. The outward end of the platform is stayed by tension rods to the inner end; the wooden uprights on the platform and the safety railing around can be folded

down flat on the platform by the removal of four thumb screws, the five uprights on either side being hinged to the platform. In the space below the tower reels of wire are carried; behind the driver are two large tool boxes, the tops forming seats for the workmen, and along either side of the wagon four ladders are slung, the ends of these all fitting into each other so as to make one long sixty rung ladder if necessary. To the rear of the vehicle a steel platform is extended to support a large tool box for carrying jacks, etc., for lifting a car or horsed vehicle clear of the rails.



MOTOR HARVESTING.

An Agricultural Motor Tractor.

The working of farm machinery by gasoline motors has attained considerable proportions in England; the word "considerable" is, of course, used only in a comparative sense, because farm owners are the most conservative men in the country, and their prejudice against any new fangled notions wants a lot of overcoming. However, the plain results shown by hard facts, accompanied by a saving in dollars and cents, appeals even to the most hidebound of farmers.

The pioneer firm in the agricultural line is the Ivel Company, of Biggleswade, a town situated in the middle of a big corn growing and farming district, and where facilities for practical testing exist, the factory being right on the edge of one of the largest farms. The machine is a three wheeler, driving by two rear wheels and steering by the front; the steering wheel is 20 inches diameter by 9 inches across the rim, and has a solid rubber tire of semi-circular section round the centre of the tread to give a good grip of the surface. The driving wheels are 40 inches diameter with a 9 inch rim width, and the steel tire has diagonal strips riveted on to give a good grip and to prevent the wheels slipping. The driving wheels are placed right inside the frame in one pattern, which is used for hop gardens and vineyards and for similar cultivation where space between the growth is restricted; the ordinary pattern has the wheels outside the frame. The framing is channel steel of heavy section, to withstand the harsh usage encountered in having to travel over rough field surfaces.

The engine is a two cylinder, horizontal opposed, each cylinder 5½ inch diameter by 5 inch stroke, and develops 14 brake horse power at 900 revolutions per minute. Inlet valves are automatic, ignition is by accumulator and coil or high tension magneto, and the engine is cooled by natural or thermosyphon system, a pump being thus unnecessary. In the standard pattern with outside wheels the water tank is carried on top of the rear axle, and holds about 50 gallons, the weight of the tank and water being found to give a better tractive effect to the wheels. The quantity of water carried will allow the machine to be run straight away for twelve hours, and then it needs refilling. The engine and main bearings are lubricated by an automatic oil pump, which takes its supply from a 5 gallon tank strapped to the side of the water tank. The funnel seen in the illustration carries off the exhaust from the silencer, and the small diameter vertical pipe beside it is a steam escape from the water tank.

No gear box is employed, the drive being directly forward or through an unenclosed gear reverse. The transmission has been designed so that any farmer with a mere smattering of mechanical knowledge can always keep it in order. The engine is so set in the frame that the crank shaft is parallel with the back axle; the shaft is extended on one side of the engine and carries the female halves of two 18 inch leather faced cone clutches, which revolve loosely upon it; these clutches are so placed that either of two male cones fixed to a sliding sleeve on the crank shaft can be engaged with one or other of them, the neutral being in a central position between the two female cones. For the forward speed the single lever to the left of the drive is pushed over, and one of the male cones engages with one of the female clutches, upon which a small sprocket wheel is rigidly mounted; a chain runs over the sprocket to another sprocket on a countershaft, and a second chain transmits the power to a large sprocket bolted round the back axle, no differential being fitted. The reverse is by means of a gear wheel bolted to the second female clutch, which meshes with a larger gear wheel fixed to the countershaft.

The crank shaft is extended on one side right outside the framing, and a small diameter flat pulley is keyed thereon, over which a belt can be run for driving a threshing machine, winnower, chaff cutter and similar machines in a farmyard, it only being necessary to put the forward and reverse lever in the neutral position for such a purpose. The steering is by a horizontal wheel on a vertical column, light steel tension rods connecting from the base of the column to a cross arm on the front wheel fork post; the front wheel is carried in a vertical fork, which extends up through the frame so as to bring the cross arm in a direct line to the tension rods. The driver sits in a pan seat sup-



THE IVEL AGRICULTURAL MOTOR TRACTOR.

ported on a large flat spring above the tool box.

This machine will easily draw a three furrow plow, turning over a strip about 30 inches wide and from 8 inches to 10 inches deep at a speed of 3 miles per hour on average land. The following figures have been obtained from a user who has had one of these machines in use for two years, and with the details accompanying are authentic and were supplied without the manufacturer's knowledge. Says the user: "I can plow 2¼ acres per day, using a double furrow plow, plowing 6 inches deep and each furrow 9 inches wide, at half the cost either by horses or steam. My land is heavy, and I am obliged to use three horses, with man and boy, to do only three-quarters of an acre per day, therefore it would take three teams (equal to nine horses), three men and three boys to do 2¼ acres. Comparing cost the result thus works out for 2¼ acres with each method: With horses—Nine, at 60 cents each per day; three men, at 72 cents each per day, and three boys, at 24 cents each per day; total, $8.28. For steam—Plowing, at $6.48; cost of coal and carting same and water, $2.70; total, $9.18. For the motor tractor—One driver, $1.08 per day; one plowman, 60 cents per day; oil and grease, 24 cents per day; gasoline, 2.52; total, $4.44. There is thus a clear saving over steam of $4.64, and over horses of $3.84. In addition I use the machine for cultivating the land crossways of the plowing, which it has done most successfully. I use it also for chaff cutting—five days straight off—and at this work can show a clear saving over steam of $1.80 per day. It drives our 5 foot double blast thresher with a straw trusser behind as well as is done by a steam engine, at a large saving in cost. I also do considerable hauling from the railway station to the farm and haul the heavy thresher all over the place and up some very steep hills." From another user a still better report reaches the writer, and from the figures sent the following is extracted: "I bought my motor in October, 1904, and sent one of my men who was accustomed to self binders to the works for a fortnight, and he can manage it quite well, and I rarely have a stoppage. I haul all my oil cake, seed potatoes and everything required on the farm from the railway station, 5 miles away; plow and drag my land, and last autumn cut all the harvest with it. In winter I use it for grinding and preparing the food for all the live stock. In the thick of the harvest last year, when rain threatened, I cut 50 acres of wheat in two days and one night, running all night and without a single stop in respect to the motor. On that occasion it was hauling two self binders at one time. I can plow 5 to 7 acres per day, at a cost not exceeding 72 cents per acre, as against horses at $1.92 to $2.40 per acre. I farm 1,400 acres of land, and since I purchased the machine in October, 1904, I have saved the wages of four men and cost of six horses, which means at least $16.80 per week; this saving has to be reckoned toward repairs and depreciation, but even then I can show a saving of at least $600 per year."

A third user, after eighteen months' experience, is most enthusiastic, and at the commencement of August, 1905, he cut 160 acres of wheat at a cost of 36 cents per acre for labor, gasoline and lubricants. The machine also hauls all the corn to the mill along the highway at a pace between 3½ and 4 miles per hour. A fourth user puts his machine to a great variety of purposes, plowing, threshing, sawing firewood in the woods, where a traction engine could not be taken, reaping corn, hauling two farm wagons at one time, breaking stones for the roads on the estate, sawing timber, chaff cutting, etc.



MOTOR HAYING.

Milford—Port Jervis Motor Bus Line.

A twenty passenger, 50 horse power motor bus displaced the old time stage coach on the line between Port Jervis, N. Y., and Milford, Pa., last Monday. For more than a century a stage line has been operated between these towns, and it is probably one of the most important left by the building of railroads. Milford is the county seat of Pike County, Pa., and a summer resort of note. Although the residents of the town have been clamoring for a railroad ever since the Erie left them 8 miles off its line in the early '40s, they have had to be content with the old time mode of transportation up to the present.

It is proposed to secure four cars and a truck for the transportation of passengers and baggage as soon as possible. The time consumed in making the trip will be reduced from over an hour to thirty minutes. It is possible to cover the 8 miles with the motor bus in twenty minutes easily, as the road is of hard packed shale, making a natural macadam roadbed, and there are no grades worth mentioning. The regular schedule will be half an hour, however, and connections will be made with all Erie trains. The regular stage fare of 50 cents per trip will be maintained. With the improved service, passengers from New York to Milford will be able to make the entire trip in two hours and a half.

The building of a garage is contemplated by the company as soon as the line is well in operation. Temporarily a large barn adjoining one of the principal hotels in Milford is being occupied. The drivers for the present will be expert operators from New York city, but later local talent will be substituted, thereby keeping the entire benefit of the enterprise within the locality.

Early in April of this year the proposed automobile line was much discussed, but nothing definite was done in reference to its establishment until May 1, when a stock company was proposed. Sufficient capital was easily raised to put the line in operation, principally among the proprietors of the summer hotels at Milford. The Delaware Transportation Company has just been organized under the laws of New York, with a capital stock of $25,000 and the following are the incorporators: Paul N. Bournique, proprietor of the Bluff House; Percy Lyman, proprietor of the Sawkill House; B. E. Brown, proprietor of The Homestead, and F. W. Cross, of Milford, and Emil Girard, of New York. The company was promoted and organized by Lawyer Xenophon P. Huddy, of New York.

The line will be extended farther down the Delaware Valley if there is a demand for it.

Successful Use of Automobiles in Canvassing.

During the successful campaign in Detroit to raise $400,000 to build a new Young Men's Christian Association building, a large number of automobiles were donated by different business men to be used by members of the building committee in calling upon people and soliciting their pledges. It was stated that more time could be given in making their appeals, and less time expended in going from place to place.

As a result a large proportion of the pledges were secured by men in automobiles—two men having secured $70,718 in pledges. It is not denied that the speed ordinance was broken when a prospective benefactor was being sought in a hurry, but it is said that the $400,000 banner carried on the autos insured protection against interference by the police, as well as constituting a fine advertising medium.

Commercial Vehicle Notes.

A. A. Vantine, of New York, the dealer in Oriental goods, has purchased six one-ton delivery wagons.

Mrs. C. F. Simmons has ordered a twelve passenger car to run between Ripon and Green Lake, Wis., this summer.

The Gully Automobile Company has been incorporated at Hollis, Okla., to operate a motor bus line to El Dorado and other points in Greer County.

The New York Transportation Company, hitherto employing electric cabs exclusively, have fifteen 18 horse power Columbia gasoline cars for rental purposes.

A motor bus line has been established from the nearest car line in Grand Rapids, Mich., to the Fifth Avenue Golf Club. A fifteen minute service is given.

The Allegheny County Commissioners have placed an order for a White steamer for the Pittsburg morgue, after inspecting the United States army ambulance at Washington.

A twenty passenger motor bus has been purchased by L. S. Mains, Portland, Me., to take the place of horse vehicles on his stage line between Portland and Casco. It began running on Memorial Day.

It is reported that the Jarvis Engine and Machine Company, of Lansing, Mich., have contracted to build 100 commercial automobile trucks for the Detroit Supply Company. They are to carry four tons, and are to be fitted with four cylinder engines.

Kaufmann Brothers, who conduct one of the largest department stores at Pittsburg, have purchased eight 1½ ton motor trucks for the transportation of merchandise from warehouses downtown to East End points, where light delivery wagons will make the final distribution.

A test with six White steam cars as vehicles for hire was recently made in Osaka, Japan, by Justes Briggs, of the Osaka Automobile Company. It is proposed to operate the cars in competition with 'rickshaws, which are now the only means of conveyance. Contracts for the installation of an electric railway are being held up until a further demonstration with an increased number of steam automobiles can be given.

Alcohol Engines.

By E. S. Foljambe.

At the present time the alcohol engine is practically an unknown quantity in this country, owing to the restrictions on alcohol, which, however, have just been removed. In Germany these engines have already attained considerable prominence, owing, doubtless, to the fact that gasoline and other fuels which are readily obtainable in this country at a comparatively moderate cost are extremely scarce and high priced there, while the quantity of potatoes raised is in excess of that demanded for food, and it is but natural that this article has been turned into alcohol for fuel purposes, and that the restrictions were very soon removed. The cleanliness and lack of odor of this fuel, combined with the ever increasing price of gasoline, is, however, bringing it into serious consideration as a fuel for at least automobile engines, and the removal of the alcohol restrictions will doubtless be the signal for the early appearance on the market of several engines of this type. It is known that certain automobile manufacturers are now experimenting with such engines, but, of course, it does not pay them to invest too much in this kind of work, unless there is fairly good assurance that such engines can be used in this country.

The calorific qualities of alcohol are very slightly less than those of gasoline, and it has been found that by mixing alcohol with a portion of benzol (C_6H_6), a byproduct in the production of gasoline, its heating effect is even in excess of that of gasoline. Alcohol contains a certain percentage of water, which during the power stroke of an internal combustion engine is converted into steam, and has a tendency to fatten the indicator card. It has been believed by many that the introduction of a certain quantity of water in the cylinder of an explosion engine by thus fattening the indicator card would materially increase the work done, but experiments along this line have developed very clearly the fact that the cooling effect, owing to the presence of the moisture, more than offsets any advantage gained, as indicated by the increased card area. It has been shown that a small quantity of water injected as spray into the cylinder at the proper moment on the compression stroke will slightly increase the work done, but the disadvantage caused by the added mechanism and the accurate adjustment as to quantity and time which are necessary more than counterbalance the advantages. However, in the case of alcohol, it has been argued that as the water is already contained in the fuel, no additional mechanism is necessary, and therefore there should be a material gain. This, however, does not seem to be true, but the water is of advantage in another respect, and that is the fact that owing to its presence a much higher compression pressure and consequent temperature are possible with alcohol vapor than can be used with gasoline. This higher temperature to a certain extent annuls the cooling effect of the moisture, and the resulting explosion is more nearly equivalent to that of gasoline vapor than the calorific value of the two fuels would indicate. This being true, the difference between the use of gasoline and alcohol would not cause a material increase in the size of the engine bore to do the same work, provided the carburetor and the compression space of the alcohol engine is well designed. With gasoline vapor it is conceded that it does not pay to exceed 110 pounds compression pressure, but with alcohol pressures of over 200 pounds per square inch can be used to advantage.

The general type of engine used for gasoline is perfectly suitable for the use of alcohol, with the exception that difficulty is experienced in starting, as the cold liquid alcohol does not form a proper mixture. However, after an engine has been running and is thoroughly warmed, alcohol can be used almost as well as gasoline, although the power will be reduced when using alcohol, unless an arrangement is provided by which the compression space can be reduced. The same type of carburetor which is suitable for one can also be used for the other, if suitably warmed. The means usually employed for starting such engines is to have a small auxiliary tank of gasoline from which a feed pipe leads to the carburetor, as well as a pipe from the alcohol supply, so that by turning a two-way valve either fuel can be used. Thus, the motor is started as an ordinary gasoline engine, and then switched over on the other fuel. Warming the inlet air has been found of advantage in using gasoline, but is of much more advantage when using alcohol. The heating of the intake air is usually accomplished by air jacketing a portion of the exhaust pipes, and in certain foreign machines where accumulators are used, a small electrical heater has been arranged in connection with a coil of pipe through which the alcohol is fed to the carburetor, so that this alcohol could be heated for starting the engine, thus doing away with the necessity for carrying two kinds of fuel. The proportion of the volume of the heated incoming air to the piston displacement which has been found most advantageous is from 12 to 15 per cent.

A patent for a paper waistcoat, specially suitable for motorists, which is shortly to be placed upon the market, has been taken out by Herr Schaer, a native of Bale, Switzerland, who has discovered a process for making paper pliable and soft, yet difficult to tear. The waistcoats, which can be folded and placed in an ordinary waistcoat pocket, cost 4 cents each. It is claimed for them that they are warmer than woolen waistcoats, and can be worn either by men or women under a coat.

Alcohol Fuel and Air Cooled Motors.

tor HORSELESS AGE:

have been speculating of late as to the ıable bearing which the prospective em- ment of alcohol fuel will have upon the ·ation of air cooled vehicle motors.

is generally understood that one of the f difficulties in the use of gasoline fuel air cooled engines lies in the fact that ı compression it ignites at a rather low ɔerature, so low indeed that the tempera- of the mixture, when raised by contact the rather highly heated walls of the e passages and combustion space and ɔressed, at times becomes self ignited, ɔendently of the spark. Under such con- ns the motor may "pound" noticeably, work with reduced power. As the ten- y toward self ignition increases with increase in the compression pressure , it often becomes necessary to design ooled gasoline engines to operate with a r compression than considerations of : efficiency would dictate. From what been published as to the properties of ıol as a fuel, it would seem that its ure, at any given degree of compres- is much less liable to self ignition than : gasoline mixture. This would appear ıply a higher temperature of ignition of ıixture, although its specific heat might into the problem to some slight ex-

Even though the specific heat of alco- ·apor is considerably higher than that ısoline, the temperature to which the ctive mixtures would be raised, under ame conditions, could not be very wide- fferent. That the alcohol mixture is to withstand a very high degree of ression without self ignition resulting ı seem to be demonstrated by the fact commercial alcohol motors, according blished reports, often operate with 120 ls gauge compression when water d.

vould seem that this property of a high on temperature, if really possessed by ol vapor, may possess a certain signifi- for the manufacturers and users of ɔoled vehicle engines. It would pre- bly allow of such motors being run at y considerably increased compression ıre without self ignition taking place. her the use of alcohol would allow the ression in an air cooled engine to be ısed to a point which would result in od efficiency as can be attained with ne fuel or possibly even better is of interest.

ıbtless air cooled engine builders are ly experimenting upon the new fuel, he automobile public would certainly ɔ know with what results.

: thing is certain—in alcohol we have in motors. If its adoption allows of any improvement in the efficiency or reliability of the air cooled engine the result will be welcomed. L. C.

Police Trap at Concord, Mass.

Editor HORSELESS AGE:

I wish to warn automobilists of the police trap at Concord, Mass. The details of the methods used were given to me by a lawyer friend, who recently defended an automobilist caught in the trap.

The method is a novel one, and both the town and the man in charge are coining money by its use. The officer stands in the central square, where he commands an excellent view of the three converging thoroughfares. Three ridges have been built across each of these roads at distances of 600 feet from the central square.

When an automobile passes over these bumps the oscillations of the body are easily detected by the officer, who snaps the stop watch and expectantly waits to see if he has bagged another $10. As the machine passes him he puts the number and time on a small yellow card for use as evidence, which never fails to convict.

Automobilists should stop after passing over the bumps, back up, examine the machine, and after a lengthy stop proceed on their way rejoicing. Care must be taken, however, to go slowly in receding as well as approaching, since there are bumps in each direction.

If all the automobile fines went to the State these local traps would disappear like a fog before the sun. They are simply run as a money making graft. When business has been slack, who knows whether a man in charge of one of these traps would not let a few seconds stand between him and the money?

Why not collect evidence and publish a blacklist of towns using traps and the methods employed by each?

E. Z. DODGE.

Explosion Engine Query.

Editor HORSELESS AGE:

The writer has noticed that in the majority of foreign and American four cylinder cars the heads of cylinders are water jacketed. It is, I believe, a theory of most all experts on the subject of gas engine design that it is advisable to keep the temperature of the cylinder as high as possible in order to secure the greatest economy and efficiency of engines. The writer understands, of course, that the temperature of the cylinder must not be great enough to allow the burning away of oil on the cylinder and piston walls. I presume there must be some good reason why the tendency of engine design is to completely water jacket the heads of cylinders, but should like to learn through your columns easily self started from the switch?

Another question. Can an explosiv charge of gasoline and air be slowl burned? To better explain my question, have noticed that frequently on four cy inder engines, with cylinders not entirel water cooled, while the engine may b started from the switch very soon afte stopping, if the engine is left standing fo some minutes it is frequently impossible t start, especially if the engine is very hc before stopping. I realize, of course, tha inability to start at the switch may b caused by leakage of gas past the rings. A a consequence the full value of the charg may be lost in this way, but it occurred t the writer that this inability to start migh be the result of slow combustion of th charge in the cylinder while the engine wa standing still. LOUIS A. RIEHMANN.

[Plain round discs without a wate jacket were used as cylinder heads to considerable extent in the early years o automobile construction, but later this typ of head entirely disappeared, owing, n doubt, to the fact that it was found that with the higher compressions that wer gradually being adopted, there was to much danger of preignition with a jacket less head. Comparatively high compres sion has been found very essential in build ing motors of high horse power and ligh weight, and the jacketing of the head wa thus necessary. At present almost all cyl inders have the heads cast integral, i which case it would appear to be abso lutely necessary to have the head jacketed as otherwise distortion of the cylinde would be sure to result, the head being th part exposed to the highest temperature.

When the engine is very hot, the charg drawn into the cylinder is naturally some what smaller, and if the head is not jack eted, the cylinder is probably distorted anc allows the charge to flow out past the pis ton. We believe that the difficulty of start ing on the switch under such conditions i thus explained, and do not believe tha there is slow combustion in the cylinder —ED.]

Jump Spark versus Make and Break.

Editor HORSELESS AGE:

I have read Mr. Gibson's reply to my criticism of his article on ignition ("Jump Spark versus Make and Break"). Mr. Gibson seems willing to admit that there is a slight difference in the igniting values of sparks, but contends that it is only slight.

As regards the loss of power with partially discharged batteries I have noted this phenomenon on all sorts of motors, from single cylinder motor cycle engines fitted with non-vibrator coils up to four cylinder touring car motors, both with individual and single coil systems. As the point which

I wished to prove was that there was a difference in the power due to the quality of the ignition, it is hard to see what bearing on the case the good or bad design of the outfit had so long as the ignition is regular.

Mr. Gibson slightly misquotes me when he states that I said that the much smaller advance required with the make and break spark proves the effect of the spark on the rapidity of the propagation of the flame. What I said was, "Another fact which goes to prove," etc. However, I have reasons for believing that in order to secure the best results it is necessary to cause the jump spark to actually occur in the cylinder sooner than would be necessary with the make and break.

I will state briefly my two reasons for believing this. The first is that the jump spark requires a much greater lead than the make and break, and the second the time interval which elapses between the completion of the circuit at the inner and the occurrence of the spark in the cylinder is probably very small. If we admit the fact that it is necessary to actually cause the spark to occur in the cylinder sooner in the one case than the other I see no dodging the issue that the latter spark has greater ignition efficiency.

I have also read W. S. D.'s communication on page 842. I have not the slightest doubt but that the time interval spoken of by him partially accounts for the difference of lead, but only partially. I come to this conclusion from the fact that there is still a marked difference when non-vibrator coils are used. It is probable in this case that the lag is inappreciable. HAROLD H. BROWN.

Queries.

Editor HORSELESS AGE:

There seems to be quite a diversity of opinion among repair men as to the proper material and method used in grinding in valves on gas engines. Some say use emery flour, some powdered oil stone, others glass. Some make a paste of the abrasive material with oil, dabbing the face of the valve in one or two spots, while others cover the valve face with oil and sprinkle with the cutting material. Again, some spin the valve backward between the hands, while others merely turn the valve in one direction a part of a revolution, lifting it from its seat each time. What constitutes the best practice?

My car, a large tonneau of popular make, has a water heated carburetor. I have been told by some to leave the water turned on in hot weather as in cold, as it gives more power to the motor from a readily vaporized gas, while others say turn it off, as hot water causes greater consumption of gasoline and heats the motor more rapidly than if the gas is cold; also, that it takes away part of the power. Which is right?

What horse power electric motor would be required to drive a 10 inch swing screw cutting lathe of the "Sebastian" type, which is used for light work in steel and brass; also, what speed motor and the proper size of pulley? "JUMP SPARK."

[We are not prepared to say which is the best method of grinding in valves; making a paste of emery flour and oil, smearing it on the seating face of the valve and turning the latter back and forth, but occasionally raising it from the seat, is a method very commonly employed.

We believe you will be well advised to let the water circulate through the carburetor, even in warm weather. With the warm water circulating through the carburetor jacket the temperature of the incoming charge is approximately the same winter and summer, and the gasoline feed has been adjusted for this temperature of the air.

A half horse power electric motor will drive the 10 inch lathe. A slow speed motor, 800 to 1,200 r. p. m., is to be preferred, as it lasts longer and allows of direct belting to the lathe countershaft. The countershaft of the lathe must run at about 150 r. p. m., and you must use pulleys of such a ratio as to give you this speed.—ED.]

Mercedes Magneto Adjustment.

Editor HORSELESS AGE:

I note from the sample copy sent me that one of your correspondents is asking about the setting of the magneto on Mercedes cars. I have been through this for the 60, 1904, which has, like the new models, a Simms-Bosch low tension magneto, in which the armature revolves, not the sectors. In my car, when the pistons are about 17 millimetres from the top centre, the magneto armature, which rotates in the same direction as the engine, has just left the pole piece, and a gap shows between the edge of the armature and the pole piece of about 1 millimetre. Under these conditions there will be sparking zone enough to cover a spark on the dead centre for the retarded position, and also when the lever is in the advance position, which gives a spark when the piston is 20 or 25 millimetres before the top centre. E. M., JR.

Who Has Repair Parts for the "Scott" Motor?

Editor HORSELESS AGE:

Can you or any of your readers supply me with information as to where new parts may be procured for a gasoline motor (vehicle or marine), branded "Scott," but without designation of factory location? The engine is described in part as follows: Double opposed cylinder horizontal type, 5x5 inches; automatic inlet valves and jump spark ignition. H. C. MATHIS.

[The motor referred to was probably manufactured by the Scott Motor Company, of St. Louis, Mo., which failed some years ago. We understand that they were bought out by another concern located in the vicinity of St. Louis, but are unable to say whether this firm is still in business and what its address is; perhaps some reader can furnish the information.—ED.]

Radiator Query.

Editor HORSELESS AGE:

I am proposing to construct a radiator to cool a 30 horse power, three cylinder engine. I propose to use three-eighth inch water pipe instead of the thin tubing. Will have regular radiating discs on the piping. I wish to ask if there will be any great difference between the radiating qualities of this pipe and the thin tubing. It is to be used where the extra weight of the pipe makes no difference. INQUIRER

[The extra thickness of the water pipe will not materially reduce the cooling efficiency, and the cooler should give about the same result as the standard article bought in the market, provided the flanges make good metallic contact with the tube —ED.]

Two Cylinder Compression Pressure.

Editor HORSELESS AGE:

In your issue of May 9 J. C. Liebhardt seems to intimate that my statements in regard to compression in two cycle engines were exaggerated. I wish to say that the compression was not obtained by the use of a lead pencil, but was registered by a pressure gauge screwed into the spark plug hole while the engine was turned over by the starting crank, and not very lively either The crank case compression was obtained in the same way. I have made a number of four cycle engines that had a compression of 90 pounds, and the cylinders were not ground, just bored. O. V. H.

British Speedometer Trials Awards.

The long looked for awards in connection with the trials which ended on March 31 last were issued on June 1, and it will interest our readers to learn that the Jones speedometer secured the British Automobile Club's gold medal. During the period intervening between the end of the trials and the issue of the awards, most exhaustive and searching laboratory tests were made as to the accuracy and general behavior of the instruments. The judges make a notification that at a later period a full detailed report will be issued. Following are the awards:

Fold medal, Joseph W. Jones' speedometer.

Silver medal, Elliott Brothers' motormeter.

Special gold medal for excellence of design, workmanship and accuracy. Kirby speedometer.

The order of merit of all the competing instruments is: First, Kirby; second, Jones; third, Elliott; fourth, Cowey indicator; fifth, Cratze; sixth, Vulcan; seventh, Cowey recorder; eighth, Warner; ninth, Stanton. The winning of the gold medal may be taken as a mark of very special distinction, the A. C. G. B. I. not having given more than about twenty for all kinds of competitions since it has been in existence, and any device gaining it may be deemed to have exceptional merit.

OUR FOREIGN EXCHANGES.

Theory and Practice of Lubrication.

(Abstract of a paper read before the Auto-Cycle Club of Great Britain by J. W. G. Brooker.)

THEORY OF LUBRICATION.

Lubrication is the art of making things work smoothly. Lubricants minimize the friction existing between two surfaces when one slides or rolls over the other; but they set up friction themselves, our engines having to overcome two classes of friction—the friction arising from the metal surfaces sliding over one another, and the internal friction of the lubricant. The first we call solid friction, the second fluid friction, and it is the aim of all engineers to reduce the first to nil and the second to a minimum. The nearest approach to this ideal is obtained by the use of an oil bath containing a fairly fluid lubricant and with, of course, accurately made bearings. The ideal condition is one where the sliding surfaces are completely separated by a film of lubricant. Like other ideals, it is never attained, so that for all practical purposes we have compound friction—a friction due to the action of surfaces partly separated by a fluid—in which there is solid friction where the bare surfaces touch one another, and fluid friction where the lubricant intervenes.

Let me briefly enumerate a few laws of solid and fluid friction.

First, as to solid friction. Increasing the pressure increases the friction; increasing the comparative roughness of the surfaces increases the friction. Distribution of the load over a larger area of bearing does not decrease the total friction, but it lessens risk of abrasion and seizure. Friction is greater between soft than hard metals, and is greatest at the beginning of motion. In practice it is better to let a hard work against a soft metal, making provision for the easy renewal or repair of the latter as it wears. Now as to fluid friction. It is independent of the pressure, it is directly proportional to the area, varies approximately as the square of the velocity and is influenced by the viscosity.

Between the solid sliding surfaces the fluid may be regarded as consisting of a series of superposed layers, each moving at a speed proportional to its distance from the fixed solid surface. The topmost plane of fluid is carried along by and moves at the same speed as the moving solid surface, the lowest plane remains stationary, the intermediate move little or much, according to their distances from the solid surfaces. Now, it is this sliding of the planes of lubricant over each other that constitutes fluid friction. The more viscous the liquid the greater will be the resistance to motion; the ease or lack of ease with which the layers slide over one another is a direct measure of the viscosity of the lubricant.

Viscosity is the property by virtue of which the lubricant forms a comparatively thick film between rubbing surfaces—I say thick, but in reality these films are measured in thousandths of inches. The more viscous the lubricant the greater is the pressure which can be sustained, but at the same time unnecessarily high viscosity creates unnecessary fluid friction and the viscosity of the lubricant should therefore be in proportion to the pressure which it will have to sustain. The following table shows the wide variation of pressure in bearings:

	Lb. Per Sq. Inch.
Light and fast running cotton spindle	2 to 5
Light shafting	80 to 100
Heavy shafting	300 to 600
Marine engine crank pins	800 to 1,100

ROLLING VERSUS SLIDING FRICTION.

It is of interest to compare these figures with those for a ball bearing, in which it is customary to consider the whole of the load to be carried by one ball. With an average five-sixteenth inch to three-eighth inch ball the working pressure may vary from 500 to 1,500 pounds between the points of contact. Converted, this means many hundred thousand pounds to the square inch.

In rolling friction the balls or rollers act in a manner closely analogous to the lubricating medium of a plain bearing by keeping the working faces apart. If it were possible to make a ball or roller bearing with absolutely no sliding friction, i. e., entirely rolling friction, the use of a lubricant would be unnecessary. However, there is always a little sliding between the balls or rollers themselves or between them and the cage employed to keep them in position, and it is to minimize this that a lubricant is necessary. Ball or roller bearings undoubtedly minimize the sliding friction of a plain bearing.

One of the functions of a lubricant is to overcome or neutralize accidental variations of the smoothness of surfaces. Although almost infinitesimal in magnitude, they cause variations in the friction, which are always tending to produce overheating, and it is solely a matter of chance when these tendencies preponderate over the lubricating effect of the oil. A light oil lubricates as well as a viscous one when all is smooth, but when a minute irregularity occurs, such as grit or rough places on the surfaces, heat is generated locally, the oil becomes too thin, and there is a risk of seizure taking place. By the use of a plentiful supply of viscous lubricant this risk can be considerably reduced. A new engine underlubricated will seize much more readily than one well run in.

There are three other conditions to meet which a viscous lubricant is necessary, viz., great pressure, slow speed and high temperature. The reasons are so obvious from what I have already said that it will be wasting time to dwell on them.

PHENOMENA OF SEIZING.

Seizing can always be traced to a failure of the lubricant to keep two metal surfaces adequately separated by a film of oil. Either the oil may be too thin or the pressure between the surfaces too great, or there may be no lubricant there at all. When the two surfaces come into close contact under considerable pressure much work has to be done to get one to slide over the other; the work expended in overcoming the friction is translated into heat, and the heat thus produced raises the temperature of the bearing, and the molecules of metal at the two surfaces, spurred into greater activity, diffuse from the shaft into the brasses and from the piston into the cylinder wall and vice versa. This tendency to diffuse or weld is so great that when two metals with carefully cleaned and polished surfaces are very strongly pressed together and left for several weeks at the atmospheric temperature molecules from one are found diffused throughout the other. This migration is immensely facilitated by a rise in temperature equivalent to an increase in the velocity of the molecules. Under suitable conditions the interlocking may be so great that it is impossible to separate the surfaces intact again.

When the seizing is incomplete, and the metals continue to slide over one another, the surfaces, especially of the softer of the two, are scored, and even if checked at this stage by stopping the engine or by a copious supply of oil, the repair of the damage is an expensive matter. Scoring and seizing are facilitated by high temperature, high pressure and close fitting (remember that a close fit at a low temperature becomes a much closer fit at a high temperature). Hence we arrive at the main features determining a suitable lubricant; it must withstand the maximum pressure and the maximum temperature which it will have to meet and preserve, as far as possible, an unbroken film between the sliding surfaces.

INSTRUCTIVE EXPERIMENT.

The following experiment shows in a striking manner the difference between a thick and a thin oil: A plug and ring are taken and thoroughly cleaned free from oil and grease, when it will be found that the plug, which should be a close fit in the hole, will not go in without a tap from a mallet. On greasing the plug with a little thin oil it slips in readily and can be easily revolved in the hole several times; but in a few seconds, owing to the lubricant being squeezed from between the surfaces by the pressure, the plug seizes and has to be knocked out. The plug and ring are again well cleaned, and this time greased with thick oil. The plug will slip in just as easily as before, but it will be more difficult to revolve, owing to the greater fluid friction of the lubricant, and, further, owing to the lubricant's greater resistance to pressure

the plug may be revolved for a much longer time without seizing.

GREASES.

The usual constituents of greases are mineral oil, tallow, vaseline and soap. In several cases a lime or aluminum soap is used instead of a soda soap, and in special cases talc and graphite are added in small quantities. Other materials, such as chalk, starch, china clay, whiting, sulphur, resin and water are sometimes present; they serve no useful purpose, unless it be to increase the makers' profit. Personally, I think the use of greases overdone; many bearings and gear boxes, etc., would be much better lubricated by a thin material somewhat in the nature of thin vaseline or thick oil. For the gear wheels to have to cut through a thick clogging mass, such as is often loaded into a gear box, is very wasteful of horse power. It is not as if there were great pressures requiring great resistance on the part of the lubricant; a thinner material would serve equally as well. And there is another advantage in a thin grease—in the event of a nut or bolt or other foreign matter falling into the box, it immediately sinks to the bottom, whereas with the thick grease it is liable to be picked up and carried into the teeth with disastrous effects.

GRAPHITE.

Graphite is a native form of carbon, and occurs in fine granular and foliated masses. It is, next to the diamond, the purest form of carbon known, and can be ground to an exceedingly fine powder. It resists the action of acids and alkalies, is very incombustible, and stands great heat. It is greasy to the touch, and this peculiar resistant greasiness, together with its unchangeable character, makes it a valuable lubricant. It is not easy to apply dry, and does not mix with thin oil, but it can be easily worked into grease, and in this form is extremely useful. Graphite is not advisable for use in motor cylinders; in very, very small quantities it is beneficial, but when constantly added it accumulates and forms a coating on top of the piston and in the combustion chamber, which in one specific instance increased the compression to such an extent as to blow the top of the cylinder off.

Graphite should be used for the lubrication of the rawhide and fibre wheels extensively employed for the transmission of light powers, because of their noiseless running. On no account should oil or grease be applied; failing graphite, a little French chalk is beneficial. Because of its dust resisting properties graphite is invaluable for chain lubrication; oil should be rigorously avoided.

TESTING LUBRICANTS.

The following are the chief properties which a lubricant should possess to be efficient: Enough body or viscosity to keep it between the rubbing surfaces at their maximum temperature and pressure. The greatest fluidity consistent with the required viscosity. Good capacity for transmitting heat. (It is one of the uses of a lubricant to transmit or carry off the heat generated by friction; the larger the supply of lubricant the better is this effected, which is another argument in favor of an oil bath.) No tendency to change in the air. Free from mineral or fatty acids likely to corrode the surface of the metal. High temperature of vaporization and of decomposition and low freezing or "setting" point. Free from grit, water and other foreign matter. The following are the usual tests:

SPECIFIC GRAVITY.

Flashing point and ignition point: These are usually taken together, and are an indication of the temperature to which a lubricant can be heated before it gives off an inflammable vapor, and of the temperature at which it completely takes fire. The results from this test are apt to be misleading; when the tested oil contains a proportion of the volatile oil or is an oil compounded with light and heavy fractions, the light portion fires too soon and ignites the remainder. However, this test is of importance for cylinder lubricants when it is valuable to know that at the temperature of the cylinder wall the oil is not being burnt.

VOLATILITY.

The volatility of the oil is a measure of the loss by evaporation on exposure, and is determined by exposing the oil in a shallow vessel to a temperature of 200° Fahr. to 250° Fahr. for twelve or twenty-four hours.

SETTING OF FREEZING POINT.

In this test the sample is slowly cooled by a freezing mixture, and the temperature at which paraffin or other solid hydrocarbon is deposited is noted. In many cases no precipitation occurs, so that the point at which the whole mass just solidifies is observed.

Other tests are briefly as follows: Determination of acidity, and whether due to mineral acids—evidence of bad refining—or to fatty acids, showing the presence of fixed oils. Determination of vegetable or other fixed oil; this is best done by heating the sample with a solution of caustic soda or potash in dilute alcohol. The fatty oil is rendered soluble and can be washed out with water and its percentage obtained, or the mineral oil, which is not acted upon by alkali, can be extracted from the mixture with gasoline and weighed to see whether it has lost in weight. The spreading power of a lubricant is tested against a standard material by placing equal drops of each on a polished glass or steel surface heated to 250° Fahr. to 300° Fahr.

Gumming and oxidization tests should also be carried out; these, as their names indicate, are to measure the absorption of oxygen on exposure, and the extent of the formation of the gummy, varnishlike substance. A good mineral oil, even on long exposure, absorbs very little oxygen and remains practically unchanged; on the other hand, all fixed oils under these conditions change more or less rapidly, and the change is hastened by warming.

Absolute or true viscosity is as much a physical constant of every liquid as is its density or boiling point. The greater the viscosity the greater is the resistance to shear, displacement of the molecules over one another, and the simplest method of scientifically measuring this characteristic is to find the energy required to force the liquid through a long capillary tube. In the simplest instrument the time which a definite volume of liquid takes to gravitate through a long capillary tube is a direct measure of viscosity, provided all are tried at the same temperature, and a slight correction is made for differences of density of the liquids tested. The above is Poiseuille's original method and is accepted as standard; but for oil testing for the sake of convenience many of the instruments used, although on similar lines, have very short outlet tubes, with comparatively wide bores, and the results obtained are not comparable with the true viscosity of the liquid; they are merely times of efflux—in other words, the time taken by a volume of liquid to flow out of a hole—and bear no relation to true viscosity. The results obtained from any one of these standard commercial instruments are fairly comparable among themselves; but the results from a Redwood cannot be satisfactorily compared with results given by an Engler, the standard German instrument, or by a Sayboult, the American apparatus.

EXPERIMENT WITH STANDARD LIQUIDS OF INCREASING VISCOSITY.

Liquid.	Instrument A. Times of Efflux. Secs.	Instrument D Secs.
A	100	100
B	133	102
C	172	105
D	256	109
E	406	116
F	667	127
G	1,294	153

The above table shows a series of figures obtained with standard liquids, tested first in a scientifically correct instrument A, and then in an instrument with an outlet similar to that in Fig. D.

In quite a different class are the testing instruments of which Professor Thurston's was the first practicable example. Since then testing by practical trial has been extended, and today in many large works the testing of lubricants is carried out on duplicate machines under conditions precisely similar to those in the factory.

EFFECT OF HEAT ON LUBRICANTS.

The first effect of heat on a lubricant is to considerably reduce its viscosity. The temperature of the cylinder wall in an air cooled engine averages from 250° to 300° Fahr., and in a water cooled engine from 180° to 250° Fahr. At the higher of these temperatures the lubricant is about as thin as water or paraffin, and splashes just as readily. The following table shows roughly the

change of viscosity with rise of temperature:

Temperature, Fahr.....	75°	110°
Time of efflux in seconds	740	110

If there be an adequate supply, even in this state it is capable of preserving a good film between piston and cylinder, and it is not till temperatures of 400° up to 500° Fahr. are reached that danger arises. At this stage a good deal of the oil is turned to vapor and is no longer useful as a lubricant. Unless copious supplies are pumped in to make up the loss the piston will seize, especially if it is a close fit in the cylinder, owing to the absence of the protective film which keeps the metal surfaces from touching. I have just said that at a high temperature the oil is evaporated, and, therefore, passes out of the exhaust with the burnt charge. That is only partly true; the truth of it varies with the quality of the oil used. If you have a well refined pure oil 99 parts in a 100, say, are evaporated and do no damage; the one part is carbonized—that is to say, decomposed by the heat. It is solid matter in a very fine state of division; a portion of it will go out of the exhaust with the gases, the rest will be deposited on the walls of the combustion chamber and on top of the piston. In the case of the oil containing notable quantities of impurities, the proportion carbonized is very much greater, and the deposit in the cylinder head grows more rapidly. There is another and a very prolific cause for this deposit, and that is, defective carburation. Either an overrich or a not sufficiently sprayed and vaporized mixture will cause a carbon deposit to form. In practically every case these deposits are the cause of preignition, and in many cases of overheating. There are few worse conductors of heat than carbon, and a thin film will work wonders in keeping the heat in.

I have several times heard it stated that the lubricant has to withstand the heat of the explosion. Now that is erroneous, there is no lubricant in existence capable of successfully standing a temperature of 1,500° Cent. to 2,000° Cent. or 3,000° Fahr. to 3,500° Fahr., which is the average temperature of the explosion at its hottest point. The lubricant is always at the same temperature as the cylinder wall, and it is this factor which governs the choice of an oil. The size of a cylinder is of some account, because a big cylinder means a big piston and a correspondingly heavy pressure between them. If an abnormal piston speed, either very fast or very slow, is employed, that must be taken into account, but, as a rule, piston speed need not be considered, so we are narrowed down to cylinder temperature as the chief question to be studied. With an efficiently water cooled engine, an oil of moderate viscosity and volatility can be used; in fact, a good quality gas engine oil will frequently serve. But we must discriminate between a single cylinder and four or six cylinders; the latter engine, with its smaller and cooler cylinders, less pressure on crank pins and shaft, etc., and higher average speed of

150°	250°	300°	350°	400°
54	39	32	25	21

running, is best served by a thinner lubricant than the slower speed single cylinder engine.

The same applies with even more force to single and multi cylinder motor cycles. With one cylinder, particularly if it is of 3½ horse power to 4 horse power, a very viscous and resistant lubricant is required; for the four cylinder better results would most probably be obtained with an oil recommended for water cooled engines; for a twin cylinder an oil intermediate between the two should be used.

SMOKY EXHAUST.

Smoky exhaust is a whole subject in itself, and unless I am very much mistaken it will have to be taken up seriously in the near future. It is due primarily to an excess of oil in the crank chamber, but even then it is puzzling to see how it can get past the piston in sufficient quantities to make the exhaust visible and smellable for yards round. One writer has explained that it is most noticeable when the engine is running very light—i. e., with the throttle most closed. On the suction stroke there is an appreciable vacuum; oil passes from the lower end to the top of the piston and on the explosion stroke is burnt. That is all very well, but it does not take into account the compression stroke, which will drive the excess of oil back to the underside of the piston. I have observed a number of smoky cars, and have invariably found that smoke is most noticeable with the clutch in, and more or less stops when the clutch is taken out—in other words, the reverse of the above writer's experience. My explanation is that the oil is in a fine spray on the top of the piston; when the clutch is in and the throttle open there is a large volume of gas, a high compression and high explosion temperature; much oil is thereby burnt, and the bulk of it is carried right through the exhaust box into the open air. When the clutch is out and throttle closed down the volume of gas and the temperature of explosion are less, hence less oil is burnt, and of what is burnt a great proportion is caught by the muffler, because the rush of gas is less, and very little of it shows. Two proofs of this occur to me—one, that a car with no muffler is smokier than one with; secondly, that other conditions being equal, an increase in the noise of the explosions corresponds to an increase in the emission of smoke. It is hardly necessary to explain that burnt oil is soot or carbon, solid matter in a fine state of division, and that the products of the combustion of gasoline are true gases. The deposit of soot in exhaust pipes and silencers is mostly due to burnt oil. Without those accessories that burnt oil would be ejected as visible exhaust. The remedy is obvious, the more completely the burnt oil is filtered out or deposited the less obnoxious will be the ultimate exhaust.

German Method of Denaturizing Alcohol.

For most industrial purposes alcohol is used in Germany duty free, after having been "denaturized" or rendered unfit for drinking purposes by the admixture, in presence of a Government official, of a prescribed percentage of one or more denaturing agents. There are two degrees of denaturizing, viz., the "complete" and the "incomplete," according to the purposes for which the alcohol so denaturized is to be ultimately used.

Complete denaturization of alcohol by the German system is accomplished by the addition to every 100 liters (26½ gallons) of spirits of (*a*) two and one-half liters of the "standard denaturizer," made of 4 parts of wood alcohol, 1 part of pyridin (a nitrogeneous base obtained by distilling bone oil or coal tar), with the addition of 50 grams to each liter of oil of lavender or rosemary; (*b*) one and one-fourth liters of the above "standard" and 2 liters of benzol, with every 100 liters of alcohol.

Of alcohol thus completely denaturized there was used in Germany during the fiscal year 1903-4, 931,406 hectoliters denaturized by process (*a*), as described above, and 52,764 hectoliters which had been denaturized by process (*b*). This made a total of 26,080,505 gallons of wholly denaturized spirits used during the year.

Incomplete denaturization, i. e., sufficient to prevent alcohol from being drank, but not to disqualify it from use for various special purposes, for which the wholly denaturized spirits would be unavailable, is accomplished by several methods, as follows (the quantity and nature of each substance given being the prescribed dose for each 100 liters (26½ gallons) of spirits): (*c*) Five liters of wood alcohol or one-half liter of pyridin; (*d*) 20 liters of solution of shellac, containing 1 part gum to 2 parts alcohol of 90 per cent. purity (alcohol for the manufacture of celluloid and pegamoid is denaturized); (*e*) by the addition of 1 kilogram camphor or 2 liters oil of turpentine, or one-half liter benzol to each 100 liters of spirits.

Alcohol to be used in the manufacture of ethers, aldehyde, agarcin, white lead, brom-silver gelatins, photographic papers and plates, electrode plates, collodion, salicylic acid and salts, aniline chemistry, and a great number of other purposes, is denaturized by the addition of (*f*) 10 liters sulphuric ether, or 1 liter of benzol, or one-half liter oil of turpentine, or 0.025 liter of animal oil.

The price of denaturized alcohol varies in the different states and provinces of the empire in accordance with the yield and consequent market price of potatoes, grain and other materials. At the present time alcohol of 95 per cent. purity, which is the quality ordinarily used in Germany for fuel purposes, sells at wholesale from 28 to 29 pfennigs (6.67 to 6.9 cents) per liter (1.06 quarts), and at retail for 33 pfennigs (7.85 cents) per liter.—Consular Report.

The Simple Life Garage.

By E. F. Lake.

The writer's home town is not very large, the population being about 15,000, but it is growing; it is the home of the largest factory in the country for the manufacture of automobile parts and complete chassis, consequently there are quite a number of motor cars here, and while the town boasts of only a single garage establishment, it is beyond doubt a model of compactness and simplicity, and can give some of the larger garages pointers on how to keep down expenses.

Among the novel features which this garage contains is a portable washstand, which for ease of operation and compactness cannot be excelled, as after using it can be tucked under the lathe which the garage boasts of, or put on a shelf or in a corner out of the way; in fact, it will not be injured if set out into the back yard, and it only occupies a space of about 12x12x12 inches. Any child can operate it, but it gives better results if operated by a grown person with longer arms and able to reach farther. The apparatus consists of an ordinary water pail and a sponge or old rag, and if a car happens to be in the garage at the time occupying about all the available space, it can be carried out into the street and used just as easily as inside.

Of course the garage has a runway, having two large sliding doors (à la barn door), and a car can be run inside and then backed out, thus avoiding waste of useful room.

The repair pit has been rendered unnecessary in an ingenious manner. The garage boasts of a mechanic who has a strong, well calloused back and likes to lay down; he is the habit of sliding under the cars to repair anything which needs repairing, and as in sliding he might wear a hole in his jumpers or get slivers in his back, and make a kick for a repair pit, a low car has been built of a 1 inch board 10x36 inches, with castors in the front corners, and by the use of his hands and feet the mechanic can move from the rear axle to the front with ease, no matter what the wheel base may be.

A turntable is not needed, as the proprietor says he can back out of the garage and run around the block, which also tests the turning ability of the car. As electrics are not used here much, a charging board has not yet been put in, but I will write up the details when it is.

Rents not being as high as in the large cities, the garage is all on the ground floor, thus doing away with elevators, hoists, inclined runways and other apparatus for taking cars up to the upper floors; but in their place are used a couple of good stout ropes thrown over a brace on the rafters, and by means of these a car can be hoisted up to the shingles. Then a man can stand up under it to repair it, or in case of a rush in business a second car can be run into the garage, providing it does not carry a top that would strike the bottom of the elevated car. These ropes also serve as a portable crane and a jacking device, and the necessary investment in equipment is materially reduced by thus combining several functions in a very simple arrangement which was invented by an early ancestor, and on which, therefore, no royalties have to be paid. If a top or a body is to be taken off, or an engine or a transmission taken out, all the owner of the garage has to do is to hitch a good strong man to the other end of the rope, and with a "Ho-heave," up she goes.

Gasoline is a necessary article around a garage, and in the method of storing it employed in this garage the simple life also reveals itself. A barrel is rolled into the back yard, the head is knocked in and a lid put on, and it is ready to sell by the pint or the pailful. If the barrel should go up with a bang, the loss would be very light, owing to the simplicity of the equipment. For this reason no insurance is carried.

The arrangements for the entertainment of chauffeurs and patrons in this garage are ideal—that is on bright, sunshiny days. Two chairs are provided which can be carried out in front of the shop and tilted back against the building, where one can rest with ease, and the old settler comes along occasionally to add to the entertainment. When the sun gets too hot the chairs can be shifted to the back yard, where the air is laden with the aroma of cocktails from a café adjoining, or of corned beef and cabbage from a restaurant kitchen on the other side.

While the motor truck has not put in its appearance here yet, the garage is well supplied with facilities for handling it when it does come; it has a good paved street in front, and the trucks can be lined up along the curb, and a brick put under each wheel to keep them from running away.

The charges for services in this garage are no more than the proprietor expects to be able to get, as the general impression around here is that every automobile owner is a millionaire, or the son of one, and $200 a minute would not be too much if you could get it.

Compressed air is used as an auxiliary to the pail and sponge for cleaning cars. When the mechanic using his anti-repair pit coat goes under the car you can hear him compress the air in his lungs, and when it comes out you can see a cloud of dust rise from the corners of the machine and float around the garage, so that when he gets to an erect position the bellows from the forge is turned on him through a rubber hose, and his hair, whiskers and eyelashes are dusted out.

As a remedy for the smoky exhaust nuisance in connection with motor omnibuses in London, it has been suggested that all motor omnibuses should be compelled to have the exhaust tube right in front of the driver. This would be rather hard on the driver.

Traffic Accidents in London.

In response to an interpellation of the British Home Secretary by Mr. Weir, on the number of automobile and horse accidents in London, the following corrected statistics were furnished at Arthur Stanley's instance on May 16.

The number of accidents caused in April by horse drawn omnibuses was 265 (forty-seven resulting in personal injuries and one in death), and by other horse drawn vehicles 2,233 (643 resulting in personal injuries and ten in death.) This, then, is the tabulated comparison for last month:

	Horse Omnibuses.	Motor Omnibuses.
Accidents	265	424
Injuries	47	76
Deaths	1	3

	Other Horse Vehicles.	Other Motor Vehicles and Motor Cycles
Accidents	2,233	433
Injuries	643	134
Deaths	10	9

Buckboards in Greenland Expedition.

According to *Politiken*, a daily paper published in Copenhagen, Herr Mylius Erichsen, who will start upon a Greenland expedition soon, has purchased an Orient buckboard for the purpose, which will be used together with fifty Greenland dogs. The buckboard has been altered in several ways to better adapt it for use on the ice of the interior deep fjords. It is to carry only one man, and is to be used mainly for hauling goods to provision depots, and all of the goods that cannot be placed on the automobile itself will be brought on broad gauge sleighs of the Nansen type, which are to be towed after the automobile. The gauge of the car is very large, so that it will not easily upset. The motive power is gasoline, but as gasoline freezes at about 40 degrees centigrade below zero, and as probably a still heavier cold can be expected, there will be made an arrangement for warming purposes worked with pure alcohol, which only freezes at a lower temperature, and by means of which the gasoline can be kept liquid in the tank. Around the rubber tubes of the wheels there is not a rubber cover, which would break in the cold, but a cover of leather or linen. The car will be arranged to be placed on sleigh runners so it can be drawn by dogs and men if loose snow is met with. It is the intention to always have dogs beside the car so that it can always be transported along if the machine should break.

W. G. Smith was fined $2 at the Bow street, London, Police Court on May 28, for driving the Sultan of Zanzibar along the Victoria Embankment at 26 miles per hour. The Sultan said he considered the speed was moderate, but apparently his opinion does not carry as much weight in London as in Zanzibar, for the magistrate found defendant guilty.

N. A. A. M. Meeting.

The following members attended the monthly meeting of the Executive Committee of the N. A. A. M. last week:

W. T. White, S. D. Waldon, William R. Innis, E. H. Cutler, Charles Clifton, S. T. Davis, Jr., Albert L. Pope, G. W. Bennett, Thomas Henderson, William E. Metzger, M. L. Goss, M. J. Budlong, C. C. Hildebrand.

H. A. Lozier, Jr., of the Lozier Motor Company, and A. L. Garford, of the Garford Company, Elyria, Ohio, were admitted to membership.

The Legislation Committee reported that the license test case had reached the Supreme Court of New Jersey in record time, and an appeal perfected, and that a decision by that court is looked for at any moment. The case will then go to the Court of Errors and Appeals, the highest State Court of New Jersey, and from there to the United States Supreme Court.

Thomas Henderson, of the Winton Motor Carriage Company, was elected a member of the Executive Committee in place of Percy Owen, and was also appointed a member of the Membership Committee in place of Mr. Owen.

William E. Metzger, of the Cadillac Motor Car Company, was elected secretary of the association to fill the vacancy caused by the resignation of Mr. Owen.

The Contest Committee reported that they had had a conference with A. B. Tucker, of the A. A. A., regarding the Glidden trophy rules, and decided that certain changes in the rules governing this tour were desirable, which changes were embodied in a recommendation to the Executive Committee of the association, who adopted their recommendation. The changes recommended will be submitted to Mr. Gorham today for consideration.

The Automobile Blue Book.

The Automobile Blue Book, which has just been published by The Class Journal Company, Flatiron Building, New York, has been compiled on entirely new and original lines. Instead of large maps, the roads are described in the text and illustrated in marginal maps, showing the turns and many characteristics of the thoroughfares described. Where a route leads through a city, a plain map of the place is inserted, showing the principal streets and landmarks. Touring automobilists have little trouble in finding their way on the principal country roads, but do lose considerable time and experience much annoyance when they come to towns and villages, because the directions received are often misleading.

The book has over 800 pages, and is divided into three sections, New York and Canada, New England States, New Jersey, Pennsylvania and Maryland. The roads of over sixteen States are described, and there is a total of 599 routes covering 31,467 miles. There are 144 city maps, 207 route maps, making a total of 351 maps, which include seven double page maps and fifteen full page maps.

The Strike of French Automobile Workmen.

According to recent advices from Paris, the strike of machinists and body builders of the French automobile industry continues, and there are no immediate prospects for a settlement. Meanwhile many of the important French automobile factories are idle and deliveries are being greatly delayed. The success of the two most important automobile competitions of the year, the Grand Prize race and European Circuit tour, is also threatened. The labor unions demand a working day of eight hours, the "English" week (Saturday afternoon off), discontinuance of the piecework system, etc. At a recent meeting of the Automobile Manufacturers' Association (Chambre Syndicale), attended by over 800 manufacturers, it was unanimously resolved not to accede to any of the demands made. There have been some attempts at violence on the part of the strikers, particularly in cases where the factories are being operated, and soldiers are stationed at the different works to protect the men willing to work from assault, as shown by our illustration. It is quite obvious that the effect of the strike must be to work considerable injury to the French industry, especially as regards the loss of export business.



GENDARMES GUARDING A FRENCH AUTOMOBILE FACTORY.

Semi-Annual Meeting of A. L. A. M.

A three days' session of the various branches of the A. L. A. M. was concluded last Friday night, when the mechanical branch adjourned at Hartford. On Wednesday and Thursday the executive committee and board of managers were in session at the New York offices, 7 East Forty-second street, and as it was the semi-annual meeting a number of interesting and lengthy reports were made. Acting upon the report of the Trades Committee, it was voted to continue in 1907 the same general policy with regard to agencies that has been in successful operation this year.

The show committee announced a general plan for the national exhibition in 1907 in Madison Square Garden, even more extensive in scope and elaborate than last year.

Reports were submitted from the tire committee, the traffic department, the mechanical branch, from President Charles Clifton, General Manager George H. Day and from Treasurer H. H. Franklin.

The meeting of the mechanical branch was held at Hartford in order that the engineers of the various big manufacturers might have an opportunity of inspecting the laboratory that has been established there, with Henry Souther in charge, for the purpose of metallurgical experiments and the testing of various features of construction.

Light Runabout With Front Drive and Round Radiator.

The D. W. Haydock Automobile Company, Pine and Commercial streets, St. Louis, Mo., has been incorporated with $100,000 capital stock for the manufacture of automobiles. They propose to make a runabout of new design, the special features of which will be the front drive, a round radiator and a direct lever control without clutches or gears. The radiator will be 30 inches in diameter, with tubes 6 inches long, yielding a cooling surface of 45 square feet.

The officers of the company are: President and treasurer, D. W. Haydock; vice president, G. A. Anderson; secretary, L. M. Haydock.

LEGISLATIVE and LEGAL

The Automobile's Effect on Public Safety.

By Xenophon P. Huddy, LL. B.

The frequency of automobile accidents on the public ways, together with the special prominence which some of the newspapers have given to automobile injuries, has had a tendency to create a prejudicial public opinion with respect to the new locomotion, even though it is a well recognized fact that there are more accidents on the public highways from other causes than that of the operation of motor vehicles. Naturally, the question arises whether the automobile has had a detrimental effect on the safety of the public, and this question leads to the inquiry, "Has not the automobile imposed a duty upon the members of the public to exercise a higher degree of care in protecting themselves from injury?"

There can be little conflict of opinion as to whether or not people traveling on the public thoroughfares are obliged to adjust themselves to increased danger. Many of the automobile legal problems which have arisen have been difficult to solve to the satisfaction of those interested in motoring and those occupying an antagonistic position to it. Equal rights of the automobile on the public road have been established. Legislative disputes have been settled. The law is plain and understandable, and the most important and serious aspect of automobiling which remains for the public to consider relates to matters of fact. Upon these matters of fact questions of law depend. Among the questions of fact which constantly arise in automobile cases may be cited the following: "Was the automobile operator overspeeding?" "How many miles an hour was he driving?" "Was the chauffeur grossly negligent at the time he ran into and killed a pedestrian?" "Was the pedestrian properly looking out for his own safety?" "Was the motor car at the time operated in a dangerous manner?"

Turning now to the degree of care which the public is obliged to exercise, it must not be forgotten that the travel on the public ways cannot remain the same from age to age. We can easily look back to the time when one might walk or ride along the public highway with no special concern in regard to his safety. There was then no great amount of traffic. There were comparatively few persons on the highway. But with the increase of population and the invention of new means of transportation, the pedestrian, or the party traveling in a vehicle on the public thoroughfare, is obliged to adjust himself to the modern conditions, and this necessarily obliges him to exercise a greater degree of care for his safety. The law compels him to be on the alert constantly, to do all in his power to save himself from harm. This duty the public has failed to recognize in dealing with the automobile question. People have attempted to cast all responsibility for their safety upon the shoulders of the motor car operator. According to the trend of popular opinion in some localities the driver of an automobile must not only look out for his own safety but that of everybody else. Is this fair? Is it just to the automobilist that he should assume the whole of these responsibilities? Is it not right that the members of the public should commence to make an extra effort to protect themselves?

So far as the law is concerned, it is the duty of the public to exercise a degree of care for its own safety commensurate with the existing conditions presenting a lawful danger on the public highways and streets. This is an age when the individual must look out for himself. He must be on the alert to save himself, and he has no right to cast that responsibility wholly upon someone else. In regard to protection against danger resulting from the operation of motor vehicles we do not need a vast amount of legislation. Statutory law cannot prevent accidents, but a personal regard for safety can, and this personal regard must be exercised by all and not by one class of parties. If we wish to decrease the number of automobile accidents, let every member of the public feel it his serious responsibility to look out for his own safety.

Philadelphia Automobile Ordinances.

Philadelphia.—The select and common councils at their meeting June 7 passed ordinances requiring automobiles to carry drip pans to catch waste oil, and prohibiting the use on automobiles of siren horns, or horns sounding more than one note.

A proposition to repeal the ordinance providing for the licensing of automobiles by the city was referred back to the committee on boiler inspection, because it was thought the committee should provide a lower speed limit than that of 20 miles an hour contained in the State law. At the present time automobiles must carry both city and State license numbers in Philadelphia. Most automobilists regard this as unnecessary and unjust.

The New Massachusetts Law.

Boston, Mass.—The new automobile law passed by the Massachusetts Legislature will go into effect June 23, and on the whole is considered by motorists as not illiberal, and an improvement over the old law. When town officials pass special regulations, sixty days, instead of fifteen days, as formerly, are allowed fifty residents (ten of whom are taxpayers of the town) to lodge their protest.

Twenty miles an hour is the limit on the highways, 12 in cities and towns and 8 around curves or crossings where the operator's view is obstructed. Before a charge for overspeeding is brought the machine must be timed for a quarter of a mile, this provision being intended to prevent local officials from setting traps for drivers and arresting them for a necessary or accidental increase of the time rate for a few hundred feet. The law provides fines for exceeding the limits of speed; but for reckless driving and for operating a car while under the influence of liquor, fine or imprisonment, with the revocation of the license, is the penalty.

The Massachusetts Highway Commission have formulated rules and regulations under authority conferred by the new law, which will be published as soon as they are approved by the Governor.

Imported Automobile Parts Undervalued.

During the past six months the customs appraiser of the port of New York has closely scrutinized importations of automobile parts for undervaluations, with the result that large advances have been made in some cases. Cases of machinery made in France and consigned to the American Locomotive Automobile Company have been held up by the appraiser. One of the cases was invoiced at 1,200 francs and the appraiser marked it up to 2,100 francs; another case was said to be worth 2,870 francs and was marked up to 3,560 francs; still another was marked up from 3,370 francs to 6,625 francs. The action of the appraiser has been fully sustained by reappraisement proceedings, so far as decisions have been rendered. Some cases are still pending.

The Herkomer Touring Contest.

The second annual competition for the Herkomer trophy started at Frankfort-on-Main at 5 a. m. on Wednesday, June 6. There were about 150 starters, including Prince Henry of Prussia, and a single American competitor, Percy Pierce, of Buffalo. The first daily stage was to Munich, a distance of 248 miles. The competitors were started from Frankfort at two minute intervals, and the first of them arrived at Munich shortly after 1 o'clock. The first to arrive was W. Poege, of Chemnitz, in a Mercedes car, but it is to be pointed out that speed does not count in the tour, so long as the average does not fall below a certain minimum. One serious accident occurred during the first day. In rounding a curve near Nuremberg at high speed the car of Herr Kienle, a member of the contest committee, struck a tree, and one of the occupants was pitched out headlong and had his skull fractured and his breastbone broken. Percy Pierce reached Munich at about 5 o'clock, and by 11 o'clock 120 of the competitors had arrived.

On Thursday the route was from Munich to Linz, and on Friday from Linz to Vienna. The tourists arrived at the Austrian capital between 11 and 1 o'clock, having made the run over roads softened by rain. Percy Pierce cabled from Vienna that he had made the run thus far without penalization.

Changes in Glidden Tour Itinerary and the Rules.

Since the return of Augustus Post, of the Long Island A. C.; James B. Dill, of the New Jersey Automobile and Motor Club, and F. B. Hower, of the Buffalo A. C., forming the sub-committee on tours of the A. A. A., from a trip over the route of the third annual Glidden Tour, it has been decided that the tourists will stop two days at Quebec instead of one, and that the run from Jackman to Rangeley Lakes, Me., will be divided into two stages, stopping over night at Waterville, Me., July 25. Two days are thus added to the trip as planned at first, so that it will end July 28 instead of July 26.

The itinerary between Buffalo and Saratoga has also been changed by cutting out Rochester and Syracuse, and going by way of Auburn and Utica, shortening the distance from Buffalo to Saratoga 37½ miles. The first day's run, July 12, will be Buffalo to Auburn, 123 miles; the second day's run, July 13, Auburn to Utica, 75 miles, and the third day's run, July 14, Utica to Saratoga, 91 miles.

In addition to the Glidden trophy, seven or more prizes will be awarded for which all entrants may contest. Paul H. Deming, chairman of the A. A. A. touring committ, has offered a trophy to the entrant, not a contestant for the Glidden trophy, who has the lowest penalization under the rules, repairs, replenishment, replacements and inspection in garage being permitted. A trophy will be awarded to the club from whose membership the largest number of entries are received in proportion to the total active membership of the club. Trophies will be awarded to the winners of a hill climb, a brake test, an obstacle race; to the car having the least tire trouble during the contest, and to the car which shall complete the tour from Buffalo to the end of the tour under the most adverse conditions, and with the greatest number of tire and mechanical troubles.

THE A. A. A. TOURING COMMITTEE.

Paul H. Deming, chairman of the A. A. A. touring committee, has announced the make up of the committee as follows: C. L. Ainsworth, A. C. of Cincinnati; George W. Beach, Hartford A. C.; James M. Boutwell, A. C. of Vermont; Otto B. Cole, Massachusetts A. C.; James B. Dill, A. C. of N. J.; George W. Ehrhart, Decatur A. C.; Ezra H. Fitch, New York Motor Club; F. C. Gates, Cleveland A. C.; George A. Gould, A. C. of Davenport; Captain Homer W. Hedge, A. C. A.; F. B. Hower, Buffalo A. C.; Frank M. Joyce, Minneapolis A. C.; J. C. Kerrison, Bay State A. A.; Ernest J. Knabe, Jr., A. C. of Maryland; Howard Martin, Albany A. C.; L. E. Meyers, Chicago A. C.; Augustus Post, Long Island A. C.; Angus Sinclair, New Jersey Automobile and Motor Club; A. B. Tucker, New York Motor Club, superintendent of the tour, and Sidney S. Gorham, Chicago A. C., secretary.

RULES AND REGULATIONS.

The rules and regulations for the tour finally decided on, in addition to those previously published in THE HORSELESS AGE, are as follows:

Cars must have at all times during the tour mud guards and mufflers, and be equipped as per manufacturer's catalogue specifications; shall carry not less than four passengers of an average weight of 125 pounds, or their equivalent in ballast, and shall have touring car bodies with tonneau.

No replacements, replenishments, adjustments, repairs or inspection shall be made upon any car after the same shall have been registered at any night stop of the tour and before it shall have registered out on the next succeeding morning.

No record of any previous performance, nor sign, or other indication of the maker's name, other than the name plate, usually attached to the vehicle as sold to private owners, shall be displayed upon any car at any time during the progress of the tour.

Cars shall be started each morning by officials of the tour between the hours of 7 and 10 o'clock a. m., but neither before nor after the hours designated under penalty of disqualification, unless otherwise directed by the officials of the tour.

Each entrant shall, upon starting on each day's run, sign a statement submitted by an official of the tour fixing the hour of his departure from such control. Failure to comply will be sufficient ground for disqualification. Each day's tour shall be preceded by a pacemaker, designated by the committee, and any entrant who passes the pacemaker shall be disqualified. If the pacemaker breaks down or is compelled to travel at a rate of speed so low as in the opinion of the committee to unduly impede the progress of the tour, his flag shall be transferred to the first car overtaking him, which car shall thereafter become pacemaker, subject to the same conditions.

The committee will publish a daily schedule fixing the exact time when each car may finish each day's run without penalty. Said schedule shall not require any entrant to operate his car at a higher rate of speed than is permitted by law. Each car failing to finish at the time fixed by the schedule shall be penalized one point for each minute required to complete said day's run in excess of the schedule time fixed by the committee. And a penalty of two points for each minute any car may finish any day's run earlier than the time fixed by said schedule shall be imposed against said car. And no car shall be allowed to stop en route for the purpose of meeting said schedule with exactitude, under penalty of disqualification.

Each car must register at each night stop immediately on arrival at the place of registration and must take its place immediately behind the cars in front until it can be properly registered. Contestants for the Glidden trophy shall, however, be entitled to precedence in registration over non-contestants.

Immediately following the registration at each night stop, each car shall be delivered into the custody of the officials of the tour, to be by them held at owner's risk, and kept under the direct charge and supervision of such officials or their agents until the hour for starting on the following morning, and no car shall be available for tuning up, adjustments, filling with gasoline or water, or for any other purpose, until after it shall have registered as starting on the next day's run of the tour.

If, upon arrival at the end of the tour, the committee finds that a hill climbing or touring course is available, it may arrange a special contest for the participants of the tour, if in the opinion of the committee such a contest is advisable or necessary to determine to which entrant the Glidden or other trophy or trophies should be awarded. In awarding the Glidden trophy, credit will be given each car for its performance as a touring car, since the test is for the purpose of determining the touring qualifications of each contesting car. The committee may also select one or more special runs during the tour in order to complete a total of 1,000 miles.

Entrants must conform to all laws and ordinances and the rules of the road, and any entrant violating any of the provisions of these rules or of other rules adopted by the committee, or who shall fail to show due consideration toward other participants in the tour, or other users of the highways, may be disqualified by the committee.

Any car whose owner or driver shall be arrested for a violation of the speed limit laws, or of any law or ordinance may, in the discretion of the committee, be disqualified.

Upon due notice being served by the committee on the person in charge of any car that the same has been disqualified, it shall cease to run in the contest, and the official numbers shall be removed, it shall not receive any award or certificate, but shall be mentioned in the record as having been disqualified. But no notice of disqualification shall be served upon the person in charge of any car until he shall have first been notified of the act which it is claimed should disqualify the car; and if the act be denied, action shall be postponed until the committee shall have given the owner or person in charge of such car a hearing, when a decision shall be rendered. Neither the person whose car shall have been so disqualified nor any entrant of any car that may be disqualified shall have any claim of any kind or nature whatsoever against the A. A. A. or any member or members of the committee or any official of the tour because of disqualification or the publication of the fact, or the failure to mention the performance of the car disqualified prior to its disqualification.

Any participant in the tour desiring to enter a protest must first deposit the sum of $10 with a member of the committee, which sum will be retained by the A. A. A. if the protest is not sustained, and if the protest is sustained the protest fee shall be returned to the person making such deposit. All protests must be made in writing and will be considered by the committee at the earliest practicable moment, and a decision rendered as soon as practicable thereafter.

All protests as to entries must be made before the start. All protests as to unfair ruling, route, etc., must be made within twenty-four hours after the occurrence. All other protests shall be made during or immediately after the tour is concluded, and before the award is made.

The committee shall have power to disqualify any car for traveling at any speed which the committee may consider excessive under the conditions existing at the time, without reference to these rules.

The committee shall have power at all time to make such examinations of the cars entered and their contents as may be deemed advisable.

In the event of a dispute concerning the interpretation of the rules, the decision of the touring committee of the A. A. A. shall be final.

Said touring committee reserves the right to alter or amend, suspend, or repeal these rules from time to time, down to and including the end of the tour and final award, as may in its judgment be deemed expedient.

THE ENTRIES TO JUNE 11.

Following is a list of entries received up to June 11: No. 1, N. H. Van Sicklen, Chicago, 40-45 horse power Apperson; No. 2, Arthur Holden, Cleveland, 45 horse power Stearns; No. 3, L. J. Petre, Cleveland, 45 horse power Stearns; No. 4, C. J. Glidden, Boston, 24 horse power Napier; No. 5, J. H. McDuffee, Chicago, 30-35 horse power Stoddard-Dayton; No. 6, Charles Y. Knight, Oak Park, Ill., 30-40 horse power Silent Knight.

The Daimler Motor Company, of Coventry, England, have undertaken the manufacture of motor omnibuses on the Pieper combination gasoline, electric storage battery system.

(the Renault may be cited as an example), it is often difficult to arrange the lamps so that they shall not be in the way when it is desired to raise the bonnet. Many expedients are used, and nearly every owner has to scheme out something that will meet his own views. The car manufacturers adopt the bad practice of placing the lamp brackets upon, and near the ends of, the front spring hangers, and while this seems to solve the problem in the factory, the user has to fall back upon his own ingenuity. The factory fitting is so crude that while the lamps are rigidly supported they are right in the way of the starting handle; the lamps are so near the ground as to only illuminate the road for a very few yards ahead, and, more serious than all else, they project right out beyond the end of the car and bear the full force of a collision. This last fault is intensified if, as in many cases, there is only about just enough room to run the car into a private garage, and a miscalculation of a couple of inches will force in the faces of a pair of expensive lamps. The owner of a Renault car in England, having suffered loss and experienced several minor troubles, has recently patented a most simple and yet effective solution of the problem, and the two illustrations of the device fitted to his car make the advantages quite apparent.

Each headlight is supported by two bars, pivoted together at their upper extremities, and forming, with the frame of the car, a triangle. On the front edge of the car frame a bracket is bolted, and to this bracket the lower end of the front bar is hinged by means of a bolt passing through the bar and the bracket. The rear leg of the triangle is attached to a slotted guide, screwed down to the frame, and through the base of the rear leg and the guide a loose bolt is passed, which can be tightened up along any portion of the guide by means the lamp is attached to the top of the rear leg, so that it always keeps the lamp in a perfectly vertical position, at any angle of the bracket. Each head lamp has its own pair of legs, and the two front ones are rigidly conected from side to side by a cranked crossbar. By loosening the two butterfly nuts only, at the rear ends of the slotted guides, the lamps and the whole device can be pulled forward and downward, so that the extreme front end of the bonnet is left quite clear and can then be easily raised.

In the second illustration the bonnet is raised right up, and the lamps have been pushed back to the position they would normally occupy when the car is traveling. In this position the lamps are raised much higher than is usual so as to get the full benefit of the illumination at the farthest point along the road; the starting handle is free from any impediment; and the lamps are quite removed from any possibility of accident, should the steering wheels be run against the rear of another vehicle. To make the arrangement clear, the right hand front mud guard has been removed. The device has been patented by John F. Marshall, a British attorney, who finds it quite practical and perfectly rigid, one of the lamps having a lenticular projector and weighing over *22* pounds.

Chance for a Motor Mail Line.

According to Consul G. Jarvis Bowens, of Guadaloupe, French West Indies, there is an opportunity just now for an enterprising American to run a daily passenger line of automobiles from that place to Basse-Terre, a distance of about 40 miles. The government of the island will grant a subsidy of $6,000 annually for the assurance that the mail will be taken twice daily, and will require a deposit of $1,500 to insure faithfulness of contract, which can run

boat or diligence, neither of which [illegible] daily, and it is said that a daily [illegible] would pay. It would require [illegible] machines, one each of 10, 8, 6, 4 and [illegible] seats, and about the same number of chauffeurs until local men could learn to handle the machines. The route is over a good road, but runs through valleys and over mountains, hence strong machines will be needed.

E. R. Thomas Detroit Company Leases Factory.

E. R. Thomas Detroit Company, [illegible] organized to construct a new Thomas [illegible] car for the Buffalo Company, have [illegible] a factory at Harper avenue and Dequindre street, Detroit, which was formerly occupied by a match manufacturing company. The location is convenient to the lines of the Grand Trunk and Lake Shore railroads, a siding from the former running into the factory yard.

Special precautions have been taken to insure the best fire protection, and no gasoline will be allowed in the main plant, the testing being done in a separate building.

Orders for most of the raw materials have already been placed, and the first car is due to be out in August. E. R. Thomas, of Buffalo, the president of the company, writes that contracts are being made with agents for next year, and a considerable number of the Detroit cars have already been sold.

According to official returns, British motor imports for the first four months of the year (January 1 to April 30, 1906) amount to the following figures, viz.: 270 motor cars, value $4,213,100; motor car parts, value $3,423,355; 805 motor cycles, value $[illegible]; motor cycle parts, value $49,755; total value $7,799,260.



DOWN AND FORWARD TO RAISE BONNET.



MARSHALL'S LAMP BRACKET. NORMAL POSITION.

MINOR MENTION

The A. C. of Pittsburg gave an outing to 500 orphans June 5.

The Jamaica (L. I.) A. C. have occupied clubrooms at Merrick road and Fulton street.

The Duquesne Construction Company, Jamestown, N. Y., have gone into bankruptcy.

The A. C. of Hudson County, N. J., gave an outing June 9 to orphans from Jersey City and Hoboken institutions.

New Haven (Conn.) motorists will meet at Moegling's Hotel, Savin Rock, June 20, to organize an automobile club.

It is reported that George P. Altenberg, of Cincinnati, will establish an automobile factory on Spring Grove avenue in that city.

The branch of the Fisk Rubber Company at San Francisco, which was destroyed by fire, has secured temporary quarters on Golden Gate avenue.

The Decauville Automobile Company, of New York, has filed notice that on July 10 it will apply for permission to change its corporate name to Wyckoff, Church & Partridge.

We have received from the A. C. of Pittsburg a booklet, "Runs and Tours," containing directions for sixty-six trips in Pennsylvania, Maryland, Virginia and West Virginia.

Motorists would do well to proceed cautiously through the borough of Dunellen, N. J. A section of the main street has been marked off so that the marshals can observe the speed of cars.

The New York Motor Club gave an outing to 1,240 orphans from eight institutions June 6. One hundred and forty cars carried them to Coney Island, where they saw a number of the shows.

A sightseeing automobile overturned and injured thirty-four persons while descending Commonwealth Hill, Boston, last Sunday. The brake broke and the machine ran away down the steep grade.

We have received a copy of the Annual Engineering Review of Purdue University, Lafayette, Ind., containing an article by Prof. W. O. Teague entitled "The Automobile Testing Plant of Purdue University."

The Cedar Rapids (Ia.) A. C. have elected the following officers: President, Ed C. Clark; vice president, George Stuart; secretary, G. L. Rothrock; treasurer, J. L. Bever; club captain and steward, Louis J. Baerthel.

Asa Goddard, the assistant secretary of the Cleveland A. C., expects to start soon upon a trip surveying roads for the Cleveland Club and for the American Automobile Association, in line with the work which he did last year in the New England States.

The Delaware A. A., Wilmington, Del., have elected the following officers: President, William S. Spruance, Jr.; vice president, Ernest duPont; secretary and treasurer, W. C. Jackson; executive committee, John Bancroft, John B. Bird, E. M. Hoopes, E. E. duPont, Charles C. Kurtz, John B. Martin, William K. duPont, J. J. Satterthwaite and Elmer E. Mitchell.

It is reported that the Oscar Lear Automobile Company, of Columbus, Ohio, have accepted the site formerly occupied by the Ohio Iron Company at Zanesville, Ohio, as the location of their new factory, and that the buildings will be ready by November 1.

Pittsburg motorists are lamenting the destruction, so far as automobiling is concerned, of the Freeport road along the Allegheny river, where trolley tracks are being laid. The A. C. of Pittsburg had been expecting to build its clubhouse on this road.

We learn that Adolph Woolner, of the Woolner Distilling Company, Peoria, Ill., has made a trip to Europe to investigate the subject of the applicability of alcohol as motor fuel, and has also made extensive experiments on a Glide car in the use of alcohol.

A bill for $158,000 has been presented by the 129 automobile owners whose machines were pressed into use for two weeks following the San Francisco disaster. As this would make the yearly earning capacity of an automobile over $30,000, it is probable the bill will be cut down considerably.

The large plant being built by the Buick Motor Company at Flint is rapidly approaching completion, and preparations are being made to abandon the Jackson plant. The new building, which will be used for assembling, will afford 64,000 additional square feet of floor space.

The General Vehicle Company announce that they have purchased the plant of the Vehicle Equipment Company, Long Island City, and will manufacture both electric and gasoline commercial vehicles, as well as furnish parts for repair or renewal of the trucks built by the Vehicle Equipment Company.

The Austin Automobile Company, Grand Rapids, Mich., are considering moving next fall to Detroit, and an option has been secured on a site near the Packard plant. The plan is to continue the Grand Rapids plant as an engine factory and to assemble in Detroit. The Austin 1907 model will be a 70 horse power $4,500 car.

It is reported that John T. Welsh, of Lancaster, Pa., a circus manager and proprietor, has formed a company in Philadelphia, capitalized at $200,000, for the purpose of having constructed forty large automobiles for Welsh Brothers' circus next season. It is the intention to do away with horses as much as possible, and to avoid transportation by railroad by using the automobiles.

A company is to be formed at Detroit for manufacturing an agricultural tractor designed by Henry Ford. The tractor is intended to be hitched to wagons, plows, harrows, mowers, binders, etc., and also for use as a portable engine for operating corn shellers, pump, posthole augers, etc. The engine of the tractor may be operated on alcohol, and it is hoped to interest Chicago and Kansas City (distilling centres) capital.

J. C. Nichols and A. B. Norwalk, doing business as the General Automobile Supply Company, 83 Chambers street, New York, have dissolved partnership, Mr. Nichols taking the store at 1663 Broadway, where he will do business under the old firm name, and Mr. Norwalk the Chambers street store, where the business will be conducted by the Thirty-five Per Cent. Automobile Supply Company, incorporated under New York laws.

Chairmen of A. M. C. M. A. Committees.

James Couzens, chairman of the standing committee of the A. M. C. M. A., has named the chairmen of the various standing committees of that association, and their associates on the various committees will be appointed speedily. The chairmen are as follows: Show, Benjamin Briscoe, Maxwell-Briscoe Motor Company; Tours and Races, W. C. Marmon, Nordyke & Marmon Company; Good Roads and Legislation, Charles Lewis, Jackson Automobile Company; Membership, W. H. Van Dervoort, Moline Automobile Company; Publicity, C. E. Duryea, Duryea Power Company; Finance, J. B. Bartholomew, Bartholomew Company; Standardization, C. E. Duryea, Duryea Power Company.

Alfred Reeves, the new general manager of the association, has opened the new headquarters in the Spalding Building, at No. 31 West Forty-second street, New York city, and is proceeding steadily with the work of arranging the details of the association's campaign of expansion and usefulness during the coming year.

Think 20 Per Cent. Commission Too Small.

At a meeting of the Board of Governors of the New York Automobile Trade Association June 7, it was announced that after all expenses in connection with the open air show at Empire track had been settled there would be a rebate to the members who were exhibitors of about 20 per cent. on the cost of their space. The treasury of the association is enriched by something like $1,000 by the profits of the show, and the receipts from other sources around show time.

As many dealers in the association declare that 20 per cent. commission on the sale of cars is too small for New York, a general meeting of the association will be called within a few days with a view of having the matter discussed and trying to secure a larger profit from the manufacturers.

Garage Notes.

C. E. Walters has opened the Palace Garage and Repair Shop at 323 East Fourth street, Long Beach, Cal.

Harry Hurley, Tacoma, Wash., formerly with the Washington Automobile Company, of that

city, is building a garage where he will handle the Acme cars.

Edgar Aldrich is building a garage at Northfield, Mass.

The Empire Garage at Marysville, Cal., was damaged by fire May 31.

W. Hodgkins has opened a garage at 9 Western avenue, Gloucester, Mass.

James Millard & Son, Kingston, N. Y., will erect a two story concrete garage.

Two cars were burned at the garage of the Little Rock (Ark.) Auto Company June 6.

Samuel Wey has opened a repair shop for automobiles on North Saginaw street, Flint, Mich.

M. G. Heim will erect a garage on Montgall avenue, near Electric Park, Kansas City, Mo.

The Cedarhurst Auto Company have opened a garage on Central avenue, Lawrence, Long Island.

Thomas W. Avery is building a garage at Groton, Conn., near the Hotel Griswold. It will accommodate forty cars.

A new garage has been opened at Flint, Mich., by James Parkhill on North Saginaw street, to be known as the Flint Garage.

Frederick and Ray Torrent will shortly open a garage at Muskegon, Mich., under the name of the Muskegon Auto Service Company.

The Hollywood Automobile Company, 118 Main street, East Orange, N. J., are building a concrete garage. They handle the Marion cars.

Charles R. Evans is trying to prevent Eugene N. Foss from erecting a garage on his property on Newbury street, Boston, on the ground that it is a nuisance.

The recently incorporated Shaw-Brown Motor Company, Buffalo, N. Y., have secured temporary garage quarters at 893 Main street, with offices in the store occupied by the Swinehart Tire Company's agency.

Clarence Hawley has sold his garage on Woodward avenue, Detroit, to Henderson Brothers, who are opening a complete repair shop in connection. C. F. Henderson, formerly with the Ford Motor Company, states that they will build a large extension soon.

Trade Personals.

George W. Wesley, superintendent of the Electric Vehicle Company, Hartford, Conn., has resigned. It is reported that D. W. Pell, formerly with the Westinghouse Company at Pittsburg, will be his successor.

Ed. E. Robertson has been appointed general sales agent of the Hartford Suspension Company, and will handle the Hartford shock absorbers, as well as the Gobron-Brillie cars, for which the company has the American agency.

E. P. White, for the past three years a salesman for the Milwaukee Rubber Works Company, Cudahy, Wis., has formed a partnership with T. T. Wildman, a former rubber manufacturer and salesman. They have opened a store at 1551 Michigan avenue, Chicago.

New Agencies.

Tacoma, Wash.—Harry Hurley, Acme cars.

Taunton, Mass.—F. W. Perry, Maxwell cars.

Detroit, Mich.—William Neuman, Queen cars.

Southboro, Mass.—J. O. Todd, Fawkes Airless tires.

Detroit, Mich.—Phil. G. Anderson, Fawkes Airless tires.

St. Louis, Mo.—W. E. Kaiser, 1512 Locust street, Fawkes Airless tires.

Dallas, Tex.—Appel & Brounell Tire and Rubber Company, Fawkes Airless tires.

New York City.—The Snutzel Auto Supply Company, 1534 Broadway, Bianchi cars.

Rochester, N. Y.—Fulton Avenue Motor House, 110 Fulton avenue, Fawkes Airless tires.

Washington, D. C.—J. B. Maxwell, 829 Fourteenth street, N. W., Fawkes Airless tires.

Boston, Mass.—Boston Tire and Rubber Company, 184 Friend street, Fawkes Airless tires.

Chicago, Ill.—White & Wildman, 1551 Michigan avenue, Fawkes Airless auto tires, manufactured by the Milwaukee Rubber Works Company, Cudahy, Wis.

Taunton, Mass.—Brownell & Burt, Lambert cars.

Philadelphia, Pa.—The Foss-Hughes Motor Car Company, Broad and Race streets, Baker eletcrics.

Cincinnati, Ohio.—Cincinnati Carriage Goods Company, 840 West Sixth street, Fawkes Airless tires.

Philadelphia, Pa.—E. Wustner, of the American Automobile Garage, 933-937 North Seventh street, American cars.

New Incorporations.

The capital stock of the W. J. Kells Manufacturing Company, of Jersey City, N. J., is to be increased to $50,000.

Wolf-Peterson Automobile and Machine Company, Chicago.—Capital, $5,000; garage repairing. Incorporators, C. E. Peterson, C. N. Wolf, William Pettis.

The Shaw-Brown Motor Company, Buffalo, N. Y.—Capital stock, $15,000. Incorporators, William Hoddick, Charles E. Shaw and Garnet G. Brown, of Buffalo.

The American Automobile Company, Cleveland, Ohio.—Capital stock, $30,000. Incorporators, C. C. Sigler, Alfred L. Brown, J. S. Maxwell, Alex. C. Mackenzie and Charles E. Carpenter.

The Dudley Auto School of Worcester, Mass., to succeed the Dudley Auto School and Garage Company.—Officers: S. W. Lamson, president; F. L. Lamson, treasurer, and L. M. Hubley, clerk.

The Shaw-Brown Motor Company, of Buffalo, N. Y.—Capital stock, $15,000; to conduct a garage and automobile salesroom. Incorporators, Chas. E. Shaw, late manager for the Maxwell Garage Company, of Buffalo; Garnet G. Brown and William Hoddick.

The Phœnix Motor Company, Augusta, Me.—Capital stock, $10,000 (nothing paid in); to maintain and operate a public garage, and manufacture and deal in automobiles and parts. Officers: President, L. J. Coleman, of Gardiner; treasurer, W. V. Lee, of Augusta.

Pedersen Manufacturing Company, 642 and 644 First Avenue, New York.—To manufacture special lubricating devices for different makes of cars. Incorporated under New York State laws, with the following officers: President, J. T. Pedersen; vice president and secretary, George W. Phillips; treasurer, Lorillard Spencer, Jr.

Trade Literature Received.

De La Vergne Machine Company, New York.—Catalogue of Hornsby-Akroyd oil engines.

Burnham-Standeford Company, Washington and First Streets, Oakland, Cal.—Catalogue No. 6, portable buildings.

Hibbard & Grindley, 35 and 37 State Street, Detroit, Mich.—Circular of the Fuller Power Vehicle Company, of Detroit.

The A. D. Meiselbach Motor Wagon Company, North Milwaukee, Wis.—Circular of Meiselbach commercial motor wagons.

Motorcar Company, 220-230 Twenty-first Street, Detroit, Mich.—Booklet B, "Cartercar, the Friction Driven Automobile."

Patents Issued May 22, 1906.

820,979. Force Feed Lubricator.—Charles W. Manzel, Buffalo, N. Y. Filed June 22, 1904.

821,028. Removable Anvil Contact and Bridge Support for Electric Vibrators.—Willard E. Dow, Braintree, Mass. Filed March 13, 1905.

821,029. Electric Binding Post.—Willard E. Dow, Braintree, Mass. Filed August 21, 1905.

821,032. Storage Battery.—Thomas A. Edison, Llewellyn Park, N. J. Filed September 28, 1904.

821,041. Repair Plug for Pneumatic Tires.—Ralph P. Kinney, Cleveland, Ohio. Filed October 20, 1905.

821,047. Adjustable Headlight.—Fred C. Lyon, Evanston, Ill. Filed November 29, 1905.

821,081. Carburetor.—Patrick H. Brennan, Syracuse, N. Y. Filed December 12, 1904.

821,149. Device for Facilitating the Removal of Valves from Valve Boxes of Internal Combustion Engines.—Gaston J. E. Alphandéry, Chaumont, France. Filed November 8, 1905.

821,154. Automobile.—Edgar P. Brewer, Spokane, Wash. Filed February 4, 1905.

821,161. Gear Controlling Device for Motor Vehicles.—Edward B. Gadsey and George P. Dorris, St. Louis, Mo. Filed October 5, 1904.

821,213. Wheel for Road Vehicles.—Annie C Birkin, Nottingham, England. Filed March 16, 1905.

821,248. Changeable Gear.—Charles E. Lipe and Alexander T. Brown, Syracuse, N. Y. Filed June 15, 1894.

821,266. Lubricator.—Thomas L. Sturtevant, Quincy, and Thomas J. Sturtevant, Wellesley, Mass. Filed March 6, 1905.

821,302. Motor Road Vehicle.—William B. Megone, Paddington, England. Filed August 3, 1905.

821,410. Relief for Explosive Gas Engines.—Peter P. J. Hall, Jr., Philadelphia, Pa. Filed July 11, 1905.

821,461. Ball Bearing.—Robert Conrad, Berlin, Germany. Filed May 10, 1904.

Patents Issued May 29, 1906.

821,622. Process of Cleaning Metallic Surfaces.—Thomas A. Edison, Llewellyn Park, N. J. Filed June 29, 1904.

821,623. Storage-Battery-Filling Apparatus.—Thomas A. Edison, Llewellyn Park, N. J. Filed November 2, 1904.

821,624. Gas-Separator for Storage Batteries.—Thomas A. Edison, Llewellyn Park, N. J. Filed November 2, 1904.

821,625. Process of Treating Alkaline Storage Batteries.—Thomas A. Edison, Llewellyn Park, N. J. Filed November 5, 1904.

821,626. Process of Making Metallic Films or Flakes.—Thomas A. Edison, Llewellyn Park, N. J. Filed March 30, 1905.

821,627. Process of Making Metallic Flakes or Scales.—Thomas A. Edison, Llewellyn Park, N. J. Filed March 30, 1905.

822,518. Wheel.—Alfred Freschl, Chicago, Ill. Filed April 21, 1905.

822,525. Spark and Valve Controlling Device for Explosion-Engines.—Robert M. Keating, Middletown, Conn. Filed December 23, 1901.

822,561. Apparatus for Manufacturing Wheel Tires.—Peter D. Thropp, Trenton, N. J. Filed November 1, 1905.

822,583. Vehicle Tire.—James Christy, Akron, Ohio. Filed August 11, 1905.

822,615. Vehicle Wheel.—Lewis G. Langstaff, New York, N. Y. Filed June 29, 1905.

822,634. Automobile Extension Canopy Frame.—Lewis C. Shipley, New York, N. Y. Filed February 6, 1905.

822,651. Tire Armor.—John Coan, Kansas City, Mo. Filed July 31, 1905.

822,665. Automobile Wheel.—John C. Higdon, St. Louis, Mo. Filed September 23, 1905.

822,681. Carburetor for Gasoline Engines.—Robert A. Middleton, Rexburg, Idaho. Filed May 2, 1905.

822,685. Lubricating Apparatus.—John F. McCanna, Chicago, Ill. Filed August 1, 1902.

822,702. Clutch and Transmission Gear.—Julius W. Walters, New York, N. Y. Filed June 9, 1903. Renewed September 28, 1905.

822,711. Rim and Tire Fastening for Wheels.—Robert H. Atcheson and Joseph H. Walsh, Chicopee, Mass. Filed July 31, 1905.

822,723. Ball Bearing.—Robert Conrad, Berlin, Germany. Filed February 23, 1904.

822,726. Friction Clutch.—James F. Duryea, Springfield, Mass. Filed December 12, 1904.

822,727. Friction Clutch.—James F. Duryea, Springfield, Mass. Filed December 12, 1904.

822,736. Grating for Facilitating the Flow of Fluids.—Jules Grouvelle and Henri Arquembourg, Paris, France. Filed August 28, 1903.

822,782. Current Distributer for Sparking Devices.—James M. Smith, Philadelphia, Pa. Filed May 23, 1904.

...THE...

Horseless Age

VOLUME 17 JUNE 20, 1906 NUMBER 25

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Hill Climbing Contests: A New Method of Classification.

By Albert L. Clough.

Each spring witnesses the holding of quite a large number of hill climbing contests, under the auspices of automobile clubs. Such contests are designed to test the relative merits of the cars entered, so far as their rates of speed up a hill are concerned. Hill climbing contests have the merit of allowing the full power of cars to be exercised, without the danger of excessive speeds being attained—the gradient, as a rule, automatically limiting the speeds within safe limits. Such a contest is nothing more or less than a speed contest up a grade, but it possesses practical merits entirely different and out of all comparison with a speed contest on level ground.

HILL CLIMBING VERSUS RACING.

The writer has listened with close attention to the laudation of speed contests on level tracks or roads, and the arguments which have been presented as to their usefulness in leading to the perfection of the motor car, but these arguments have "fallen on stony ground," so far as he is concerned. Hill climbing contests appeal to one as something of more practical value in proving the relative merit of cars for everyday use. A car capable of making a marvelous record on a race track might be and often is incapable of traveling ordinary roads, but an automobile which makes a fine showing in a hill climbing contest is almost always capable of good, practical road work. In a word, the track record of a car furnishes no criterion as to those qualities which make a car practically useful, while a hill climbing contest does.

A hill climbing contest, if held upon a steep incline, gives a measure of the relative capabilities possessed by the entering cars, so far as lifting themselves is concerned. The power consumed by road resistance is small relatively to that absorbed in raising the car against gravity, and at the speeds usually attained the power consumed in air resistance is a rather small fraction of the total energy expended. In track racing a very large part of the net power of the engine is dissipated in overcoming air resistance, very little in tractive resistance and usually none in doing work against gravity. On a very steep course the vertical distance through which a car is raised per unit of time in climbing the grade, times the weight of the car, furnishes an approximate measure of the net horse power being developed by its motor.

FACTORS DETERMINING SPEED ON HILLS.

To the operator of every car which is driven at legal speeds the matter of surpassing interest is the car's capabilities in overcoming grades, rather than its powers of attaining a speed in which air resistance becomes the main power absorbing factor.

The speed at which a car can ascend a given grade is directly proportional to the net horse power which its motor is capable of developing under the assumed conditions, and is inversely proportional to its weight. In other words, it is proportional to its net horse power per unit of weight.

A hill climbing contest, in order to prove of interest and to attract a large number of entries, must be so arranged that each event shall be so conditioned as to insure a close competition between the vehicles which are permitted to enter it. If the rules governing the entries to any particular event are so framed that cars obviously of very widely different hill climbing capability are permitted to enter the result is sure to be that only the strongest hill climbers among the cars will actually take part. No contestant is willing to enter his car in a class in which he is sure to be hopelessly outdistanced.

CLASSIFICATION OF ENTRIES.

Considerable thought is required in order to so frame the classification of the different events that all cars can find at least one event in which they will be "up against" cars with which they may compete closely, and no method of classification is found to be by any means ideal, either in theory or practice. As is well known to all who follow hill climbing contests, the method usually followed is to arrange for a number of events open to cars the regular selling prices of which range between certain figures. For instance, one event may be provided for cars listing at $850 or less, another for those listing at more than $850 and not more than $1,250, another for those listing at more than $1,250 and not more than $2,000, and so on up to a contest for cars costing $5,000 and upward.

CLASSIFICATION BY PRICE.

The theory underlying this method of classification is that all cars priced at $850 or less are necessarily somewhat alike in their capabilities, for the simple reason that all manufacturers may be expected to turn out comparable production for about the same money. The assumption is that if about the same amount of money is put into two cars by two different manufacturers, those cars should possess hill climbing capabilities sufficiently comparable to render them close competitors and to thus make things interesting.

If one manufacturer can produce a car for less than $850 that is a better hill climber than any other car produced for less than this amount, it is argued that his car must be better designed and better built than that of any other manufacturer and that he ought to have the prize and the advertisement which goes with his winning of the event. There is certainly merit in this method of classification. It is simple, and the price data required are readily available from manufacturers' catalogues. No weighing in or other measurements are required, and there can be no argument as to what class a certain car is eligible. Of course, it is very difficult to decide what minimum and maximum price shall form, so to speak, the boundaries of each class. The boundaries are necessarily purely arbitrary. If a large number of classes are made, defined by prices not very widely different, the events may be more close and interesting, but the entries in each will be smaller and the whole contest unduly protracted. If, on the other hand, the classes are few, the events will be less close and a great many cars which in price correspond to nearly the minimum figure of the class to which they are eligible will be deterred from entering as standing very little "show" with other much higher priced cars in the same class.

SPEED ON HILLS AND PRICE.

In contests conducted on the price classification basis the lower priced vehicles generally appeal to the careful student of the figures as making, in a way, a better average showing than the highest cost cars, so far as mere speed up grade is concerned. For instance, in the recent Worcester contest the average speed of the nine cars in the $3,000-$5,000 class was only about 12 per cent. greater than that of the six cars in the $850-$1,250 class, although the average cost of the cars in the former class was about four times that of those in the latter. The fastest time in this contest was made by a very costly imported car and was only 25 per cent. faster than that made by a $150 motorcycle. While the best time made in such a contest is pretty sure to be by a high priced car, the practically minded observer is pretty sure to see that there is really a very slight difference in hill climbing speed between high and low priced vehicles. When one buys a very high priced car one is buying luxury, good workmanship, selected materials and reputation, rather than exceptional hill climbing capability. It is unfortunately the case that many a person, noting that a certain car wins a hill climbing event, jumps to the conclusion that that car is the one for him. On the contrary, it may be the very make of car which he should "steer clear of," for it may be equipped with a motor too powerful and heavy for its light running gear and transmission and prove weak and short lived in actual use.

Classification by price does not always result in closely contested events. In the contest above referred to, in the $3,000-$5,000 class the slowest car took 140 per cent. as much time in making the ascent as did the swiftest one, and in the $850-$1,250 class the car which showed the least speed consumed 96 per cent. more time than did the winner.

CLASSIFICATION BY WEIGHT.

Classifications based upon weight are sometimes resorted to in hill climbing contests. The rationale of this system is evidently founded upon the assumption that the effective horse power of motor vehicles

as generally constructed bears a constant relation to their weight. This is by no means exactly true, but it is a fact that a certain minimum weight per unit of power has been found by the manufacturers to be necessary in order that a car shall prove able and satisfactory. Heavier cars, as a class, possess more power than do light ones, and, in time, the ratio between the two factors may approach sufficiently near to a standard to render hill climbing contests based upon a weight classification close and interesting. The car of a certain weight which wins a hill climbing event is likely to be better designed, as to motor and transmission, than are its competitors. The builders of such a car ought to have credit for their achievement. It would seem that the weight classification is quite as logical as that based upon price, although its employment involves some labor in weighing in the machines.

CLASSIFICATION BY HORSE POWER.

Rated horse power is very seldom made the criterion for classification in hill climbing trials, nor is this strange, for the figures given on power are hardly more than an "idle dream." If this classification were used the conservatively rated car would have a chance of entrance into a lower class than would the exorbitantly rated car of about equal actual horse power, and the honest builder's car would have a good chance to win, and virtue would have its reward—a thing that happens only too seldom.

As has been stated above, the real criterion of hill climbing capability of a vehicle is the ratio of the horse power delivered to the wheels by its motor and the total weight of the car and passengers. In practice, the gear ratios of an automobile sometimes interfere to prevent the full engine power from being realized, under particular conditions. Thus, a car may be so much slowed down, when climbing a particular grade, that its engine does not run fast enough on the high speed to develop the full power of which it is capable, while, if driven on its low speed, on the same grade, the engine has an excess of power over that required to move the vehicle at the speed which the gear permits of. Three and four speed cars can compete under terms which nearly eliminate the effects of differences in gearing. In some hill climbing contests a change of sprocket ratio is allowed, and thus the question of differences in gear may be practically set aside, since each contestant may be expected to gear his car at the most effective ratio. The factors then are reduced to effective engine power and car weight.

CLASSIFICATION BY CYLINDER VOLUME AND WEIGHT.

There is no perfect criterion of a simple nature by which the power a motor is capable of producing can be judged. The best rough and ready estimate is probably the cubic inches of volume swept by the piston or pistons in a single stroke. That is, the volume of fuel burned per cycle, which is found by multiplying the cross-section of the cylinder bore in inches by the stroke in inches and then by the number of cylinders. Engines having the same cylinder dimensions and the same number of cylinders vary very widely in respect to their horse power outputs, but such variations are almost entirely due to merits or demerits in design. The manufacturers of a motor having a 4½x5 inch cylinder who can get the most power out of that cylinder is the "best fellow" and ought to have credit for it. Starting, as one may say, with the same basis mechanically, the designer who can secure the most work from certain dimensions is worthy of commendation.

It does not seem an entirely impracticable proposition to base the classifications for a hill climbing contest upon the cubic inches of piston displacement of the motor per 100 pounds of actual car weight, and it would seem that this method has a substantial, logical foundation. The bores, strokes and numbers of cylinders of the motors of nearly all cars are now freely printed in manufacturers' catalogues, and weighing in is no serious or unusual procedure. The amount of figuring required to compute the cubic inches of piston displacement per 100 pounds of car weight need not be very great, as there are plenty of tables of areas of circles and the matter is one of simple arithmetic.

Classification of cars on this system would be as follows, for example: Class 1—Cars having more than 8 cubic inches piston displacement per 100 pounds of loaded weight and not more than 10 cubic inches. Class 2—Cars having more than 10 and not more than 12 cubic inches per hundredweight. Class 3—12-14 cubic inches, and so on, until 20 cubic inches or so is reached. This classification might have to be extended, perhaps at both ends, and the range included within each class could be made wider or narrower, as desired.

A classification of this sort would abolish all rules as to whether tonneaus or other equipment should be carried, the only stipulation necessary being that cars should contest in the condition in which they were weighed. In any class that car might be expected to win which was fitted with the most powerful engine—considering its size—and which possessed the most efficient transmission of power to the driving wheels.

These two facts, in regard to cars, are the very ones respecting the power plant which are of the most interest. It is believed that a hill climbing contest in which the contesting vehicles were classified as above would bring out some very interesting points. The writer fails to see why it could not be carried out successfully. There are some objections to the method, but it appears to possess a much more logical basis than do others.

A Reserve Gasoline Tank.

By Frank N. Blake.

In order to make room for attaching and testing various carburetors, the writer had occasion to replace the gasoline tank in a runabout of popular make with a new one which occupied less horizontal space in the rear part of the vehicle. That the capacity of the tank might not be diminished, it was made as high as the rear deck of the body would permit, and the galvanized iron water tank which had previously rested on the gasoline tank was replaced by a tank made of copper, and placed on the other side of the vehicle. Incidentally it may be remarked, for the benefit of the inexperienced, that water tanks for automobiles should never be made of galvanized iron, as this material, with some kinds of water, will be pitted through in the course of a year or so. It is said, and probably it is a fact, that the purer waters are more destructive to iron tanks than those which contain considerable mineral matter; be this as it may, water tanks should not be made of a material which will soon occasion both trouble and expense. If the manufacturer cannot be content with a dollar less profit per automobile let him charge the additional dollar that a durable tank would cost to advertising, and rest assured that it is money well spent; that is, if he is in the business to stay.

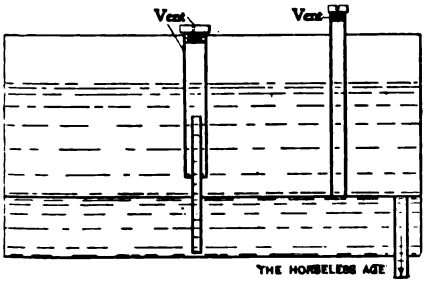
As some carburetors are so constructed that the gasoline nozzle is relatively high, it appeared best to raise the bottom of the tank correspondingly, and this gave rise to the idea which is described in this article, namely, to provide a reserve storage capacity for an extra gallon of gasoline for emergency use, occupying space which in the present case at least would not otherwise have been utilized. The accompanying cut makes the construction of the tank clear. When the lower portion of the tank is filled, the screw which closes the top of the small brass vent tube must be removed in order to vent the auxiliary reservoir, but, of course, it will not need to be taken out when filling the main part of the tank; both parts of the tank are filled through the same opening, the lower compartment being filled by gasoline overflowing from the main compartment.

If the main tank becomes empty the reserve gasoline is elevated into it by forcing air into the vent, either by means of the tire pump or by the more convenient method of using the mouth and lungs.

In making the tank it is well to have a tube made of sheet metal surround the filling opening and extend downward nearly to the bottom of the tank, to prevent gasoline from being dashed against the vented plug when riding over rough roads; this tube must be vented at the top, as shown in the cut. The usual partition with openings at top and bottom (not shown in cut) should be put in to keep the gasoline from swashing about in the tank.

One of the advantages of the form of reserve tank above described is that it does not require the use of any cock or valve, and is therefore obviously free from all liability to the troubles which always result from their use. The tank made has the following dimensions: Length, 15 inches; width, 8 inches; depth, 8 inches. The auxiliary tank has a further depth of 2 inches, making a total depth of 10 inches, capable of holding five gallons.

In making a new tank, do not perpetuate the short sighted manufacturer's method of drawing the gasoline supply from the front or middle of the tank. A very little reflection will convince the ordinary mind that in case the fuel supply becomes low, it is better to have the little which remains in the tank flow into the carburetor so that it can be used; a car will usually go down hill with little or no fuel, but going up hill is another matter, and naturally calls for taking the gasoline from that part of the tank which is then the lowest. A certain car is made so illogically that it stops from lack of gasoline when going up a 16 per cent. grade with over 2 gallons of gasoline still in the tank. Perhaps it should be stated that the elevation at which the carburetor is placed is partly responsible for the car refusing to go up hill with



SECTIONAL VIEW OF TANK.

so much gasoline still remaining in the tank, but this matters little to the unfortunate who is stuck.

Many, and perhaps most, automobile drivers can testify to the desirability of being able to carry a small emergency supply of gasoline, enough to get home on, or to at least take them to some dealer in gasoline, in case the tank becomes empty unexpectedly. An acquaintance went riding one Sunday without thinking to inspect his gasoline tank before leaving home; of course, the unexpected happened, and the first thing he could do was to apply to a druggist for the quart of gasoline which he estimated would be sufficient to carry him home. The drug man did not keep gasoline; he had benzine, but his license would not allow him to sell it by the quart, so my friend bought two pints, at a good round price, which did just as well as a quart would have done, and landed him safely home, and without a readjustment of his carburetor. Another time when his tank suddenly went dry there was no drug store near by, and a four mile tramp ensued, the return half of which was enlivened by the companionship of a leaky can of 30 cent gasoline. Wishing to avoid being caught again in this manner, he then began to carry about in his automobile a large bottle of gasoline, until one day an unlucky jolt cracked the bottle and allowed its contents to flavor the lunch he had procured for himself and lady, and to temporarily moth-proof the wraps which were stowed away in the luggage space.

Not only the tank in the automobile, but the storage tank at home should also be so arranged as to give the owner timely notice of approaching emptiness. A pump should always be used instead of a cock for drawing gasoline from the storage tank; a cock will wear, and sooner or later leak, and a slight leak cannot be detected, on account of the rapid evaporation of gasoline; and even if it could, how would you stop it? The pump may wear some, but it will not waste gasoline, nor is it as liable to cause an accident.

In order to insure a warning being given when the gasoline is getting low in the storage tank, the suction pipe may be raised a little above the bottom, enough so that, say, 5 gallons will be below it; then, when the action of the pump indicates that there are but 5 gallons left, more can be ordered, and the suction pipe let down to the bottom of the tank and the remaining fuel pumped out as wanted for use pending the arrival of a fresh supply. Of course, the height to which the suction pipe is raised will depend upon how fast you are in the habit of using gasoline, and also upon the celerity with which Mr. Rockefeller is accustomed to attend to your gasoline wants; in some localities the tank wagon goes the rounds every day; in others two or three times per week, so there are several factors which must be taken into account in determining the elevation of the suction pipe.

Herring-Bone Gears.

By E. J. B.

One of the improvements in the transmission system of electric pleasure carriages is the substitution of herring-bone gears for those of the spur type, the advantage of doing so being the quiet running qualities of the former, which if well designed and mounted are practically noiseless. This feature of quietness is due to the twisted arrangement of the teeth, which tends to distribute any errors in their shape. Some of the spiral teeth are in contact very nearly all the time, and the action is therefore practically perfect, so that the herring-bone gears of ordinary size work together with a very smooth action.

To avoid driving gears or sprockets of a large diameter a double reduction from the motor to the rear wheels is usually employed, one of the reductions being made by means of herring-bone gears mounted on the motor and the other reduction by chain and sprockets to the driving wheels. Another satisfactory arrangement, which is more recent, consists of a double reduction of herring-bone gears from the motor to a live rear

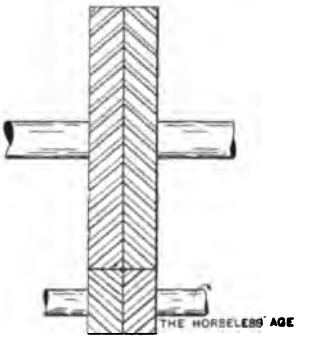


FIG. 1.

axle. Whatever system is used, the design of the gears will be much the same.

To get the best results more metal should be allowed under the teeth than is necessary for strength, that the tendency to chatter may be reduced to a minimum. If the gears are mounted on the motor, which is in turn mounted on the metal frame, pieces of leather or wood should be interposed to break up any harmonic vibrations which might increase the noise of the gears. Care should also be taken that the lubricant in the case does not get so stiff that the gears merely cut out a channel through it and run practically dry.

The material of the pinion should be machine steel, not hardened, while the gear should be made of a fairly hard grade of bronze. The efficiency of these gears, if properly cut, will not be materially less than that of spur gears working under the same conditions.

Herring-bone gears differ from spiral gears with their axes parallel only in the fact that each gear has double spiral teeth which act in opposite directions, thus completely neutralizing the thrust due to the oblique action of the teeth. This arrangement of right and left hand spiral teeth gives the advantage of the smooth, almost constant contact of the spiral teeth, and avoids the otherwise necessary thrust bearings.

For manufacturing reasons the right and left hand spiral teeth are usually, though not always, cut separate and then bolted together, forming the complete gear, in which case the angles should be so arranged that

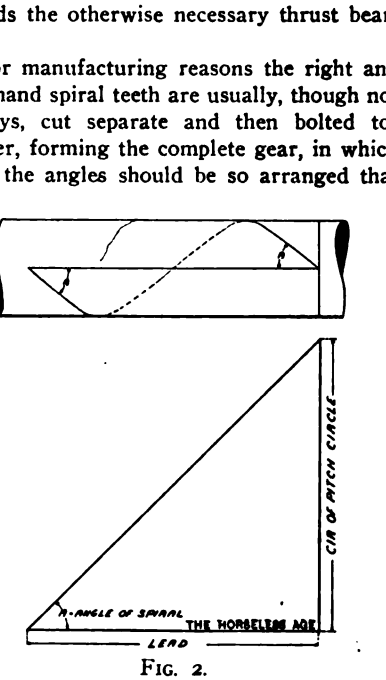


FIG. 2.

the wedging action of the teeth of the driving pinion tends to pull the halves of the gear together, as shown in Fig. 1.

Spiral gearing in any form seems to be a subject not well understood by draftsmen and designers. This is due largely to the difficulty of making graphical explanations, and the comparatively limited field in which they are employed. This fact, together with the increasing use of herringbone gears in automobile construction and the limited amount of information pertaining to them given in the gear instruction books, may make a brief explanation of their calculation of interest.

As a preliminary experiment, cut a piece of paper in the form of a triangle and roll it on a cylinder, as shown in Fig. 2. It will be clearly seen that the altitude of the triangle corresponds to the circumference of the pitch circle, the base to the lead, or the advance of the spiral in one turn, the hypothenuse to the development of the spiral, and the angle between the hypothenuse and the base to the angle of spiral. The relations of these functions are then those of simple triangulation.

The real section of a spiral tooth is shown by a plane at right angles to the axis of the gear, while the normal section is represented by a helical surface at right angles to the spiral tooth. This section is the equivalent for spiral teeth of the normal section of the spur gear that is made by a plane, or of the normal section of the bevel gear made by a sphere. As the helix cannot be represented on a plane figure, it must be imagined. The normal section should be the one considered, as on it is based the size of the cutter, which should be standard where possible.

The relation of the diametrical and circular pitch of the normal section to those of the real tooth section depends on the cosine of the angle of spiral. For example, the normal circular pitch is found by multiplying the real circular pitch by this cosine.

The angle of the spiral most used is 45 degrees, though several manufacturers are using about 35 degrees with somewhat better results. This angle is enough to insure almost constant engagement of the teeth, and the thrust due to the oblique teeth is less, thus giving quieter and more efficient gears. It is usually convenient, however, to vary this angle somewhat, that standard tooth sections or leads may be obtained.

For example, assume a gear of twenty teeth, six normal pitch, and thirty-five degree angle of spiral, and calculate the dimensions necessary for cutting the teeth.

Normal circular pitch = .5236", the same as for a spur gear.

Real circular pitch = .5236" ÷ cos. 35° = .6392".

Circumference of pitch circle = .6392" x 20 = 12.784".

Diameter of pitch circle = 12.784" 3.1416" = 4.069".

Diameter of blank = 4.069" + addendum = 4.402".

Lead = 12.784" ÷ tan. 35° = 18.25".

To cut the required lead, special gears for the milling machine may have to be made, and this should be done, rather than to use a lead which differs over one-eighth inch for small pinions and three-eighth inch for gears of the size ordinarily used. Data showing the standard leads obtainable are given on a chart furnished with each milling machine and differ with the machine used.

Where possible gears should be designed so they may be cut in gangs, thus making them cheaper to manufacture.

Securing the Piston Pin.

By Frank N. Blake.

In The Horseless Age, Vol. 17, No. 10, there appeared an excellent article by Thos. J. Fay, E. E., on motor piston pins, in the course of which he described and illustrated various methods used for preventing the pin from working endwise and scoring the inside of the cylinder. Mr. Fay truly says that "floating" piston pins are responsible for a great deal of mischief, and in view of the importance of the subject it may be worth while to supplement the good work by considering a few more methods which are employed for keeping

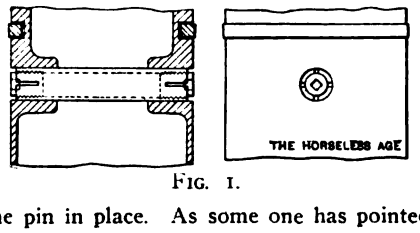


Fig. 1.

the pin in place. As some one has pointed out, the piston pin receives more force from the explosion than any other working part of the gasoline engine, with the exception of the piston itself; this, in addition to its proximity to a source of great heat, renders the best possible construction, as well as the most perfect lubrication, practically imperative. It is, of course, understood that the piston pin should be tight in the boss, and remain so, even were it not for the serious damage which a loose pin will invariably cause.

Protection for the cylinder, the most costly part of the engine, is of the most vital importance, because in the event of injury it must be replaced, usually at a high price for a new cylinder, together with considerable labor and delay, or else the cylinder must be rebored and a new piston and set of rings made and fitted, which is no small task, considering that patterns and castings must be made, in addition to doing considerable of the most careful work which enters into the construction of an automobile.

The piston pin which is only well fitted and driven to the right place and left there is perhaps too simple to require mention; if it actually is a good fit it will give no trouble, still, in view of what might happen, it would seem best to have something more than a good fit to stand between the pin and a ruined cylinder.

Fig. 1 illustrates a method of fastening

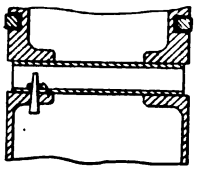


Fig. 2.

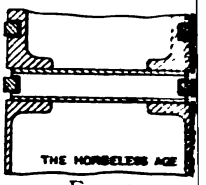


Fig. 3.

the piston pin which the writer knows to have failed in at least two instances, either because of some inherent defect in the design or from carelessness or lack of skill on the part of workmen. This plan is to drill and tap each end of the hollow pin, split it into quarters and screw in a tapered brass socket plug, so as to expand the split ends and make them bind against the walls of the hole through the piston. This plan does not seem right, in that the pin does not have a uniformly tight fit throughout the length of the hole through the piston, for if the ends are expanded they will fit tighter than those portions of the pin which are nearer the connecting rod; this, in connection with the split ends, must weaken the pin, reduce its rigidity and allow it to spring. Very likely this action contributes largely to the difficulty of keeping the pin in place.

Fig. 2 shows how the piston pin is fastened by drilling a hole through the boss in the piston and one wall of the hollow pin and driving in a tapered pin, which in turn is held in by a cotter pin in the hollow piston pin. If this work is well done, and especially if both ends are thus secured, there is very little chance that the pin will ever move.

Another method is shown in Fig. 3. This is to hold the pin from doing damage by putting one of the piston rings around it and the piston, so that if the pin becomes loose the ring will prevent it from touching the cylinder. This seems a simple and effective way of accomplishing the desired end, but at least one manufacturer who once employed this method has abandoned it for a different one.

Fig. 4 shows a way which has given good results and is easy to apply. A three-sixteenths inch steel pin is put through one side of the piston and one end of the pin. Both ends of the hole for the three-sixteenths inch pin should be counterbored and the ends of the pin spread a little with a centre-punch, to keep it in place.

When it is realized what serious damage a loose piston pin can and certainly will do, it surely seems worth while to go to considerable trouble, and, if need be, expense in order to make sure that the piston pin cannot get loose and necessitate costly repairs and aggravating delay. Automobiles and the men who make them are not like Cæsar's

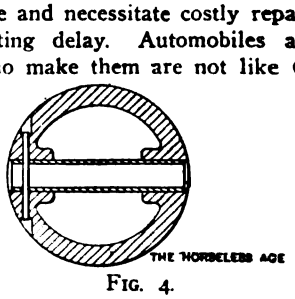


Fig. 4.

wife, and though it may be inconvenient and seemingly unnecessary at the time of purchase, it may be best to dissemble a new car and see that the piston pins are reasonably sure of keeping their proper places; the writer knows of more than one instance where a heavy expense was incurred which might have been avoided by such a course; an inspection would have taken but a small fraction of the time which was subsequently consumed in making repairs, not to mention the expenses which attended the resulting damages.

Kerosene for Internal Combustion Motors—The Patent Situation.

By Frederick W. Barker.

The quick vaporizing quality of gasoline and the convenient manner in which air can be carburetted thereby for use in internal combustion motors have undoubtedly been most important factors in the rapid growth of the automobile industry. The ability to start an engine by simply drawing in, compressing and firing a charge of gaseous mixture is one of the great attractions of the fuel, and a most extensive art has grown up around the means for mixing the air and gas, and controlling and regulating the supply to the motor.

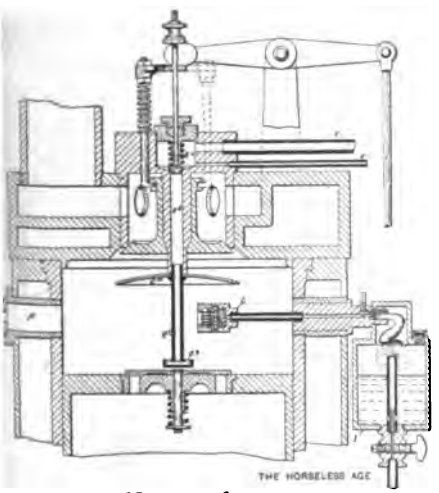
On the score of economy and safety, however, kerosene is so much superior to gasoline as fuel that when its features of relatively slow vaporization and the concomitant tardy propagation of flame have been compensated for—as by adapting the motor to these peculiar characteristics—this fuel will undoubtedly supplant gasoline, and be the means of rendering practicable the commercial vehicle.

Many patents have been issued dealing with the subject of kerosene motors, but generally the efforts of inventors seem to have been directed to subordinate this more reluctant combustible to the high speed gasoline engine, instead of designing engines capable of fully utilizing the different potentialities of this fuel.

The following review of patents affords a fairly comprehensive idea of the various lines in which inventors have worked:

BRAYTON, NO. 432,260, OF JULY 15, 1890.

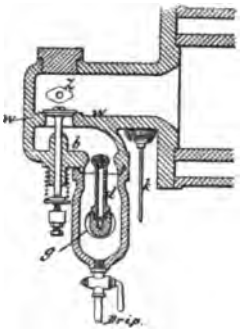
Air and oil are forced through pipes e e^1 respectively to chamber e^2, and, with the periodic opening of valve f, passes through tubes e^6 and e^7, issuing upwardly in fine streams through perforated plate e^9. G is an incandescent igniter, in the path of said ascending streams, receiving its fuel supply from a chamber I, through which air is pumped under pressure. A torch introduced through opening P first fires the igniter. The plate e^{10} becomes incandescent in the operation of the engine, and the unburned particles of ascending fuel impinging against this plate are thereby consumed.



No. 432,260.

OTTO, NO. 437,507, OF SEPTEMBER 30TH, 1890.

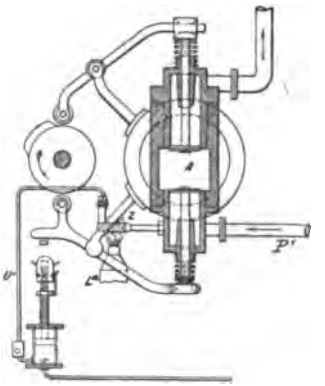
Oil issues from nozzle d in chamber b and strikes against heated wall w of the combustion chamber. Air enters through port g, and the mixture passes through valve a into the combustion chamber, z being the igniter. The wall w is initially heated by an external burner K.



No. 437,507.

LINDNER, NO. 453,446, OF JUNE 2ND, 1891.

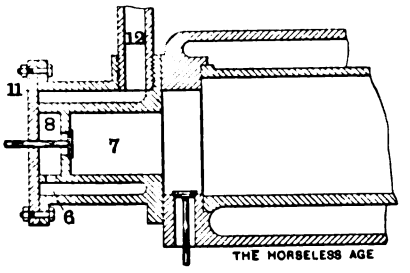
The oil, pumped through pipe V', is vaporized at Z by a continuous flame from burner L^a; the vapor and air from pipe P' enter a valve box to supply cylinder A.



No. 453,446.

KNIGHT, NO. 518,151, OF APRIL 10TH, 1894.

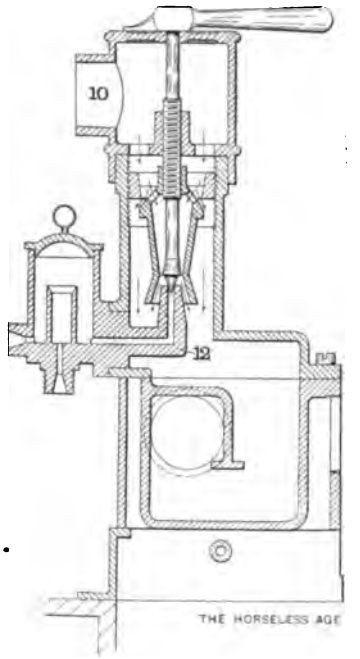
The pipe 12 conducts oil through passage 6, around combustion chamber 7, to valve chamber 8, whence it passes, as vapor, through valve 11 to the combustion chamber. The combustion chamber is to be heated externally in starting up.



No. 518,151.

SECK, NO. 549,939, OF NOVEMBER 19TH, 1895.

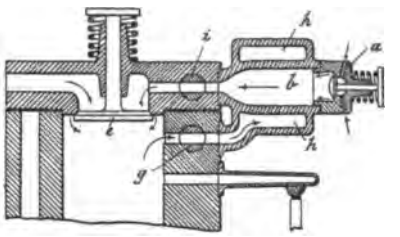
Air, aspirated by the action of the engine piston (not shown in this view), enters port 10 and passes through the downwardly contracting tube, expanding again in leaving the bell shaped mouth of said tube. In passing, the air draws oil from the adjustable nozzle 12, and carries it to the cylinder in the form of fine spray.



No. 549,939.

BOMBORN, NO. 578,034, OF MARCH 2D, 1897.

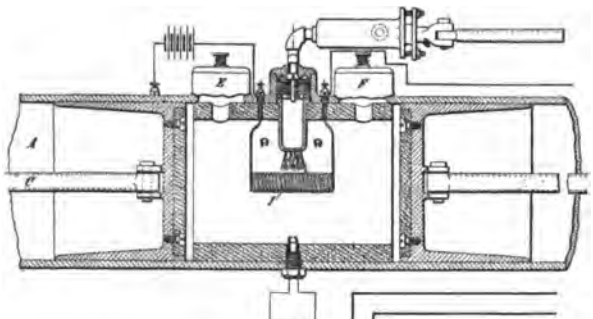
Oil enters the combustion chamber through port a and valves i and e during the suction stroke, becoming vaporized in transit through chamber b by reason of said chamber having jacket h, which receives the hot exhaust from the cylinder, through valve g.



No. 578,034.

ROWBOTHAM, NO. 595,487, OF DECEMBER 14, 1897 (SEE PAGE 918).

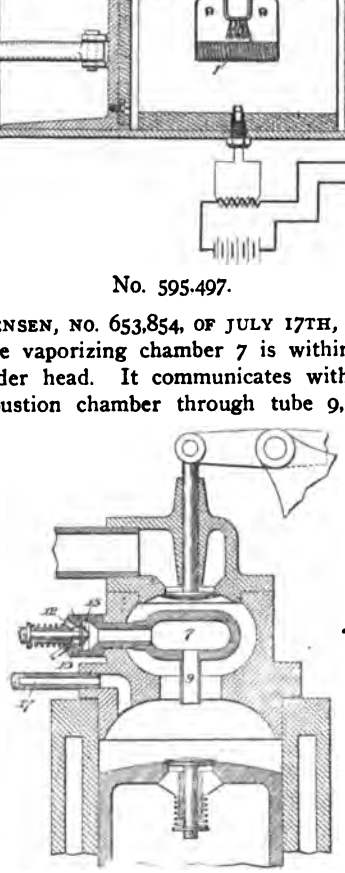
This example shows a multi-piston cylinder, E being the air inlet, and F the exhaust. The oil is injected through spray nozzle d, and impinges against a refractory body I containing a resistance conductor which is included in an electrical circuit, and is thereby maintained at a temperature less than incandescence, but capable of vaporizing the oil, which mixes with the air under compression.



No. 595,497.

TORBENSEN, NO. 653,854, OF JULY 17TH, 1900.

The vaporizing chamber 7 is within the cylinder head. It communicates with the combustion chamber through tube 9, and

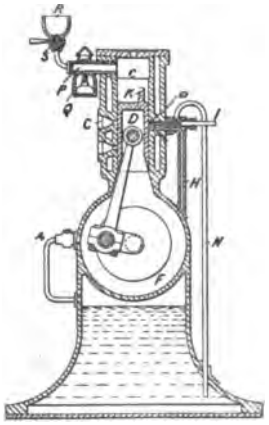


No. 653,854.

receives oil and air through ports 13 and 12, respectively, these latter being controlled by valve 15. Ignition is effected by hot tube 17.

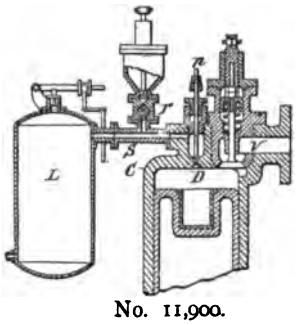
BAY, NO. 661,599, OF NOVEMBER 13TH, 1900.

Oil fed from cup R is vaporized by lamp Q in its passage through channel P to the combustion chamber, to start the engine. Subsequently this fuel supply is shut off by valve S, and the engine operates with the oil received through pipe N, and air



No. 661,599.

coming from crank case F through pipe B, controlled by needle valve I. These elements impinge against the heated ledges



No. 11,900.

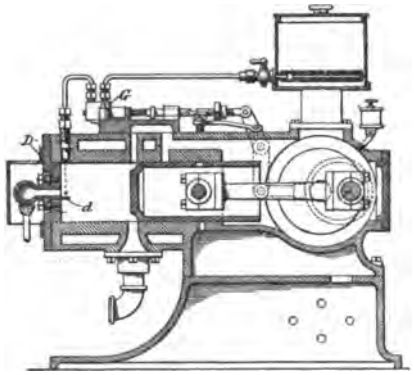
K, the oil becoming vaporized, mixing with the air under compression, and the mixture being fired by an igniter introduced at C'. This is a three port, two cycle engine, having an air intake A and exhaust C.

DIESEL, NO. 11,900, REISSUE OF APRIL 2ND, 1901.

Air is pumped into compressor I to a pressure higher than the maximum pressure in cylinder C. A certain proportion of this highly compressed air passes through pipe S, valve chamber *n* and nozzle D, drawing with it oil admitted through valve *r*, to mix with the larger quantity of air that has been admitted through valve V and compressed by piston P. Means (not shown) are also provided for mixing the oil and highly compressed air in valve chamber *n*, and for passing the mixture in subdivided form into cylinder C.

WEISS, NO. 680,953, OF AUGUST 20TH, 1901.

This device shows pump G for forcing the oil against ledge *d* of igniter bulb D',

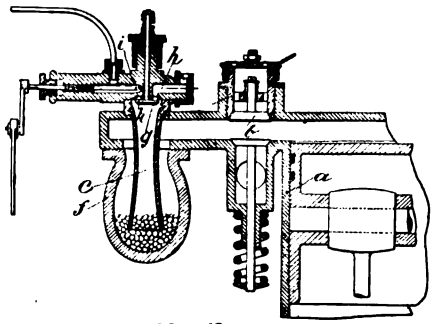


No. 680,953.

the latter being insulated from the cylinder head. Said bulb is heated by an external flame in starting.

LAURENT & CLERGET, NO. 683,125, OF SEPTEMBER 24TH, 1901.

Air enters through passage *h*, oil through



No. 683,125.

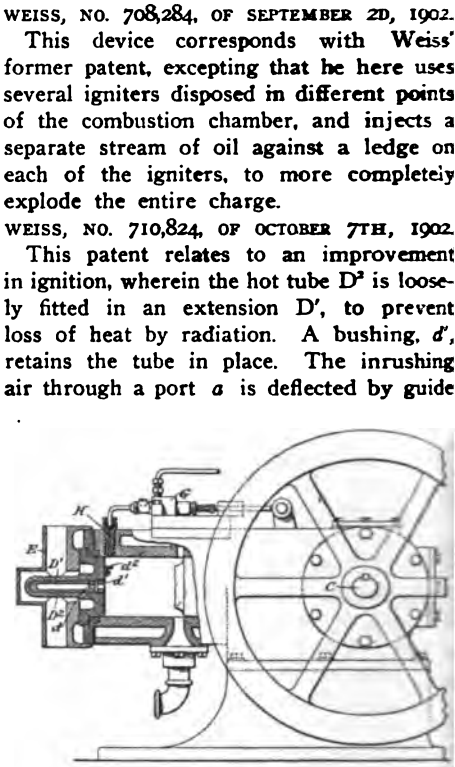
hole *i*, and water through an adjacent hole (not shown in this view), all three inlets being controlled by valve *g*. The oil, water and air pass through tube *e* onto metal fragments in pocket *f*, which at starting is externally heated. The oil and water are here vaporized, and the mixture, entering passage *a'*, mixes with air introduced through valve *b* to form an explosive charge.

WEISS, NO. 708,284, OF SEPTEMBER 2D, 1902.

This device corresponds with Weiss' former patent, excepting that he here uses several igniters disposed in different points of the combustion chamber, and injects a separate stream of oil against a ledge on each of the igniters, to more completely explode the entire charge.

WEISS, NO. 710,824, OF OCTOBER 7TH, 1902.

This patent relates to an improvement in ignition, wherein the hot tube D^2 is loosely fitted in an extension D', to prevent loss of heat by radiation. A bushing, *d'*, retains the tube in place. The inrushing air through a port *a* is deflected by guide

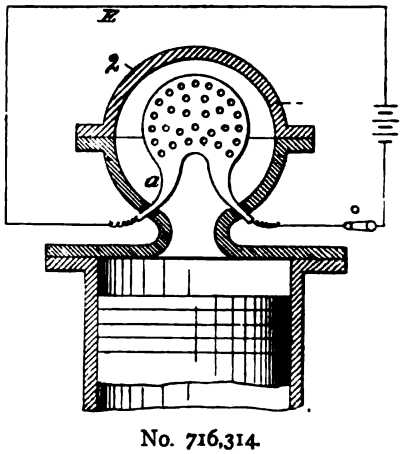


No. 710,824.

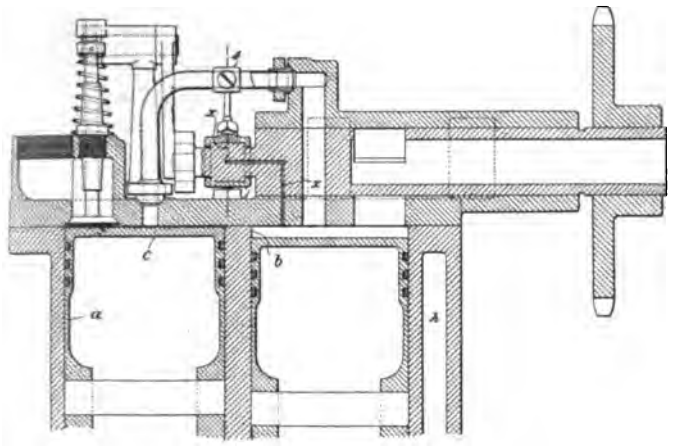
h, and strikes the cylinder head behind plate d^2, thereby being prevented from cooling the tube D^2, which is always kept at sufficient heat to fire the charge. It is further prevented from cooling by an outer shell, E, in which latter a torch may be introduced for starting up.

TUCK AND WASSMANN, NO. 716,314, OF DECEMBER 19TH, 1902.

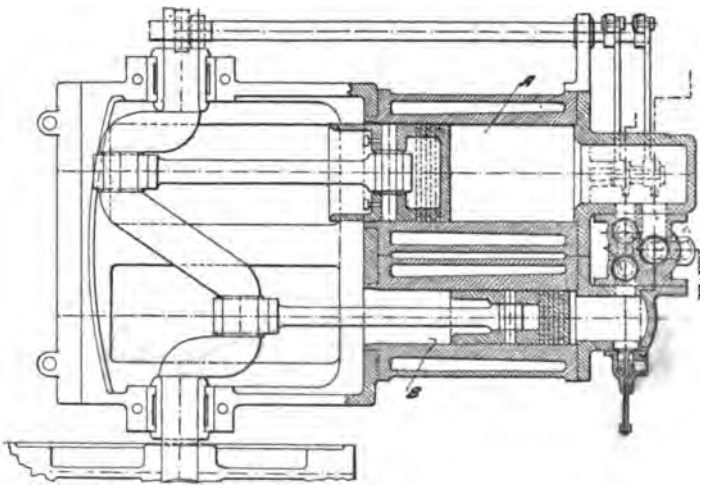
A resistance plate *a* is placed within the globular ignition chamber Q, said plate being included in an electric circuit E by which said plate may be raised to a tem-



No. 716,314.



No. 710,302.



No. 725,191.

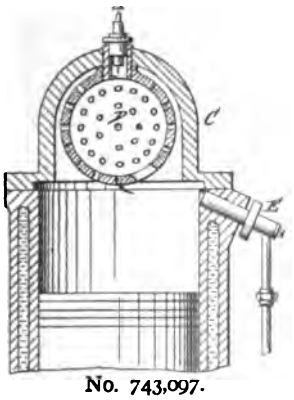
perature sufficient to ignite the oil, which is injected thereagainst. After starting the motor the circuit may be opened, as the plate will retain its heat during operation.

PRESTWICH, NO. 710,302, OF SEPTEMBER 30TH, 1902.

There are two cylinders, the working cylinder *a* and a separate air compressing cylinder *b*, kept cool by water jacket *h*. At a certain period of compression attained in cylinder *b*, the valve 4 opens, allowing the compressed air to pass through pipe *u* to cylinder *a*, pressure through passage *x* forcing a supply of oil from a reservoir (not shown), also through pipe *u*, into cylinder *a*. The inlet of the mixture is timed to occur with the outward movement of piston *c*. The heat in the cylinder *a*, augmented by the heat of the compressed air charge, is sufficient to cause ignition. The air can be more effectively compressed because not subject to the adverse influences present in a hot combustion chamber, and the working cylinder is allowed to remain at a higher effective temperature.

PHAIL, NO. 743,097, OF NOVEMBER 3D, 1903.

The combustion chamber C contains a hollow spherical igniter D, having a port

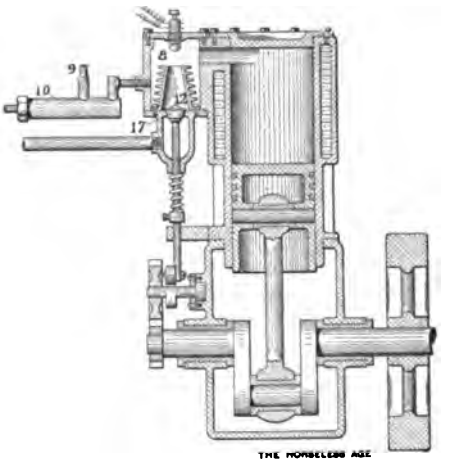


No. 743,097.

arranged opposite the oil injector E. The sphere is intended as a mixer, and is perforated for the circulation of the mixture.

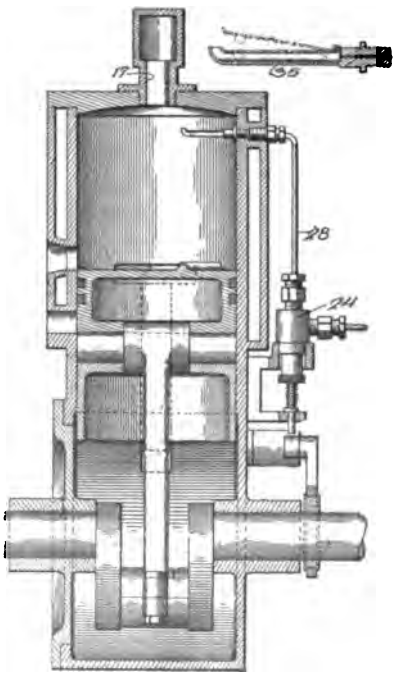
POMEROY, NO. 750,489, OF JANUARY 26TH, 1904.

A pump, 10, injects oil from pipe 9 into combustion chamber 8, which is kept hot by means of vaporizer 12, through which



No. 750,489.

the exhaust gases pass to valve 17. Singularly enough, no air intake is shown or indicated.



No. 784,760.

ALLSOP, NO. 725,191, OF APRIL 14TH, 1903.

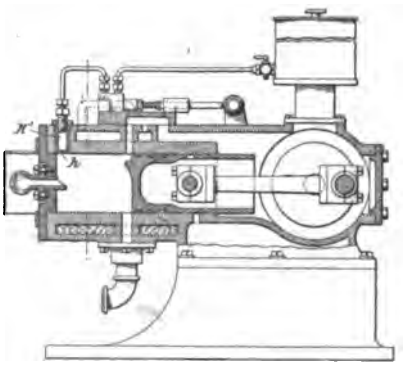
This inventor uses two cylinders, the larger one A being the combustion of power cylinder, and the other one, B, being the mixing cylinder. The two pistons have the same length of stroke, and the cranks are set at 180 degrees. The piston in cylinder B draws in oil and air, the latter in sufficient volume to support combustion. The mixture is compressed on the return stroke, then expanded, and on the fourth stroke of the cycle is carried into cylinder A, entering the latter in the form of a heated vapor. A larger volume of air is at the same time admitted to cylinder A through another valve, the mixture then being compressed, ignited and exhausted as with an ordinary four cycle engine. Both cylinders are jacketed.

ROSSEAU AND FERRIS, NO. 784,760, OF MARCH 14TH, 1905.

The vaporizer 35 projects into the combustion chamber and conducts the oil received through pipe 28, from pump 24. The end of the vaporizer is turned up, to direct the fuel towards igniter 17.

WEISS, NO. 787,709, OF APRIL 18TH, 1905.

The compression stroke of the piston charges chamber H' with full pressure. As the piston makes its forward stroke, the pressure in the combustion chamber, be-

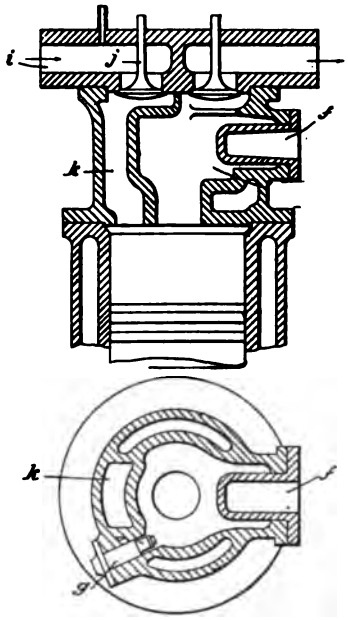


No. 787,709.

coming reduced, enables the air, under greater pressure in chamber H', to escape through small aperture *h*, spraying with it a charge of oil which at that moment has been pumped into said chamber *h*.

TURENNE, NO. 807,338, OF DECEMBER 12TH, 1905.

Water is admitted at *h* with the air intake at *i*, passing through valve *j* and hot space *k* to the cylinder, the water becoming steam in transit; the air and steam mix in the cylinder with the hydrocarbon vapor produced by injecting oil from injector *g* against igniting tube *f*. The in-



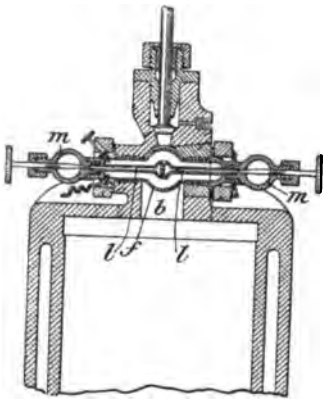
No. 807,338.

ventor claims that for a given power he can use less hydrocarbon fuel because of the power of expansion of the steam; and, further, that all clogging is thus prevented.

GOODSPEED, NO. 808,915, OF JANUARY 20TH, 1906.

This invention relates to an igniter for kerosene engines and consists of a hollow body *f*, placed in igniting chamber *b*. Hydrocarbon and air respectively enter this body through needle valves *m m* and telescoping perforated tubes *l l*, the mixture being ignited electrically and serving to render the body *f* incandescent.

Other patents in this art, of interest to those engaged in the development of the kerosene motor, are as follows: 524,946, 542,846, 543,818, 573,762, 592,034, 616,403.

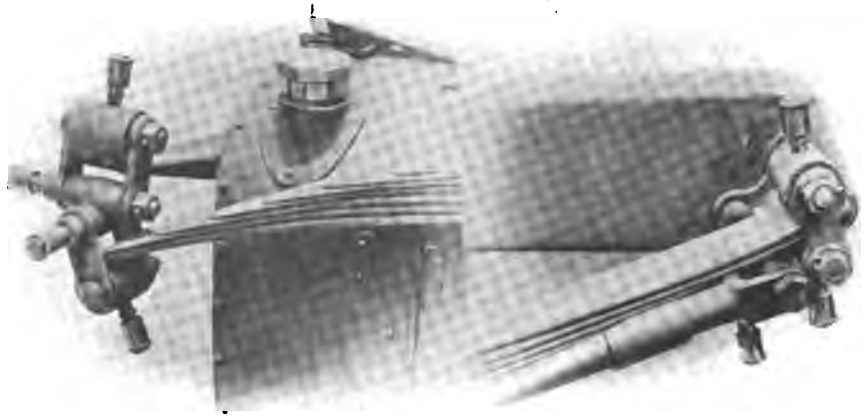


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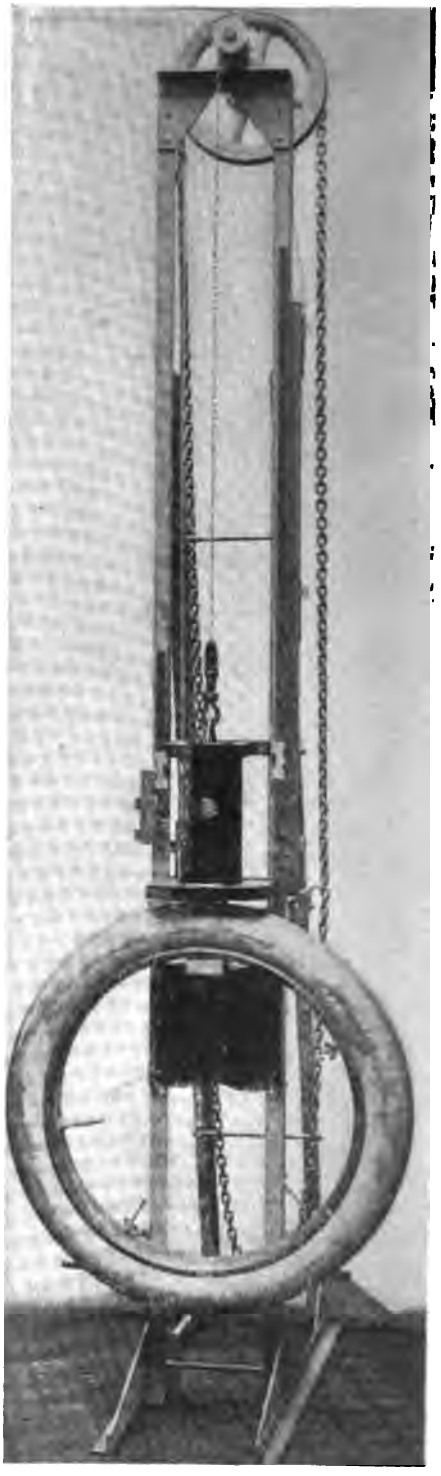
700,295, 718,933, 723,956, 725,104, 725,700, 736,807, 750,451, 750,488, 752,304, 757,632, 762,960, 764,614, 784,760, 784,818, 785,389.

Lubrication of Spring Joints.

As an instance of the attention to detail in modern touring cars, S. F. Edge sends us a photo of the spring connnections of the six cylinder Napier car, which is herewith reproduced. The view on the left is the universal joint between the transverse spring at the back of the chassis and the rear end of the near side rear spring. The photo is taken from the back. It will be seen that there are no less than four little grease cups in connection with these joints. Two of them are screwed into the ends of the shackle bolts, which are drilled out to receive them, and conduct the grease to the centre of the joint. The other two are screwed into the joints of the springs themselves. The view on the right shows the forward end of the same spring. Two grease cups are clearly seen, screwed into the spring boss and the supporting joint beneath, respectively. The front springs are equally provided with grease cups, there being two screwed into the ends of the shackle bolts at the rear end of the spring and one into the end of the pivot bolt at the front end. The object of fitting these numerous lubricators is to increase the comfortable riding qualities, to reduce wear and obviate breakage of the springs.



LUBRICATING PROVISIONS ON NAPIER SPRING JOINTS.



APPARATUS FOR TESTING PNEUMATIC TIRES.

Tire Testing Apparatus.

This machine was specially devised for the British Automobile Club's tire trials this year, and was used for testing the yield or amount of deflection, and return or amount of rebound of pneumatic and other tires. The tire, mounted on a rim or wheel, is placed on a bracket and a weight of 40 pounds is allowed to drop on it from a given height; the deflection is shown by the pointer attached to the small scale on the left of the machine, and the rebound by the pointer on the long scale on the right.

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...EVERY WEDNESDAY...

Devoted to Motor Interests

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Automobile Technical Education.

The large technical schools and technical departments of colleges and universities are the main source of the trained talent which is concerned in the magnificent engineering works of today. It is very natural that these schools should await the growth of a very substantial demand before going to the expense and trouble of making the additions and changes in the courses which are called for by new developments in applied science. It was only after the electrical business had arrived at very substantial proportions that technical schools added to their courses in mechanical, civil and mining engineering a course in electrical engineering, but now all such schools of any pretensions depend to a very important extent upon their electrical students.

Ten or fifteen years ago the instruction on heat engines furnished in the technical schools of this country was confined almost exclusively to a very thorough study of the steam engine. The internal combustion motor was treated of in a most superficial manner, rather as a curiosity in the prime mover line than as a practical source of motive power. Of laboratory facilities in the gas engine line there were none, or, at the most, only those of a most rudimentary description.

Now one finds engineering schools realizing the importance of the internal combustion motor as a prime mover, and increasing the attention given to it in their mechanical engineering courses in a very marked manner. It will not be strange to find, within a very short time, the gas engine occupying as important a position in courses of mechanical engineering as the steam engine does at present. Nor will it be at all astonishing if special courses on the gas engine and its applications are soon provided in the more progressive institutions. Already the laboratories of these schools are being fitted with gas and oil engines of various types, including vehicle motors, and in some cases with gas producers.

The automobile industry is in need of men specially trained in the art of designing and constructing internal combustion motors and in the problems relating to self propelled road vehicles. This need has been detrimentally manifested in the past, and for the lack of a sufficient number of really competent gas motor engineers the work of automobile development has doubtless been accomplished in many cases gropingly and empirically, at an excessive cost in failures and expensive experiments.

If the problem set for the self propelled vehicle be that of ultimately effecting a general substitution of mechanical energy for animal power in the performance of the world's work of transportation, the motor car business will attain proportions comparable with that of the electric power industry, for example. A veritable army of highly trained motor car engineers will be required to put this revolution in road traffic into effect in an efficient manner.

The question may be raised in all seriousness whether it is not time that courses in motor car engineering should be initiated in the large technical schools, and whether such courses, if inaugurated, would not be in good demand.

Motor car engineering is as well defined and legitimate a branch of engineering as a number of others which are at present generally recognized by technical school courses. Such a course might comprise, in addition to the usual basis of mathematics, a careful study of heat engines, especially of the internal combustion type, applied mechanics, mechanism, draughting and machine design, the chemistry specially relating to the matter in hand, and a practical course in electricity, as well as other suitably selected branches. Graduates from established technical institutions who had taken such a course would doubtless be

sought after by automobile manufacturers, and would enjoy the prestige in the industry that technical graduates do in every other line of engineering. The automobile industry in the future would profit immensely by the activities of these thoroughly instructed men.

Danger in Handling Gasoline Around Lighted Lamps.

A deplorable accident which emphasizes anew the great danger involved in filling the fuel tank of an automobile while the lamps are burning occurred at Newark, N. J., last week. Four young girls were sitting in a tonneau car at a garage, about to start on an evening drive. The lamps of the car were already lighted, and an employee of the garage proceeded to fill the tank of the machine. When through with the filling, he inadvertently held the funnel close to one of the lamps; the vapors rising from the funnel immediately caught fire and the flames were communicated to the still open vehicle tank. A big column of flame shot up at the side of the car, and one of the girls, seated on that side of the car, although she jumped immediately, had her dress set on fire and was so severely burned about the head that it is thought she will die.

This is not the first instance when a tank of gasoline has been ignited owing to the fact that the tank was being filled while the lamps were alight, and the special press has repeatedly called attention to the danger involved. It appears, however, from what may be observed around garages and on the road, that little heed is given to such warnings. All garages, and particularly those located in country towns, employ some cheap and oftentimes ignorant help for washing, filling tanks and general work, and all garage owners should, therefore, consider it their first duty to issue rigid and repeated instructions to their help as to the precautions to be observed in handling gasoline. Such simple rules as the following should be printed on a card in large type and displayed in one or more prominent points in the garage: "No open vessels containing gasoline must be allowed to stand in the garage; no matches must be used for lighting beneath the car or for making tests for leaks; gasoline tanks must never be filled while the lamps are alight; vehicle lamps must never be lighted or allowed to burn in the garage, etc."

If this subject of safety from gasoline fires was taken up by some organization of garage owners, their combined experience would undoubtedly permit of some simple set of rules being formulated that could easily be applied, and, if followed, would practically exclude the possibility of accidents of this nature. The danger of gasoline should be impressed upon apprentices in the garage business as strongly as the dangers of steam, for instance, are impressed upon those learning boiler tending. The above suggestion might possibly be taken up with advantage by the National Dealers' Association, which, though it was evidently formed with the object of regulating the relations between manufacturers and dealers, will undoubtedly eventually extend its activity to matters affecting the garage business, owing to the close relationship between the businesses of selling and garaging cars.

The Cobalt Battery.

According to the latest reports from Mr. Edison's press bureau, the storage battery problem, and with it the automobile problem, is to be solved by "the cobalt battery." By the use of the metal cobalt as an element in the construction of a storage battery, the weight for a given capacity is to be halved, and cost of upkeep and operation is to be reduced. Lest any one should object that the minerals from which cobalt is reduced are comparatively rare and expensive, the report mentions that Mr. Edison has found important deposits of cobalt ores to exist in Tennessee and North Carolina, and the present limited production of only about 5 tons per annum in this country, could be greatly increased.

Our source of information does not disclose any details of construction of the new battery (only Mr. Edison's expectations from it), but as cobalt is a metal very similar in its chemical properties to nickel, it may be presumed that the cobalt is to be substituted for nickel in the iron-nickel alkaline cell which has been exploited by the "Wizard" for the past four years. The substitution may possibly result in a gain in specific capacity, but it is not likely to remedy the mechanical weakness due to expansion and contraction of active material in operation, from which the alkaline cell was at first supposed to be free, while later experience proved this supposition erroneous. After the first batteries had been in use for a considerable period, a whole series of patents were issued for forms of construction designed to allow for the alternate expansion and contraction and to give a stronger mechanical structure. Those who remember the great claims made when the alkaline battery was first announced and are aware of its very limited application up to the present, will probably not attach very great importance to the latest announcement of a revolutionary battery. At the same time, Mr. Edison deserves credit for his extensive researches to find improved forms of storage cells, owing to the deeply felt want for improvement in this field. This branch of applied science has, of course, been pretty well worked before this, but probably never with the thoroughness of which the Edison facilities and staff allow.

Secession From the Tire Association.

At a meeting of the G & J Tire Association, held in New York city last week, the B. F. Goodrich Company, of Akron, Ohio, gave notice that at the termination of the present agreement, in September next, they would withdraw from the association. It has been understood for some time that the Goodrich Company considered the terms of the agreement disadvantageous to themselves, and that they would not renew their obligations. The Tire Association, or so called Tire Trust, will thus lose one of its most important members, and it would not be at all surprising if this initial secession should be speedily followed by others, and the association cease to exist.

The purchasing public will undoubtedly welcome the first sign of the doom of the Tire Trust, for the public does not regard the trust idea with any favor. The G & J Tire Association was formed quite a number of years ago among licensees under the Gormully & Jeffery basic clincher tire patent. The association is very similar in character to the Association of Licensed Automobile Manufacturers, as both owe their existence to a patent and occupy themselves with the regulation of trade matters, only the Tire Association comprises much more nearly the whole of the industry than the Selden association, and enjoys almost a complete monopoly. Among the deserving work which the association has accomplished is the standardization of tire sizes with respect to vehicle weight; it has also adopted price agreements, and it is understood that it has concerned itself with the

apportioning of production to the different works.

The Rubber Goods Company, which controls the G & J patents, possesses a number of patents which are claimed to be so broad that it is impossible to manufacture a clincher tire without infringing them, and these patents still have several years to run. The validity of these patents is not generally admitted, however, and suits under them are now pending against two important tire companies, one American and one foreign. In late years the mechanically attached tire has made considerable inroads on the monopoly once enjoyed by the clincher tire, and the thought naturally occurred that perhaps the Goodrich Company had decided to give up the clincher type for a design of tire that would not come under the G & J claims. But, although not much information was obtainable at the company's New York branch, as to their motives and plans, it was positively stated that they had no intention of discontinuing the manufacture of the clincher type of tire. If this is so, it will only tend to hasten the end of the association, for if one maker refuses to pay the royalty or license duties the others will naturally be disinclined to do so.

Although the association has not entirely prevented competition among the different firms, it has had a tendency to shield the weaker ones and to correspondingly retard the more enterprising and deserving. The buying public have been under the impression that no matter what concern they patronized they would be paying tribute to the trust, and this has acted as a check to the development of that healthy competition which is the life of trade and the principal incentive to technical progress. It is to be hoped that the secession will not result in any undue price cutting, as in perhaps no other industry would the practice be as ruinous as in the tire industry; but that the more open competition may lead to important progress in tire construction, which is most urgently needed for the further progress of the automobile movement.

A manufacturer of air cooled cars, commenting on the recent observation in these columns that certain experiences tended to show that air cooled cars run less regularly at low speeds than water cooled cars, declares the idea absurd, maintaining that air cooling has nothing whatever to do with the regularity of running of a motor at low speeds.

NEW VEHICLES AND PARTS.

Hewitt Motor Company Four Ton Truck.

The Hewitt Motor Company, of 6 East Thirty-first street, New York city, have recently placed on the market a 4 ton gasoline truck, in which pressed steel is used extensively throughout the construction. Its general specifications are: Four cylinder vertical engine, 4¼x5½ inches, rated at 30 horse power, at 1,000 r. p. m., under the hood at the front; two speed planetary transmission; side chain drive; wheel base, 144 inches; tread, 68 inches; wheels, 36 inches, front and rear, with Firestone single tires on the front and double on the rear wheels; weight, 6,000 pounds; capacity, 4 tons; platform, 6x12 feet. The engine is fitted with both make and break and jump spark. In the photograph is shown a general view, and, as will be seen, the front seat is divided into two parts, one on each side of the engine hood, which can be easily removed. The seats are also hinged at the back and can be turned up out of the way, and as the floor boards, as usual, are removable, access may be had to the engine from all sides. The steering column is almost vertical at the left and supports an extremely large wooden rim steering wheel, with T section cast aluminum spokes. The flanged tube radiator is hung at the front, as shown.

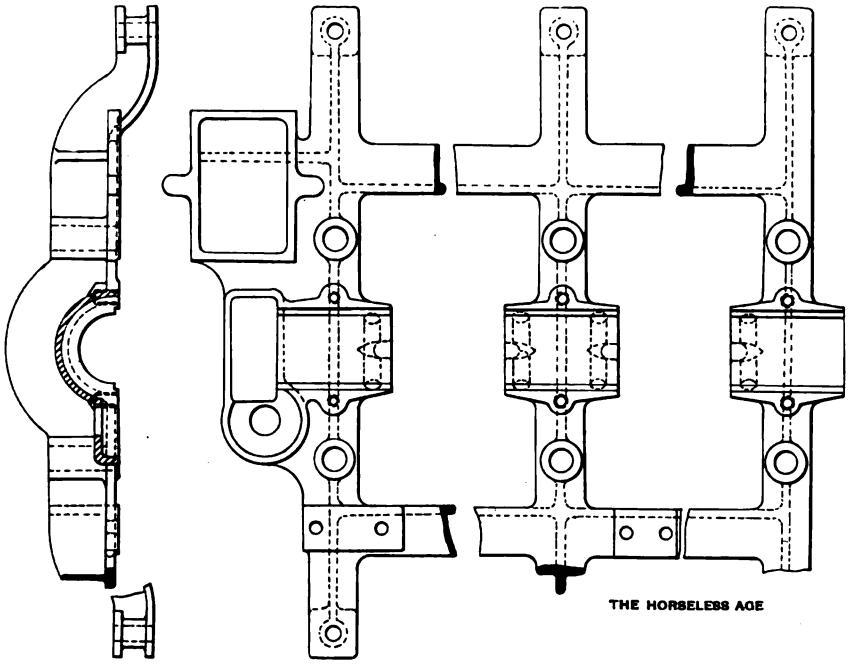
MOTOR.

The four cylinder 30 horse power motor is shown in the accompanying photo. The peculiarity of this engine is the open crank case construction similar to that of yacht engines. This design has been adopted, as it makes all parts accessible, so that a piston and connecting rod can be easily removed without disturbing other parts. The cylinders are cast in pairs, and these pairs bolted together, so that they look as though made in one piece. They are supported on six vertical steel uprights of circular section, which are bolted at their lower ends to a cast steel frame, which forms the engine base. A detail of this frame is shown on the next page, and consists of a single casting of I section, having two side members and three cross members, the extended arms of which form the supporting arms, which rest upon the subframe of channel section pressed steel which supports the engine. The upper ends of the vertical columns are fastened into suitable lugs cast integral with the cylinders. The construction is further stiffened by diagonal braces. The water jackets covering the heads and upper two-thirds of the cylinders are also cast integral. The valve chambers are all on one side and contain mechanically operated valves made of nickel steel, with heads and stems integral; the fillets under the heads are very large. The one piece aluminum inlet pipe and the exhaust pipe, which is cast in two pieces, are compactly arranged, as shown. The muffler is disposed lengthwise under the body and is of the usual baffle plate type of large size and very quiet.

The cam shaft carries twelve cams pinned and keyed in position. Four of these are ignition cams and operate the make and break igniter device. This cam shaft is placed high on the engine and supported in three bronze bearings by the vertical framing. On the front end of the engine shaft is a 45 degree spiral gear, which meshes with a spiral gear on a short horizontal shaft above the engine shaft and at right angles to it. On one end of this is the magneto and on the other end the water pump. The spiral gear on the crank shaft meshes with a gear on a vertical shaft, at the upper end of which similar gears drive the cam shaft; these gears are encased in



HEWITT 4 TON GASOLINE TRUCK.



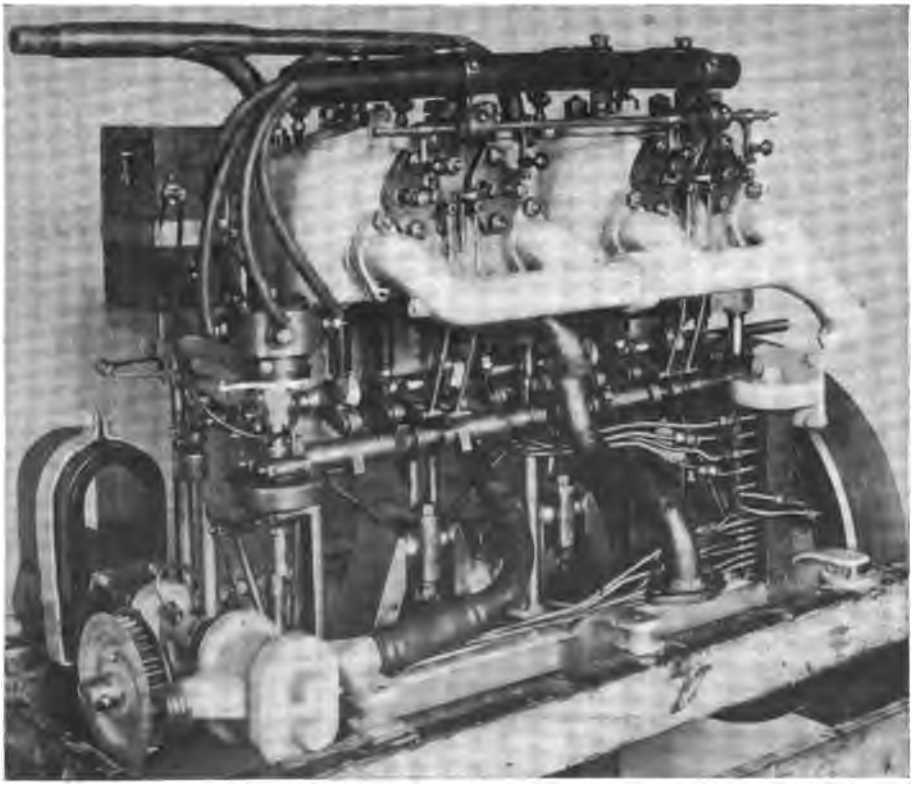
CAST STEEL ENGINE BASE.

bronze and run in oil. This vertical shaft also carries at its top the combined timer and distributer.

The pistons are very long, with flat tops and rounded edges, and carry four rings, three of which are at the top and one at the bottom. These rings are eccentric, diagonally cut, ground and pinned. Three shallow oil grooves are cut around the pistons near the bottom to retain the oil. The hollow wrist pin is hardened and ground steel, split at the ends, and has a bolt through the centre, which receives tapered nuts at its ends, which tend to spread the ends of the pin, and is further retained by set screws through the bosses and cotter pins, which bear against the walls of the pistons, the cotter pins being placed through holes in the head of the set screws.

The connecting rods are I beam section, steel drop forgings, with separate split bronze box ends, held by through bolts, with lock nuts and cotter pins. These boxes are fitted with special babbitt made according to their own formula, and no shims are used. The bearing at the upper end is a hardened and lapped steel sleeve, which is a pressed fit into the rod.

The four throw crank shaft is machined from a slab of chrome-nickel steel without being forged; it runs in three babbitted bearings of large size, held to the cross members of the cast steel engine base by bolts through the bearing caps fitted with castellated nuts. The flywheel is held to the tapered rear end of the shaft by a straight key and special nut.



FOUR CYLINDER HEWITT TRUCK MOTOR.

CARBURETOR.

The carburetor shown in the photograph is also one of their own manufacture; it is of the float feed type, constructed of aluminum and has the gasoline inlet into the top of the float chamber. From this chamber a gasoline pipe runs upward inside of a brass tube concentric with the vertical central portion of the carburetor and ends in a nozzle. The incoming air passes up around the nozzle in the usual manner, and at the upper end of the vertical central tube



HEWITT CARBURETOR.

of the carburetor is a butterfly throttle for the mixture. The box shaped portion of the carburetor to the right contains a large rectangular auxiliary air valve, which is in a horizontal position when closed. The axis upon which this valve pivots is at one side of the centre and one side is weighted, so that when at high speeds the suction becomes great enough the pressure of air on the blade of this valve overcomes the weighted portion and the valve automatically opens. The air which passes through this valve is conducted up through the central portion of the carburetor, but around the outside of the tube enclosing the nozzle, so that this air does not draw gasoline with it, but mixes with the nozzle gas.

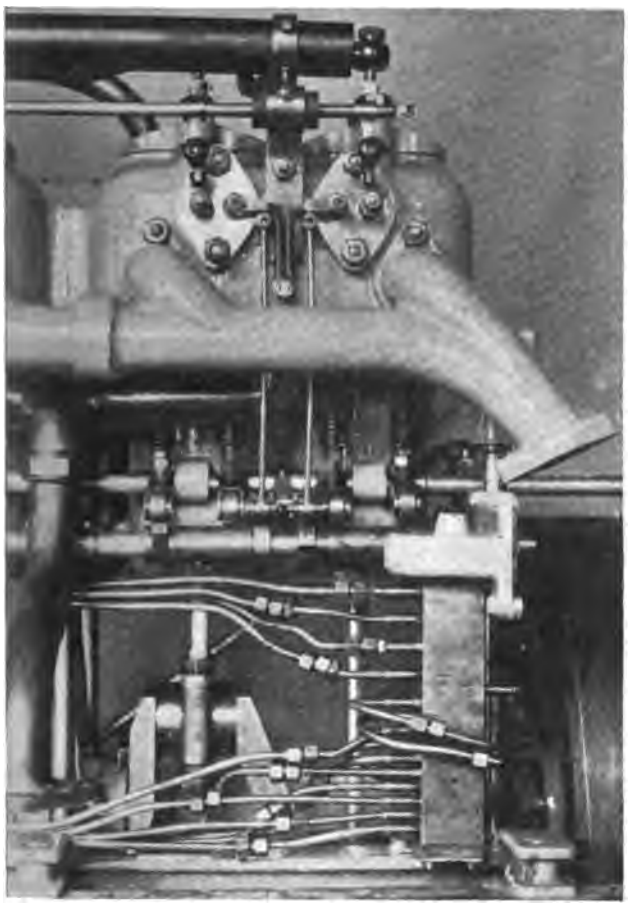
COOLING.

The water is circulated by an ordinary gear pump at the front of the engine on the horizontal cross shaft, to which it is directly connected. This pump differs from those ordinarily used, in that its gears have each about 3 inches width of face, so that it handles a large volume of water. The water passes into the jackets at two points near the bottom and passes out at the top through a gradually tapered copper pipe to

the radiator, which is of the flanged coil pipe style, hung at the front. At the rear of the radiator is a large, six bladed aluminum fan driven by special chain from the front end of the engine shaft. A copper water tank is located above and to the rear of the engine, but is covered by the hood. The water system carries about 8 gallons.

IGNITION.

A double set of ignition apparatus is used, one being by jump spark and the other make and break inside the cylinders, actuated mechanically from the crank shaft. A three-way switch is supplied so that the jump spark is operated from a battery carried in a special frame under the platform and fast to the side channel of the chassis frame. The high tension current is supplied by a single Guenet coil, carried on a special bracket in front of the engine. At the upper end of the vertical shaft which drives the cam shaft is a combined timer and distributer, the wires from which run through a vulcanite tube on top of the engine and out through holes in the sides to the plugs, which are set into the middle of large cast iron caps covering both valves. These caps are cast hollow, to reduce the weight and facilitate cooling.

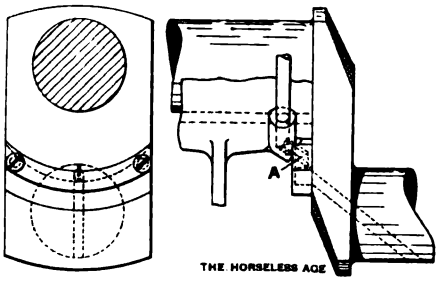


OILER AND IGNITION MECHANISM.

The current for the make and break spark is supplied by a magneto directly connected to the opposite end of the shaft which runs the circulating pump at the front of the engine. It also rests on a special bracket and is securely held, but can be easily removed by means of a band clamped over its top. By moving the three-way switch another point the current from the batteries can be used for the make and break after passing through a large discharge coil. It will thus be seen that three sources of ignition are available, one being high tension current and ordinary jump spark plugs; the second being make and break from the magneto current, and the third make and break from the battery to the discharge coil. The bus bar and the igniter plugs are shown in the near view of the two rear cylinders. These plugs are a ground fit into the cylinders and are each provided with a knife switch with a vulcanite handle, so that the individual cylinders can be cut out. The igniter plugs are held to the cylinders by studs and nuts. The outside arms which connect with the hammers on the inside and the springs which cause the break are shown. Just back of the cam shaft is an auxiliary shaft with small, projecting arms, to the end of which are pivoted arms provided with rollers, which bear on the igniter cams and which have the four vertical lifting rods pivotally attached at their outer ends. By this arrangement the time of ignition can be varied by slightly rotating the auxiliary shaft, which changes the position of the arms with the rollers and push rods relative to the igniter cams and thus changes the time of their maximum lift and break. The auxiliary shaft has a double motion; it can be rotated to retard the spark for starting, and another motion slides it lengthwise in its bearings, bringing the exhaust rollers on to a part of the exhaust cams, so shaped that they hold the exhaust valves slightly open, thus acting as a compression relief. It is intended to start the motor usually on the jump spark, but to do most of the running on the make and break.

OILING.

The oiling has to be specially arranged on this engine, owing to the open crank case construction. It is accomplished by a peculiar force feed mechanical oiler of their own design, the complete oiler and parts of which are herewith shown. It consists of a built up series of circular cast iron discs about 2 inches in diameter by three-eighth inch in thickness. At the centre of each

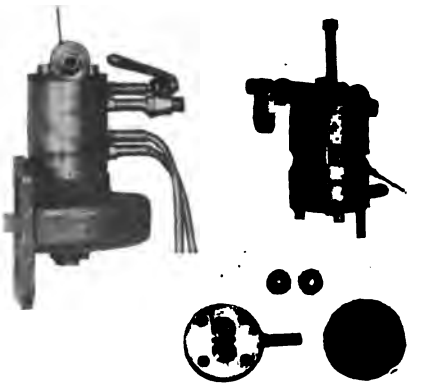


CRANK PIN OILING ARRANGEMENT.

are two small gears, which are ground on the side and end of the teeth to fit the holes in the discs; these virtually form small gear pumps, the oil being fed to the teeth at one side and forced out at the other side to its feed pipe. One of these gears has a square hole in it, and is on a small, vertical, square driving shaft, which extends upward through the entire set, while the other gear is not on any shaft, as it is so close a fit in the circular space cut for it in the disc that it is centred. The large encased worm wheel, shown at the bottom of the pump, is the driver, and meshes with a worm on the end of the cam shaft. At the top a shut-off valve is provided, so that the oil can be entirely cut off from the pump. Fourteen oil leads are carried to the different bearings. On the side of the crank webs curved bronze cups are attached (see drawing) into which the oil drips, and from which it is carried by centrifugal force through a hole in the crank web and pin to the crank pin bearing. The oil tube leads through a hole in the under side of the bearing and through a small tube A into the bronze cup, from which it passes to the bearing through a three-sixteenth inch oil hole, as shown. An oil tube is also led to each of the cylinders and to the spiral gears which drive the cam shaft. The oil reservoir is a copper tank located under the seat and close to the heat of the engine, where it will be maintained fluid in cold weather.

FRAME.

The frame is made of very heavy pressed steel of channel section; the cross members are also channel section pressed steel, the one at the middle being specially formed to support the rear end of the engine sub frame, and also the bevel drive and differ-

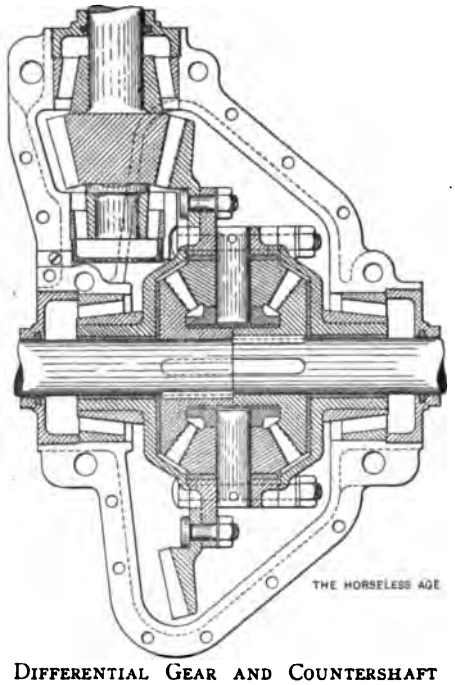


DETAILS OF OILER.

ential case. The front end of the subframe is hung from the under side of the front cross member of the main frame. Very large gusset plates are used at the corners.

TRANSMISSION.

Between the engine and transmission a large, full universal joint is used. The transmission is a two speed and reverse planetary, which is composed of three sets of three spur gears each. No internal gears are used. The arrangement of the gears, as shown in the accompanying sectional drawing, is the same as usual, but the clutch for the high speed is distinctive; it is in reality a cone clutch. In the accompanying drawing the portion marked A is the movable piece and bears against the cone shaped side of the main casing, which is provided with a series of fibre blocks for the friction surface against which A bears. This clutch is thrown into engagement by the operation of three pivoted fingers, as at B, which are forced against the circular plate C in the usual manner by a sliding cone D on the shaft. The plate C bears first against the six coiled springs shown, so that even if thrown in suddenly the action is very gradual and the truck starts smoothly. These springs in turn force part A inward, compressing the large main clutch spring, the thrust of which is taken up by a series of thrust washers at E, which have sufficient area to distribute the wear. This spring disengages the clutch when the foot pedal is released from its ratchet. The forward and reverse speeds are controlled in the usual manner by contracting bands which act against the outside of the transmission case. The shaft from the transmission extends toward the rear into a bevel gear and differential housing located at the middle of the jack shaft, but has between it and the jack shaft another full universal joint. Timken bearings are used throughout this construction as shown in the sectional drawing. The driving pinion has sixteen teeth, is four pitch and has 2¼ inch face, is not overhung, but is supported by a bearing on each



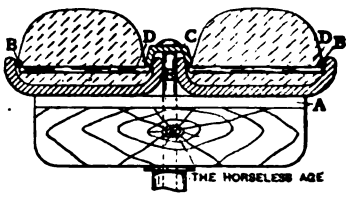
DIFFERENTIAL GEAR AND COUNTERSHAFT DRIVE.

side of it. The gear reduction is approximately 6 to 1. The differential is of the bevel gear type, four bevel pinions being used. At each side of the case where the jack shaft projects dust and oil retaining washers are fitted. The case is divided horizontally, and is securely held by bolts with a nut at the end, under which a washer is used and over which a cotter pin is placed. The outboard bearings of the jack shaft are Timken rollers, which are supported in special cast steel hangers fastened to the side frame members. The front sprockets are of chrome-nickel steel, have sixteen teeth and carry a Whitney roller chain of 1¾ inch pitch. The radius rods are of the banjo type, adjustable in length, and are made of pressed steel and support the fulcrum for the brake shoes, so that the strain of the brakes is taken by them. Their forward ends are attached to the jack shaft bearing hangers. The rear brakes are 24 inches in diameter and consist of contracting fibre faced steel bands acting on cast iron drums, to which are bolted the forged steel sprockets; the combination is then bolted to the wheel through each spoke. These brakes are operated by a toggle joint action and are very powerful. The reverse pedal acting on the transmission is also intended to be used as a brake when necessary.

AXLES AND SPRINGS.

Both the front and rear axles are steel forgings, the forward one being an I section 3¾ inches in depth by 2¼ inches in width. The rear axle is 2¾ inches square section. Semi-elliptic springs are used both front and rear; these springs are 3¼ inches in width, the rear spring being 50 inches in length, unloaded. The ends of the springs are free to slip longitudinally in cast steel boxes, which are riveted to the under side of the frame; the springs rest on hard wood pieces on cast steel blocks, which form saddles and straddle the axles. The wood pieces allow sufficient give, so that the nuts on the bolts which hold the springs stay tight.

The steering gear consists of a rack and pinion of coarse pitch, both of which are made of steel. The rods which lead to the steering knuckles are made of hollow steel tubing, with forked ends pinned with taper pins and brazed. The steering knuckles



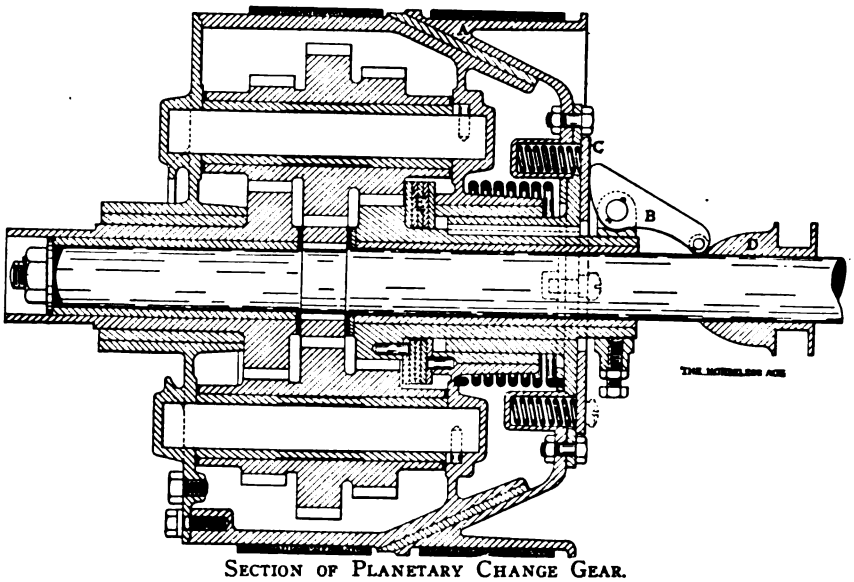
FIRESTONE DOUBLE REAR WHEEL TRUCK TIRE.

are of the ordinary type, but of very heavy design.

Firestone solid rubber tires are used, the large, heavy pattern wood wheels being fitted with single tires on the front and double 4 inch tires on the rear. These double tires are fastened to the rim, as shown in the accompanying drawing. A metal rim A is placed around the wood felloe of the wheel, and upon this rest two channels of the ordinary section, as shown; the two tires are placed into these channels and at the outside are held in the ordinary manner by the retaining wires B. At the inner side, however, the retaining wires cannot be employed and a curved metal band of the section shown at C is clamped down on to the cross wires D by through bolts E, which pass completely through the felloe of the wheel. The rim C is made in suitable length sections.

CONTROL.

The control is by the usual throttle and spark levers, which are placed on the vertical steering column just below the wheel, and by foot pedals which control the speeds, the rear wheel brakes being operated by



SECTION OF PLANETARY CHANGE GEAR.

the side lever on a notched quadrant. The application of these brakes at the same time throws out the speeds, but the reverse can be operated at the same time. The right foot pedal engages the high speed, the middle one the low and the left pedal controls the reverse. The two forward speed pedals are ratchet retained, but throwing in one instantly disengages the other. The reverse pedal is without a ratchet and must be held. The low speed is approximately 4 miles per hour, while a speed of 10 miles per hour can be attained on the high at about 1,200 r. p. m. of the engine.

The Lavigne Mechanical Oil Pump.

This oiler has been designed with the idea of getting all the pressure necessary to force the oil to the required spot, by means of a few substantial parts positively operated, and to provide means for easily and accurately regulating the amount of oil delivered from any feed. It is manufactured by the Lavigne Manufacturing Company, of Detroit, and is regularly supplied in twenty-eight different sizes, having from one to ten feeds; other sizes will be furnished on special order.

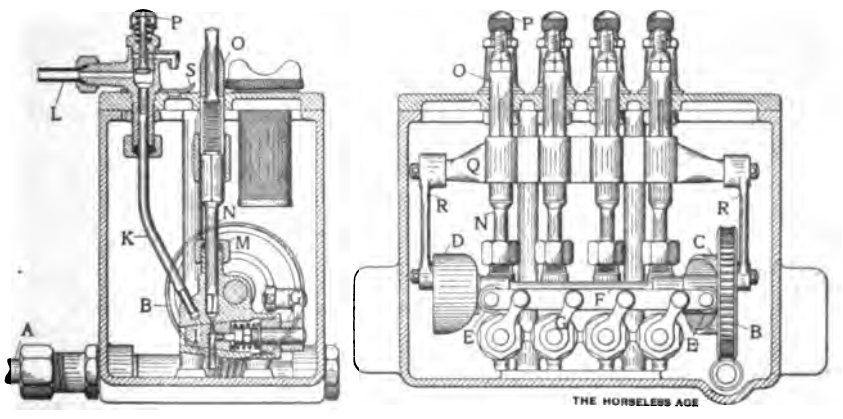
As regularly furnished, the body is of aluminum, and one corner is fitted with a gauge glass, which shows the amount of oil in the tank; if this glass should accidentally become broken leakage may be prevented by closing a valve below.

Driving shaft A actuates worm wheel B, on the shaft of which are fastened two face cams C and D. These, acting on rollers F E, move bar F back and forth, causing levers G G which are connected thereto to oscillate. The shafts H H of these levers have tongues on their ends which fit in grooves in plug valves I I and positively rotate them. These valves are hardened and ground, and, being separate from their drivers, are always held perfectly tight by the springs shown. In the illustration they are in the intake position, and are so timed as to remain in this position while the upward movement of the pistons sucks oil into the cylinders J. While the plungers are stationary at the top of their stroke, the valves rotate so as to bring upward U shaped grooves, which connect cylinders J and pipes K. They remain in this position while the plungers, coming down, force the oil out through pipes K and L to the bearings which are to be lubricated.

It is to be noted that the movements of the valves take place when the plungers are stationary; and that the plungers only move when the valves are fully open. There is one-eighth inch of cylindrical surface between the hole and the groove in the valve, so that there is a ground joint this width to resist pressure when the outlet port is open. It is claimed that dirt and waste will not clog these valves, but will be cut in pieces if caught in the passageways, and fed through.

Plungers N N are operated in the following manner: On pins which project from the outer faces of cam D and worm wheel B are mounted connecting rods R R, which drive crosshead Q, in which are square holes that are free fits on the squared portion of plungers N. The full stroke of crosshead Q is five-eighth inch, one-half of which is lost motion, making the full stroke of plungers N five-sixteenth inch. On its downward stroke the crosshead comes against shoulders on the plungers and forces them to the bottom of the cylinders. On its upward stroke the bottom of the counterbores in the crosshead comes against the bottom of sleeves O screwed on the plungers, thus lifting the plungers to a height determined by the location of the sleeves. The upper ends of plungers N are marked with a vertical line divided into five equal parts, each of which represents one-sixteenth inch of stroke. The circumference of the top of sleeves O is divided into six equal parts, so the feed can be readily adjusted to one-thirtieth part of a stroke. As the cylinders are one-quarter inch diameter, this gives a regulation of five ten-thousandths of a cubic inch per stroke. These adjusting sleeves are split for over half their length and pinched together before hardening, so they grip the threads on the plungers very tightly. If it is desired to see the number of drops being fed, depressing cap P and moving aside cover S will allow the oil to drop back into the tank in plain view of the operator.

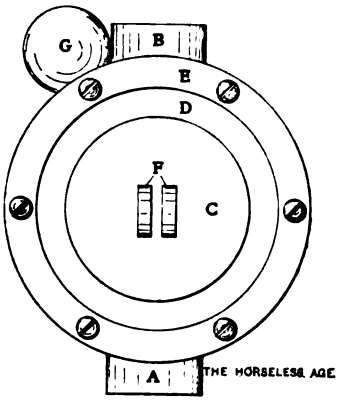
The driving shaft may be located in a number of different positions to suit various makes of cars. The proper speed of the driving pulley is 500 r. p. m., which gives about eight strokes per minute of the plungers. As all working parts are of phosphor bronze or milled steel, case hardened, there should be practically no wear. It is claimed that these oilers have produced a pressure of 2,500 pounds per square inch under test.



THE LAVIGNE MECHANICAL OIL PUMP.

The Eckhard Diaphragm Pump.

In connection with their Buffalo Arrow two cycle motor, described in our issue of June 13, the Buffalo Auto Truck and Motor Company use a pump of special design, as illustrated herewith. It consists of a cylindrical metal case with inlet and outlet check



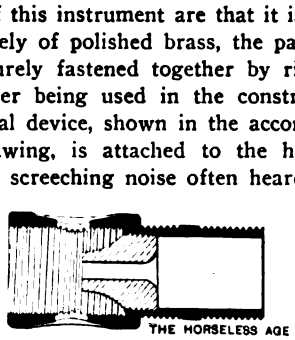
THE ECKHARD PUMP.

valves A and B, respectively. One end wall of the case consists of a flexible diaphragm D of thick rubbered canvas, which is clamped between the flange E and the body of the pump, and has a metal disc C secured to it at its centre. The metal disc C is formed with two lugs F, to which a connecting rod is pivoted that connects to an eccentric on the engine shaft and gives the disc C a back and forth motion. When the disc moves out the volume of the pump case increases and water enters the case through the check valve A; this water is forced out of the case during the next inward motion of disc C through the delivery check valve B. A spherical air chamber G is provided, communicating with the body of the pump and acting as a pneumatic cushion to reduce the resistance to the flow of water, thus tending to prolong the life of the diaphragm.

The A. C. A. will conduct a test of denaturized alcohol as a fuel for automobiles early next fall. Angus Sinclair has been appointed chairman of a committee to prepare rules and regulations for such a contest. The club will also hold a test of commercial vehicles some time in the fall. John A. Hill has been appointed chairman of the committee in charge.

The New Jersey Tube Company's Exhaust Horn.

The New Jersey Tube Company, of Newark, N. J., have placed on the market a new exhaust horn, which is composed of three pipes of different tones, which blend together in a harmonious note. The features of this instrument are that it is made completely of polished brass, the parts being securely fastened together by riveting, no solder being used in the construction. A special device, shown in the accompanying drawing, is attached to the horn so that the screeching noise often heard from



AUXILIARY AIR ATTACHMENT.

exhaust horns is entirely overcome. This device consists simply of a nipple provided with holes on each side and a sort of restricted nozzle, through which the gases pass into the horn, as shown at A. The rush of gases draws in through the auxiliary air openings sufficient outside air to cool them and reduce the extreme velocity, which was the usual cause for the screeching sounds. A special valve, spring and foot lever and this device are furnished with each horn. The device is also made in polished brass and sold to those using other exhaust horns, which at times are anything but melodious.

New English Daimler Cars.

For the Herkomer Trophy contest the English Daimler Company has turned out an entirely new type of car which has many novel features. The frame has been dropped very low in front by dipping the front axle, and it has been raised considerably at the rear, but the centre of gravity remains the same as those models which have been sent to America, the engine and flywheel being actually at a little less clearance from the ground. The engine is entirely new, as all the four cylinders are in one casting. The crank shaft is fitted with ball bearings and is constructed in two pieces, the joint being inside the centre ball race and by a taper similar to that used for the flywheel. The object of this departure from all previous practice of this company is to have better and neater fittings for the central ball bearing to the crank shaft. The front wheels are sharply dished. The pump is gear driven from the same shaft which drives the magneto. Only three forward speeds are used, the separate lever for the reverse being thereby abolished. The steering column is sharply raked and the special pattern of water cooler has been much increased in capacity. The engines are rated at 45 horse power, but are said to have given more on the testing bench.

Alcohol as a Fuel.

By E. J. Stoddard.

One feels relieved to turn from the baffling subject of gasoline and air mixtures and combustion to alcohol, which is a definite substance, and in regard to which we have available data.

Alcohol, chemically, is C_2H_5OH, and as the atomic weight of carbon is 12, of hydrogen 1, and oxygen 16, by multiplying these respective weights by the indicated number of atoms we see that the proportions of the different constituents are: carbon 24, oxygen 16, hydrogen 6, or in percentages, carbon 52.2, oxygen 34.8, and hydrogen 16. Just considering the carbon and the hydrogen as the combustibles, the carbon would be 80 per cent. and the hydrogen 20; but one atom of hydrogen is partly saturated, so that we would consider 5½ atoms of hydrogen available instead of 6, which would make the proportion of combustible material, carbon 81 and hydrogen 19. According to Mr. Fehrmann's article in The Horseless Age of June 6 the relative heat value of alcohol and gasoline is as 55 to 105. The specific gravity of alcohol vapor relative to air is 1.613.

The combustion of alcohol is represented by the following formula:

$$C_2H_5OH + 6O = 2CO_2 + 3H_2O$$
$$[24 + 5 + 16 + 1] + 96 = [24 + 64] + [6 + 48]$$
$$46 + 96 = 84 + 54$$
$$1 + 2.087 = 1.913 + 1.174$$

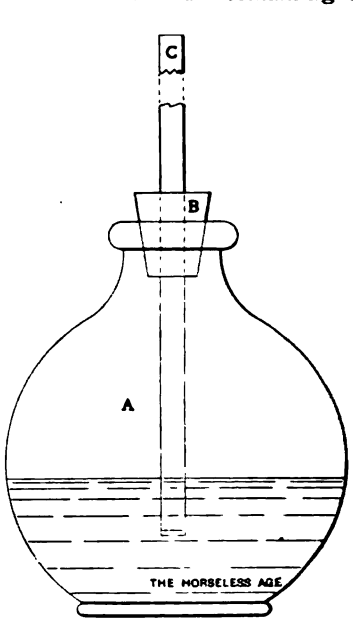
By filling in the atomic weights of the various substances we see that 1 pound of alcohol will require 2.087 pounds of oxygen to burn it, and the products of combustion will be 1.913 pounds of carbonic acid gas and 1.174 pounds of water. The oxygen will have to be supplied by the air, of which there will be required 8.98 pounds, or 118.1 cubic feet approximately. This is on the supposition that the alcohol is pure, while ordinarily it would contain about 10 per cent. of water or other impurities.

Columns 1, 2 and 7 of the following table have been taken from "Röntgen's Thermodynamics," translated by DuBois. Column 3 is in part from Hiscock's "Compressed Air," and the other columns have been specially calculated. Column 4 is calculated by multiplying the weight of 1 cubic foot of dry air (column 3) by the ratio of the elastic force of the vapor (column 2) at that temperature to the average pressure of the atmosphere, 29.91, and multiplying that product by 1.613, the specific gravity of alcohol vapor with reference to air. The 5th column has been calculated by subtracting the elastic force of the vapor at the given temperature from the average atmospheric pressure, and dividing the remainder by the average atmospheric presure and multiplying the quotient by the weight of a cubic foot of air at atmospheric pressure (column 3) and the temperature considered.

Thus, with alcohol, the ratio of liquid to air is 1 to 8.98 by weight, and with gasoline the ratio is about 1 to 15.

The first subject that one generally gives attention to is the matter of vaporization of the fuel. It will be observed from the data given above that there will be an explosive mixture with about .1 of alcohol to .9 of air by weight. By reference to the table it seems that this is a saturated mixture at a point a very little below 69° Fahr., or at about average atmospheric temperature.

The speed with which the volatile fluid vaporizes depends very much upon the state of saturation of the air above it. This can be distinctly noticed by the use of the apparatus illustrated in the accompanying figure, in which A is a flask containing water.



APPARATUS FOR DETERMINING VOLATILITY.

filling it, perhaps, one-quarter full. B is a perforated stopper, and C is a glass tube extending through the perforation in the stopper, its lower end extending below the surface of the water in the flask. If now some gasoline is poured into the glass tube, and one blows gently into the upper end of the tube so as to force a portion of the gasoline into the flask, it will be noticed that the water begins to rise rapidly in the

PROPERTIES OF ALCOHOL.

Temperature Fahrenheit.	Pressure in Inches of Mercury.	Weight of One Cubic Foot of Dry Air.	Weight of Alcohol Vapor in One Foot of Air Saturated.	Weight of Air in Same.	Ratio of Alcohol to Air by Weight.	Total Latent Heat One Pound Alcohol.
32	0.5	.0807	.002175	.07935	36.48	424.7
50	0.9539	.0779	.004006	.07543	13.84	429.858
68	1.7502	.0753	.007104	.0709	9.98	433.034
86	3.0984	.0728	.01216	.06525	5.37	432.918
104	5.2634	.0705	.02	.0581	2.90	428.922
122	8.6575	.0682	.03183	.04845	1.52	420.822
140	13.7879	.0662	.04921	.3568	.73	409.734
158	21.3052	.06433	.073885	.01851	.25	397.098

tube, but soon slows down until, when the air in the flask is nearly saturated, the movement of the column is very slow indeed. With commercial gasoline I have got as much as 55 inches of water, the last inch requiring twelve hours. The reason for this is very prettily explained, I believe, by the kinetic theory of gases, and probably the rate of vaporization and diffusion may be calculated under the various conditions of the surrounding medium.

Obviously provision should be made to supply heat if the alcohol is to be satisfactorily vaporized and mixed. If a jet carburetor is used the heat would probably be taken largely from the charge, though possibly to some extent from the cylinder walls. But it is to be noticed that the cylinder walls are abstracting heat from the charge during compression, because the compression line always falls considerably below the adiabatic. One would think that the cooling of the charge would be a very considerable advantage and make the engine work better or more economically. The amount of cooling may be approximated in the following way:

In 1 pound of the mixture there would be perhaps .1 of a pound of alcohol and .9 of a pound of air. If we take the latent heat or the heat withdrawn by the vaporization of alcohol with its admixture of water as 45 heat units per pound, .1 of a pound of alcohol would absorb 45 heat units, and this would lower the temperature of the charge about 45 divided by .2377, the specific heat of air which gives about 189 degrees.

With alcohol the elements of the products of combustion may easily be determined, as the water may be condensed and weighed and the carbonic acid gas absorbed by caustic potash solution and its volume estimated in an Orsat apparatus or other volumeter. We can also absorb the alcohol vapor from the charge, and determine the proportions of air and vapor in this manner. Not only is the vapor readily absorbed, but the quantity is sufficient so that the charge in pressure of the mixture caused thereby can be measured.

It would seem as if some provision for withdrawing the water from the alcohol would be desirable. Perhaps it will be necessary to provide tanks that will hold quicklime without injury.

The difficulty with water condensing because of the cooling due to evaporation would be increased by the readiness with which the alcohol unites with water.

Geneva is the centre of the automobile movement in Switzerland. It is the seat of the Swiss Touring Club, the Swiss Automobile Club, and of other touring associations which have members all over the country. In Geneva 321 automobiles and 470 motor cycles belonging to residents are registered with the cantonal authorities. In the Canton of Geneva 453 workmen are now employed in the automobile business, while in 1900 only 33 were thus employed.

MAINTENANCE AND REPAIRS

[Suitable contributions to this department, accompanied by sketches, are solicited and will be well paid for.]

A Supplementary Cooling Tank—Quick Healing.

By G. J. E.

No doubt some readers of THE HORSELESS AGE in running their cars these hot days find that they should have more water capacity for cooling. They want some simple way, a way that does not require any change in the piping. I will describe a method of fitting an extra tank that can be set aside when the weather gets cooler. The change can be made in ten minutes, for the regular cooling system is not altered in any way.

Suppose we have a tank and radiator combined under the hood in front, the filling cap of which is cast brass. Drill a hole in the centre of the top of the cap large enough for a half inch nipple to enter freely. Solder a half inch bushing on the under side of the cap. This is done to get more thread stock or hold on the cap. Solder a 1½ inch washer on top of the cap over this hole (providing the cap is oval on top) in order to get an even bearing for a gasket between the tank and the cap. Plug the top of your overflow pipe by taking a bolt from a dry cell, spread a little solder on the under side of the head, clean the top edge of the pipe, drop in the bolt and apply a soldering iron until the solder melts. There are two reasons for using the bolt head.

We now come to the tank. The bottom of this tank should be made to conform in shape with the top of the hood. There should be a depression in the bottom large enough to clear the cap and just deep enough to meet the cap when a gasket is placed between them. You will now have a hole in the centre of this depression large enough for a half inch nipple to pass through, and it is best to solder a washer around this, also to straighten it. A half inch nipple with a lock nut run on one end and fastened there will make the connection between the two tanks. Use a lead gasket under that lock nut. The filler cap on that new tank should be large enough to admit a piece of pipe, the end of which should be shaped to fit the lock nut, in order to screw the tank firmly to the cap. Under this cap you will, of course, use a little white lead, and a gasket at the corners of the tank; at the bottom solder an ear for bolting the tank to the hood with three sixteenth inch stove bolts. This tank can be made by any tinsmith, of 16 ounce copper, braced inside, and made of a size to best suit the requirements and appearance. As 231 cubic inches make a gallon, you can tell about what size you will need. Paint it black and it won't look bad; it won't cost much, and will do the business; and, as before stated, nothing will be damaged in case you want to remove it.

Did you ever notice how easy it was to knock the flesh off of your hands when making a repair on your machine, and how long you would have to use court plaster on it before it was healed? The following remedy beats court plaster "by a mile": Have a little box of air-slacked lime handy—say a penny's worth—it will last you a year. After you have gotten the flow of blood stopped, cover the wound freely with the lime. Don't tie it up or wash it off, and in a few hours you will find it scabbed over, and it will give you no further trouble.

To Manufacture Automobiles in the South.

The Southern Automobile Manufacturing Company, the first company to be established in the Southern States, opened for business in Jacksonville, Fla., Monday, June 11, with John B. McDonald, president; H. C. Stone, vice president and treasurer, and Hugh Partridge, secretary. The car to be turned out is a light, low priced runabout, to be known as the Southern. The motor is a double cylinder opposed horizontal, air cooled one, located under the seat. The variable gear gives two speeds ahead and one reverse, and the drive to the rear axle is by chain. The car is provided with a back lock safety steering gear, a foot brake and a chime signal, operated from the exhaust.

The special feature of the car is the road wheels, which are an invention of Mr. McDonald, the president of the company. It is a sort of double dished wheel, there being two sets of spokes, inclined in opposite directions to the plane of the wheel and forming a single circle at the rim. The hubs are small and of steel, with an inner, an outer and a middle flange, with polished brass dust cap. The roots of the spokes are held in the flanges by hexagon head machine bolts, and braced by steel flanges on each side of each set of spokes. and resting against each other, with a keystone bearing. The channel tire irons are cold shrunk upon the wheels, and on these is put a 1¼ inch side iron solid rubber tire.

At a meeting of delegates from numerous German automobile clubs at Frankfort-on-Main on June 5 the German Automobile Association was dissolved, and a new association or "cartell" founded, with the same membership as the old one, with the exception of the Mid-European Motor Wagon Association. According to the constitution of the new body each club will have a vote equal to its membership in matters relating to national and international competitions held by any of the allied clubs. The Imperial Automobile Club alone has a voice in matters of an international character.

Commercial Applications

Opportunities for Motor Trucks in Army Manœuvres.

By Captain F. P. Avery, U. S. A.

The recent action of Congress appropriating nearly $2,000,000 for military exercises this summer will cause the greatest movement of troops this country has seen for a long time. Nearly all the regular army in the United States and the organized militia will be assembled in seven great camps between July 15 and September 30. These contemplated field manœuvres will afford an opportunity for observation and experience for manufacturers of touring cars and motor trucks. The conditions will be as much like actual warfare as possible. Large bodies of troops will be assembled at rendezvous points. The regulars will proceed to their stations by marches, where the distances are considered practicable by the military authorities. In a general way, it may be said that all infantry will be required to make marches of 400 miles, and all cavalry 500 miles, marching either one or both ways, to make up these distances.

The most important rendezvous in the East will be at Mt. Gretna, Pa. Located in the central part of the State, it offers many troops the opportunity to reach it by marching. Three regiments of infantry, one regiment of cavalry, three battalions of artillery, detachments from the Signal and Hospital Corps, and two companies of engineers will be assembled at this point.

The organized militia from the following States have been invited to join: Maine, New Hampshire, Vermont, Massachusetts, Connecticut, Rhode Island, New York, Delaware, Maryland and District of Columbia. All the regular troops from Plattsburg barracks, N. Y.; from Madison barracks, N. Y.; Fort Ontario, N. Y.; Fort Porter, N. Y.; Fort Ethan Allen, Vt.; Fort Myer, Va., will march to this rendezvous, affording ample opportunity for anyone in the East to observe or participate in these marches.

Nearly all the money appropriated by Congress will be used for transportation. The Quartermaster's Department will be required to hire much of the field transportation used by the regular troops. Army officials, as a rule, are very anxious to see the motor truck compete with the mule transportation, and the ambitious manufacturer will be encouraged to do so. The Quartermaster General authorizes me to say, for his department, that he would be glad to hear from any owner of an auto truck with a view to securing his services on these marches.

While he does not say so, I feel quite safe in stating that he will hire and pay for motor trucks on precisely the same terms as for mule transportation. I am advised that the transportation hired by the military authorities, on these practice marches, is so expensive that it is cheaper for the department to buy the mules than to hire them. Here is an opportunity for the inventor who cannot



Piccadilly Circus, London, Showing How Motor Omnibus is Replacing Horse Bus.

afford to furnish a truck without compensation.

In the Middle West the rendezvous will be at Fort Benjamin Harrison, near Indianapolis, Ind. Troops from Fort Snelling, Fort Thomas, Fort Wayne, Fort Brady, Fort Sheridan and Fort Porter will be assembled here. Cavalry from Jefferson barracks, the Signal Corps from Fort Omaha, and the organized militia from the following States have been invited: Wisconsin, Michigan, Illinois, Ohio, Indiana and Kentucky.

The regulars from Forts Leavenworth, Crook, Logan H. Roots, Reno and Des Moines; artillery from Fort Snelling, organized militia from Arkansas, Oklahoma, Missouri, Kansas, Nebraska, Iowa, Minnesota and South Dakota will be assembled at Fort Riley, Kansas.

At Fort D. A. Russell, Wyoming, will be another large encampment, including all the regular troops in that vicinity, and the National Guard and militia of North Dakota, Wyoming, Colorado and Utah.

At Austin, Tex., another encampment, including the regulars and organized militia from Louisiana, Texas, New Mexico and Arizona.

At American Lake an encampment will include all the regulars on the Western coast and the organized militia from Montana, Idaho, Washington, Oregon and Nevada.

Chickamauga Park, Georgia, will be the site of another encampment, which will include regulars from Fort McPherson, Ga.; Fort Oglethorpe, Ga.; Fort Myer, Va.; Washington barracks, D. C., and Fort Wood, with the organized militia from Virginia, North Carolina, Georgia, Florida, Alabama, Mississippi and Tennessee.

The movement of the regulars will begin July 15, when practically the entire regular force of the United States army at Washington, D. C., will be on the march towards these seven rendezvous points. These marches will be conducted under the severe conditions of actual service in time of war, and a careful observer will have no trouble in acquiring what knowledge he may need of the transportation requirements of the military service by following one of these columns. This opportunity for observation, competition or trial may prove valuable to automobile manufacturers. Even if they have no trucks ready, they can go or send careful observers. I do not wish to discourage the manufacturers, and if I did not firmly believe that the time will come when the motor truck will supplant the government mule, I would not be writing this article, but I am of the opinion that manufacturers do not generally appreciate the problems to be dealt with in the military service. To give an idea of the immense amount of transportation to be dealt with in these marches, it will be safe to compute one wagon to each thirty men; this includes all kinds—draft, escort, ambulances, etc. I shall be glad to give the itinerary of any of these marches as soon as orders are promulgated.

The General Vehicle Company's Twenty-four Passenger Gasoline Brake.

The General Vehicle Company, of Long Island City, N. Y., successors of the Vehicle Equipment Company, have entered the manufacture of business motor vehicles of the gasoline type, and their first product is a twenty-four passenger brake which is intended to operate between New York and Coney Island, being designed to accomplish a mileage of over 100 a day, which would be impossible to obtain from an electric vehicle.

The motor of the brake is a four cylinder water cooled one of 35 horse power, having all of the valves mechanically operated from a single cam shaft. An automatic float feed carburetor is used. Ignition is by jump spark, current being supplied by a storage battery. The car is fitted with a honeycomb type radiator, and the water is circulated positively by means of pumps direct connected to the crank shaft. The air is exhausted through the radiator by a belt driven fan. Lubrication is by a force feed oiler with a separate feed for each bearing.

A conical leather faced clutch is used; it is controlled by a pedal and interlocked with the emergency brake. The change speed gear is of the sliding pinion type, affording three speeds forward and one reverse. The gears are made of chrome-nickel steel, and are hardened.

The frame is made of structural steel, and is thoroughly braced and trussed; it is supported on semi-elliptic springs in front and a platform spring in the rear. Artillery wheels with solid rubber tires are fitted, 4x36 inches in front and 5x36 in the rear, the bearings being plain. The driving chains are 1¾ inch pitch roller chains. A double emergency brake on each end of the countershaft is operated by a hand lever, and external expanding hub brakes are operated by a pedal. The wheel base is 140 inches and the tread 65. The gasoline tank of galvanized steel holds twenty gallons. The car has six cross seats, upholstered in leather, which accommodate four persons each comfortably.

New York Transportation Company's Portable Charging Plant.

The New York Transportation Company, who operate electric vehicles for hire in New York city, have recently placed in service a portable charging plant, which enables their cars to be driven for a visit in the country at a distance from the company's station up to the mileage of the car on a single charge; there to be recharged by the portable charging plant and then to be driven back to the city. The



GENERAL VEHICLE COMPANY'S TWENTY-FOUR PASSENGER GASOLINE BRAKE.

charging plant has been found particularly useful in connection with society events in the suburbs attended by residents of the city, and it did good service, for instance, at a recent wedding about 20 miles out from the city.

The charging plant consists of a six cylinder Speedway engine direct connected to a 50 kilowatt generator adapted to deliver current at either 110 or 220 volts pressure. The maximum regular current capacity is 175 amperes, and twelve vehicles can be charged at the same time. The switchboard is equipped with three Weston ammeters, two Weston voltmeters, a 220 volt rheostat and two double throw 250 ampere switches used to throw the charging plugs either in series or parallel. There are switches on the generator for throwing the fields either in parallel or in series. The six induction coils used for sparking the engine are suspended from the roof of the car, and the gasoline tank, water tank and radiator are placed on the roof of the car. The radiators are provided with an electric fan. The rear wheels are fitted with Hartford Turner twin solid tires. Altogether it is worthy of careful examination by practical men.



Interior of Charging Plant.

German Transportation Tests.

In the second addition to the proposed German Imperial Budget, now before the Reichstag, there is an item of 550,000 marks for acquisitions, installations and tests in the field of transportation. It is understood that the greater part of this appropriation is to be spent in trials with military automobiles, the experiences in the Russian-Japanese war making it imperative to devote greater attention to recent developments in means of transportation.

A French contemporary claims that vehicle springs were first invented in the early part of the seventeenth century by Madame Saural, the wife of a druggist in the Faubourg St. Antoine, Paris.



Portable Charging Plant in Action.

Motor Bus Drivers on Strike.

The drivers of the Vanguard motor omnibuses in London are at present on strike. Among their demands are the following: Payment at the rate of 7s. and 6s. per day for drivers and conductors (an approximate increase of 4d. per day over present rates). Payment during probationary period while learning to drive. Full day's pay to be given while their cars are in garage under repair. Abolition of back pay. i. e., suspended pay while causes of breakdown are inquired into by departments. Weekly wages. Abolition of "trip" system. i. e., payment for each journey. No suspensions or dismissals for low earnings. Maximum working day of nine hours with time for one square meal. To work on alternate Sundays only, when thirteen and one-half hours' duty will be done at a payment to drivers of 10s. 6d.

A Motor Express Wagon in Yucatan.

N. Escalante Peon, general manager of the United Railroads of Yucatan, writes: "The motor express wagon is in daily use for our express service in connection with the railroad, and is giving excellent satisfaction. The wagon does the work of three carts, and it costs about as much to run as the three carts. So far we have had no breakdowns, the wagon doing service every working day. As an advertisement of the express service we have every reason to be satisfied with the motor wagon."

"Jim Crow" Motor Bus Line Abandoned.

The Union Transportation Company, who have been operating a line of fifteen electric passenger automobiles at Nashville, Tenn., have decided to abandon the project of establishing transportation service in opposition to the street cars, and the vehicles have been taken off the streets. The project was started when the "Jim Crow" law passed by the last Legislature became effective, and for a time the colored people patronized the Union Transportation Company cars exclusively. Recently the city law department gave an opinion that each car was subject to a privilege tax of $48 per annum, the same as omnibuses, and it is probably due to this that the colored capitalists decided to abandon their project. Besides, the cars have cost a small fortune for repairs. They were the same cars operated at the St. Louis Exposition in 1904.

Atlantic City Sightseeing Cars.

The three twenty passenger gasoline sightseeing cars of the New Jersey Touring Car Company, of Atlantic City, are illustrated herewith. They were placed in operation last month, having been built specially for this service. The route covered by them is about 30 miles in length, including the principal points of interest in and

about Atlantic City—the public buildings, hotels and cottages, Board Walk, United States lighthouse, Inlet, yacht clubs, United States life saving station, Speedway, Pleasantville, Atlantic City Country Club and the golf links where the international tournaments are held annually. Their average daily mileage runs up to about 100 miles.

These cars are said to have paid from the start. A single fare is $1.50, or $1 to Absecon and Pleasantville. Moonlight trips are made at the rate of 50 cents per person, and are becoming quite popular with the hotel guests. There is already talk of buying more cars, the patronage thus far seeming to warrant such action.

The company is incorporated under Delaware laws, with a fully paid up capital stock of $60,000. The officers are as follows: President, D. W. Hughes; vice president and secretary, W. P. Bushnell; treasurer, L. T. Layton; general manager, R. H. Millward.



ATLANTIC CITY SIGHTSEEING CARS.

Commercial Vehicle Notes.

The Chicago West Park commissioners have purchased an automobile for park service.

The New York Transportation Company last week ordered fifty Columbia electric broughams, to be delivered next fall.

The Iowa Automobile Company, Des Moines, Ia., are about to place in service a thirty-five passenger sightseeing gasoline automobile.

The Automobile Transit Company is about to be incorporated at Milwaukee, Wis., with $10,000 capital stock, to operate motor buses and a freight delivery system in Milwaukee and its suburbs.

The Country Club of Sewickley, near Pittsburg, Pa., has put into commission a large motor bus for the convenience of club members and their friends in going to and from the railroad station and the clubhouse.

An automobile freight and passenger line is planned from San Diego, Cal., to Imperial by way of Warner's Pass, a distance of 120 miles. The railroad fare is $16.50 for a round trip. The automobile fare, it is said, will not be more than half that amount.

The New Jersey Auto Tourist Company are operating a twenty passenger sightseeing motor car at Newark, N. J. The patronage has been so good they are planning to put on three more cars. A trip is made to Eagle Rock in the afternoon and to Olympic Park in the evening.

The two principal motor bus lines between Tonopah and Manhattan, Nevada, have consolidated under the name of the Consolidated Automobile Company. They will build a new road that will reduce the running time one-half. A dozen high speed cars will carry passengers and light freight.

The first motor bus to be placed in operation between Port Jervis, N. Y., and Milford, Pa., a week ago is making three round trips daily, meeting the Erie trains at Port Jervis. The 8 mile run is made in from twenty to thirty minutes. The Erie Railroad will soon issue through coupon tickets from New York to Milford.

A recent murder committed in a town near Pittsburg, and the failure of the county police commissioners, on account of poor train service, to apprehend the murderer, has resulted in an agitation to secure an automobile for the use of the police, who could then quickly reach the smaller towns around Pittsburg without having to depend on the railroad or the much slower horse conveyance.

It is reported that the New Jersey Auto Transit Company have obtained a license to run a line of motor buses in East Orange, N. J. The route will be over Washington street, to East Park street, to Midland avenue, to Springdale avenue, and returning by way of Glenwood avenue and Washington street. A fifteen minute schedule is planned, and buses will meet all trains at the Lackawanna station at Brick Church.

"Long Arm" System Company.

The Garford Company, of Elyria, Ohio, has discontinued the manufacture of touring car parts and will in the future confine itself to the production of touring car chassis and truck and power wagon parts. As a consequence it is reported that the "Long Arm" System Company, of Cleveland, Ohio, has made arrangements with the Garford Company for the use of their designs for touring car parts, which will be marketed under the direction of Hayden Eames. The "Long Arm" System Company for some time have manufactured touring car parts to special design, prior to which they were engaged in the production of the mechanism for the automatic operation of water-tight bulkhead doors for ships, usually under Government inspection.

Midgley Manufacturing Company Involved in Litigation.

The Midgley Manufacturing Company, of Columbus, Ohio, manufacturers of steel wheels and rims, and the Rubber Goods Company, of New York, are tied up in a lawsuit as the result of an attempt of the Rubber Goods Company to absorb the Midgley Company. A representative of the Rubber Goods Company appeared in Columbus several weeks ago and quietly commenced to pick up stock, and one morning a number of the stockholders woke up to find they were a minority. Par was offered the minority stockholders for their holdings, and a great many accepted, but others refused.

The announcement that Thomas Midgley, president of the Hartford Rubber Works Company, was to be installed as manager was met with an injunction suit, filed by John Spear, manager for the original company, and J. O. Johnson, one of the minority stockholders. The court was asked to restrain the Rubber Goods Company from taking possession of the plant or from installing Mr. Midgley as manager, alleging that such action was not for the best interest of the company. The appointment of a receiver was also asked.

The court appointed Ralph Westphal receiver, but on representations of the defendants suspended action by the receiver. The litigation now rests in that condition.

The new tariff on gasoline in Spain is having a bad effect upon the industry in that country, owing to the high price of the article. A deputation of the Royal Automobile Club, of Madrid, has recently waited upon the Premier for the purpose of inducing the Government to modify the duties.

COMMUNICATIONS.

Wiring for Double Ignition System.

Editor HORSELESS AGE:

Being a reader of your paper I would like to ask a question through your columns. I do not understand the wiring of a four cylinder four cycle motor which uses a single non-vibrator coil with a magneto and distributor on one side of the switch, and a single vibrating coil and commutator and storage battery on the other side. Will be very thankful if you will show it in your paper. R.

[The method of wiring is comparatively simple. The magneto is combined with a primary make and break and one end of the armature winding is grounded to the core, while the other comes out to a binding post on the outside of the magneto, from which connection is made to one of the primary binding posts of the non-vibrator coil. To complete the primary circuit, the other primary binding post of the non-vibrator coil must be grounded.

Similarly one terminal of the storage battery is connected to the timer or interrupter, and through it grounded. The other terminal of the storage battery is

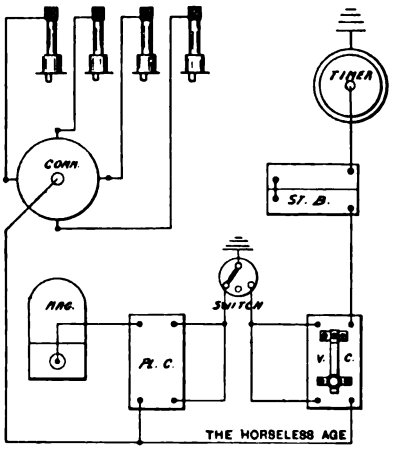


DIAGRAM OF CONNECTIONS.

connected to one primary binding post of the vibrator coil, and to complete this primary circuit, the other primary binding post of the vibrator coil must be grounded. If, now, we connect the primary binding posts of the coils that are to be grounded to an ordinary two way switch, the lever of which is grounded, we can make one primary circuit operative and the other inoperative by a single motion.

One secondary of each coil must be grounded, and the other secondary of each coil must be connected to the high tension distributor on the magneto. From the high tension distributor four leads connect to the spark plug. There might be an advantage in connecting the grounded primary and secondary terminals of each coil together, as shown, instead of grounding them separately.—ED.]

Cause of Failure to Start on the Spark.

Editor HORSELESS AGE:

Your correspondent, Louis A. Riehman, asks: "Can an explosive charge of gas and air be slowly burned?" and makes reference to the phenomenon that there is difficulty in restarting a motor which has been very hot from the switch after the engine has been standing for some time. The probable explanation is that in addition to the leakage of compressed charge from the distorted cylinder an actual dilution of the charge takes place, due to the fact that as the cylinder cools a vacuum forms therein and draws in air past the valves or products of combustion which may be present in the crank case. This dilution seems to be the only explanation of complete refusal to ignite a charge which was originally highly combustible and has merely stood for a short time. HUGO C. GIBSON.

Graphite Lubrication.

Editor HORSELESS AGE:

We were very much interested in reading "The Theory and Practice of Lubrication" in THE HORSELESS AGE of June 13. We note that the article is an abstract of a paper read before the Auto-Cycle Club of Great Britain by J. W. G. Brooker.

In the July issue of *Graphite*, now on the press, you will notice when you receive copy an article entitled "Are We Behindhand, and Do Our English Cousins More Fully Appreciate the Importance of Better Lubrication?" Our article is also taken from the same paper whence comes your article, and we cannot refrain from calling your attention to the remarks of G. de La Prelle de Nieppe, chief engineer of the London Road Car Company, who stated that he used graphite for chain lubrication and found that the life of the chain was four times as long as formerly. He boiled the chain for two minutes in Dixon's motor chain compound and let it dry, and then boiled it again a second and third time. He never put any on the outside of the chain, but let it get into the links. The chain would run absolutely smoothly, and he could tell one of his omnibuses from others by the noise of the chains alone.

What we desire at the present time is to call your attention to that part of your article wherein graphite is mentioned for lubricating the rawhide and fibre wheels so extensively employed for the transmission of light power. It is stated that on no account should oil or grease be applied, simply dry graphite. Now, that was always the belief of the Dixon Company, and only dry graphite was recommended, but later on we found that some of the trolley cars were using Dixon's graphite grease on their rawhide pinions, and with complete success and with no softening of the rawhide. Furthermore, graphite grease was used on rawhide pinions on Albany and Utica cars, where the conditions are very severe because of the hills over which they are obliged to go. We have seen a thick mixture of heavy cylinder oil and graphite used on fibre gears which are employed for driving magneto, and with entire satisfaction.

Users of graphite should at all times bear in mind that graphite is a solid substance and when used in engine cylinders only very small quantities should be used. Very small quantities will, without doubt, very largely improve compression and lubrication.

An ideal way of using graphite when it is possible to do so is to thoroughly rub it into the metal of the piston and the cylinder. At other times good results are obtained by adding graphite to the oil in the crank chamber in the proportion of about a teaspoonful to the pint or even the quart of oil.

JOSEPH DIXON CRUCIBLE COMPANY.

Explosion Engine Query.

Editor HORSELESS AGE:

I beg leave to ask you for more information regarding my motor (will not mention the maker of the engine this time, at least), the makers of which so far have not helped me out. The engine runs nicely, and I have no fault to find with anything, except that it persistently fires after the switch is turned off, say from three to six or more times. I have taken the pistons out and found them clean; cylinders also. This I did on the theory that there was some hard carbon mass that was responsible for the trouble. This firing is sure to occur as soon as the car runs a half mile or so. I will esteem it a favor if you or some of your readers will offer a solution of this defect. I might add that I have a "gear" pump that throws a good stream when the vent cock is opened in the radiator, which seems to show that the circulation of water is good. Any help you can give me will be appreciated.

DR. J. U. BLOSE.

[If the water boils insufficient radiation is shown, even though the pump is working well. However, if the water does not overheat we would suggest that you look well to the lubrication, as lack of oil will very soon cause preignition, but would be accompanied by a marked decrease in power. Small metal projections or splinters in the valve chamber or passages are sometimes found, which would be sufficient to cause preignition. An overrich, slow burning mixture might also be partly responsible. If none of these causes are found the trouble is probably due to faulty design, such as the existence of a thin wall, with fire on both sides of it, or to an incorrectly proportioned compression space.—ED.]

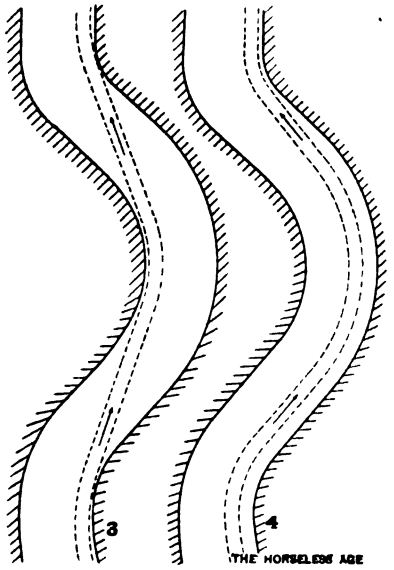
The first motor omnibuses were placed in regular service in Paris on Monday, June 11. The line from St. Germaine des Pres to Montmartre is now operated exclusively by motor buses, which make the distance in twenty-five minutes, as compared with forty-seven taken by the horse drawn buses. Eleven motor buses do the work formerly done by eighteen horse drawn buses.

OUR FOREIGN EXCHANGES

How to Turn Corners with a Car.

Some time ago a noted English automobile tradesman, S. F. Edge, published some directions on turning corners with a car, both in touring and in racing. The same rules are not followed under these two conditions, as in touring, when there is no need for making fast time, considerations of safety are paramount and regard must be had for possible traffic coming around the curve in the opposite direction, while in racing all traffic is in the same direction and certain precautionary measures observed in touring may therefore be neglected. The directions given by Mr. Edge are not directly applicable in this country, as the rule of the road is the opposite here as in England. Adapted to American conditions the directions are as follows:

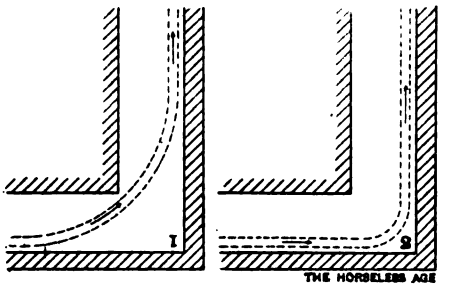
Let us first take the case of a square corner. The scorcher cuts right across the inner point of this corner, as shown in Fig. 1, in such a way that his wheels, instead of describing almost a right angle, leave a perfect semi-circular track. If somebody should happen to be coming round the corner at the same moment a very nasty accident would occur. The careful driver therefore hugs the right hand side of the road, as in Fig. 2, leaving plenty of room for a car coming in



TAKING AN S TURN.
WRONG. RIGHT.

the opposite direction to take the corner on its own side.

One very common type of curve, which is frequently occurring on roads all over the country (in England), is one which is roughly in the shape of an S. Those who are in the habit of scorching will take it as shown in Fig. 3, negotiating the curve in almost a straight line, to do which they have to shave past the three bends, which are the chief danger points. The careful driver, instead of cutting straight across the road from one bend to the other, will stick to his own side (Fig. 4). These S curves are the most



TURNING A RIGHT ANGLE CORNER.
WRONG. RIGHT.

dangerous that can be met at high speed. The driver sees at a glance that by cutting across from point to point he can keep up very nearly his maximum speed. However, the slightest miscalculation may cause the machine, instead of just missing the corner, to strike it, and the result depends somewhat upon the speed. Fortunately, most of the turns in the United States are right angled turns, and hedges and other obstructions of a clear view ahead are not as plentiful as abroad. The simple rule to follow is, always stick to your own side of the road.

Calcium Chloride Road Sprinkling Solution.

Brunner, Mond & Co., Ltd., an important firm of manufacturing chemists at Northwich, England, give the following advice on the use of calcium chloride solution for dust laying purposes, in our English contemporary the *Autocar:*

The calcium chloride solution possesses the characteristic of absorbing the moisture from the atmosphere, consequently the evaporation which takes place in connection with water, and which so largely nullifies the effect thereof, is obviated, with the result that during the night the road surfaces regain a considerable proportion of the moisture lost during the day, and the damping down effect of the treatment is consequently greatly prolonged. The solution used for watering is made by dissolving 1 cwt. of calcium chloride in 100 gallons of water. A road treated for the first time should be watered thoroughly twice over with this solution, with a day's interval between. For this treatment a length of 100 yards x 8 yards = 800 square yards will require about 300 gallons of the solution for each application. Subsequently one thorough watering about four times a year will suffice, though this will be determined by the weather, the quality of the road and the quantity and character of the traffic. Calcium chloride is sold in drums of about 5 cwt. each at $7.50 per ton at the works. For the initial dual treatment, 6 cwts. of calcium chloride, costing $2.25, will be required, and for each subsequent treatment 3 cwt., costing $1.12.

Automobile Taxes in Italy.

Signor Mayorana, who has just been appointed Minister of the Treasury, presented some ideas on automobile taxation and development in a paper read before the recent Milan International Automobile Congress. He advocates the use of autobiles for postal purposes, passenger and goods traffic in districts where there are no railways, the state undertaking their maintenance; he urges the improvement of roads and the reform of taxation on automobiles. On this last point he contends that the duty at the frontier should be exclusively protective, and that the tax on the gasoline used for motors should, if possible, be reduced without diminishing that levied upon petroleum used for other purposes. This subject has been under consideration for some time at the Ministry of Finance.

A Contest of Chronometers.

The result of the recent Milan Cup Competition has been well summed up by the remark that the contest was as much one of chronometers as of cars. This was due, of course, to the peculiar conditions of the race, whereby the cars could go any speed between the different halting points so long as they did not arrive within a certain minimum period, with the result that in most cases the difficulty was merely to calculate precisely when the control should be entered. At this interesting game Lancia proved most successful, since he hit the mark to a nicety every time and never lost a single second by being too early or too late; while those placed second and third, Maggioni, driving a Zust car, and Cagno, on an Itala, lost only seven seconds and ten seconds respectively.

Official Report on the Two Gallon Efficiency Contest.

The committee in charge of the 2-gallon efficiency contest, which was held by the A. C. A. in New York City May 5, issued its report last week. The report contains a table giving the rank in contest, actual weight, including passengers, contest weight, distance traveled, score and actual pound-miles for each car that competed. A full description of each car entered, together with the observer's report, under oath, as to the distance made and the method of operating the car, is on file at the club-rooms in a bound volume. With respect to the method of handicapping employed, the committee say:

"The results show that the addition of 800 pounds for the purpose of equalizing the scores made by the cars of different weights was approximately correct. The handicaps, however, of 15, 25 and 30 per cent. respectively for cars having less than four cylinders, which were introduced on the supposition that these types are more efficient, were apparently too great."

LEGISLATIVE and LEGAL

When the Automobile Is a Nuisance.

By Xenophon P. Huddy, LL. B.

A great deal has been rightly said for and against the automobile. It has been claimed that the automobile is a dangerous machine, that it damages the highway, and that its operation under certain circumstances constitutes a nuisance. On the other hand there are those who authoritatively say that the automobile is not necessarily dangerous, does not materially injure the surface of the road, and is not a nuisance. Who is to determine which view is correct, and how is the question to be answered?

If the automobile is dangerous per se, if it damages the highway, it may be a nuisance. The term nuisance covers all the alleged evils which arise from motoring or any other dangerous or detrimental pursuit. No doubt the automobile under some circumstances may be a nuisance. In fact a recent important decision of the Appellate Division of the Supreme Court of New York holds that speed trials of automobiles on the public highways, exceeding the speed rates prescribed by law, held under authority of a resolution of the board of aldermen, not in form an ordinance authorizing speed trials but merely a permission or privilege which the board was not authorized to give, constitute a nuisance as a matter of law, and render the defendants who hold the speed trials liable for injury to a spectator. See Johnson vs. the City of New York, 109 N. Y. App. Div. 821. At the time the speed trials were held in this case, the law of New York of 1904, Chapter 538, Section 3, Sub-division 6, providing that local authorities may temporarily set aside highways for speed contests, was not in force.

The court in the above case said: "The serious question is whether they were liable as for a nuisance per se. I think they were. The act which they committed was unlawful and inherently dangerous to the community, and constituted a nuisance in law. A public nuisance may be defined as including anything which by its use or by its permitted existence necessarily threatens or works annoyance, harm, inconvenience or danger to a community generally, and which by reason of its unlawful character may be remedied by public prosecution."

This case brings up an interesting question, and that is whether speed trials on the public highways would constitute a nuisance if held under authority of law. It is a general principle that a nuisance may be legalized, but there may be some question as to whether the Legislature has the power to authorize a blocking of the highways and thus deprive the citizen of his right to travel on the public avenues of travel. The holding of a speed trial race necessarily deprives the traveler of the use of the road, and it is unsafe for parties to use the highway while the race is in progress.

Preparing to Enforce New Jersey's New Law.

Trenton, N. J.—Up to this time 1,881 automobile drivers have been licensed by the State in anticipation of the new law which goes into effect July 1, and 2,412 machines have been registered.

Assistant Secretary of State Smith, who is also commissioner of motor vehicles, says that he is trying to find out what authority he has to enforce the law. He is of the opinion that the Department of Motor Vehicle Registration and Regulation can only lend its moral support to the constables and police departments in the performance of their work.

The department has the power to revoke licenses, and from its decision there is no appeal, a fact which Commissioner Smith is inclined to think should be corrected by the Legislature next winter.

Talking upon the subject of the authority of the new department, and the work it has to perform, Mr. Smith says that he will do all in his power to see to it that automobilists obey the law, but that there will be no persecution on the part of the State authorities. One of the provisions that will be enforced is that which requires the driver of a machine to stop whenever he collides with another vehicle or a person and give his name and address. Another provision that will be insisted upon is that which requires the driver of a machine to stop when a pedestrian or driver of a team holds up his hand.

"I believe," says Commissioner Smith, "that the majority of automobilists are careful in the operation of their machines, but there are some who are careless and indifferent to the comfort of others when they take the highways, and travel at a speed which endangers life and limb. Inspectors and the police will be urged to apprehend such as these, and when caught they will be punished to the extent of the law. A few prosecutions along these lines will, I believe, bring automobiling in this State down to a rational basis. If automobilists want to, in self protection, organize against the careless driver, they will find us ready to cooperate with them. This department will, from time to time, issue circular letters to automobilists urging them to obey the law, and to call upon the department any time that they feel disposed to do so with the purpose of improving conditions surrounding the sport."

The following agencies have been established, to which automobilists may go for examination, to secure their licenses and to register their machines:

Jersey City—Joseph Gallagher, Room 511, Fuller Building.

Newark—A. Barent Le Massena, Central Building, 828 Broad street.

Camden—Joseph H. Forsyth, 211 Market street.

Asbury Park—Charles R. Zacharias, Eagle Block.

Hackensack—John B. Brooke.

Phillipsburg—Joseph Poulsen, Electric Power plant.

Plainfield—Frank L. C. Martin and George M. McIntyre.

Morristown—Willis H. Dutton, 24 Washington street.

Rahway—S. S. Smith.

Freehold—Augustus R. White.

Seabright—Frank Riegleman.

Bridgeton—William Evans.

Edgewater—William H. Hinners.

It is probable that agencies will eventually be established at Atlantic City and Long Branch.

Will Amend New Haven's Garage Ordinance.

New Haven, Conn.—The ordinance adopted by the board of aldermen some weeks ago requiring a license to be obtained from the fire marshal under strict conditions before a motor car could be kept in any building will be amended so that garages where only *one* car is kept will not be affected. When the ordinance was first passed the intention was only to subject public garages to the strict conditions, but when the automobilists of the city realized what the ordinance meant, as passed, they petitioned the board for relief.

Must Return License Fees.

Montreal, Que.—A curious discovery has been made by the city authorities of Montreal. It is a fact that under the law the city has no right to levy a license charge for automobiles, but the officials did not discover it until the other day. The last session of the Provincial Legislature passed a law which abrogated the right to license automobiles, but no publicity was given to the fact, and the motorists and even the officials did not know of the existence of the new law. Now it appears that upward of 100 licenses have been issued to motorists, and as a consequence of the late discovery the fees will have to be returned.

Warren's Waterless Gasoline.

A special process for refining gasoline, claimed to eliminate all water and acid from it, has been invented and is being exploited by John W. Warren, of Elgin, Ill. A representative of The Horseless Age was furnished with the results of some tests of the waterless gasoline at the office of the Pease Oil Company in Buffalo, who have secured the exclusive rights for the sale of this gasoline in their territory. These test results may be of interest to our readers, though we cannot, of course, assume any responsibility for their accuracy.

Tests recently made in Buffalo tend to show that the Warren process increases

the Baumé test of gasoline one-half to one degree, and that gasoline so treated increases the power of an engine 8 per cent., as compared with that obtained with ordinary gasoline. Tests made at Freeport, Ill., indicate that under test conditions a car traveling 150 miles on a tank of ordinary gasoline will travel 180 miles with a tank full of waterless gasoline. The car averaged 17 miles to the gallon of ordinary gasoline and 20 miles to the gallon of waterless gasoline.

A comparative test made by the Rockford Engine Works, of Rockford, Ill., May 2, 1906, gave the following results: The tests were made with an 8 horse power stationary engine, 7x10 inch cylinder, hit and miss governor, electric ignition. The speed maintained throughout the tests was 280 r. p. m.

In the first test the engine was run without a load, to determine the length of time a quart of gasoline would run the engine. Previous to the test the engine was run for thirty minutes to warm it up. One quart of Standard Oil Company's gasoline ran the engine fifty-two minutes and forty-five seconds. One quart of Warren's waterless gasoline ran the engine sixty-six minutes and ten seconds.

The second test was made with the engine under a dead load, the same quantity of gasoline being used as in the first test. One quart of Standard Oil Company's gasoline ran the engine ten minutes and fifty seconds. One quart of Warren's waterless gasoline ran the engine eleven minutes and forty-five seconds.

The third test was with the engine under a brake load to determine which gasoline showed the greatest delivered horse power. During the test a tachometer was attached to the engine shaft and closely watched to see that the engine maintained its speed throughout the tests; the tests being continued long enough to fully demonstrate that the engine would carry its maximum load indefinitely. With the Standard Oil Company's gasoline the maximum load carried by the engine was 8 6-10 horse power. With Warren's waterless gasoline the maximum load carried was 8 9-10 horse power.

In addition to the gain in efficiency, it is claimed for the waterless oil that, as it is practically free of all traces of water and acid, there is absolutely no corrosive action upon the inside of the cylinder or sparking points. The Warren patents for refining oil cover the use of certain specified chemical compounds for the purpose of neutralizing the acid and absorbing the water, traces of which are unavoidably left in all oils refined under the older processes. The cost of purifying crude oil by the waterless process is said to be less than the cost of the ordinary refining process.

A bill has just passed the British House of Commons providing for the purchase of ten motor ambulances for use in London.

Glidden Tour Arrangements and Entries.

In answer to a number of inquiries regarding accommodations along the route of the Glidden Tour, and inquiries regarding the possible discomforts during the trip from Buffalo to Bretton Woods on July 12-28, the officials have issued the following statement:

Arrangements have been made by the committee and the superintendent by which provision has been made for a reservation of the entire transient accommodations in each place where the tour stops for the night. There is no place on the route where 400 tourists cannot be comfortably accommodated, and at several points as many as a thousand members of the party can be adequately cared for. To accomplish this result it has been necessary to arrange for the erection of tents, portable houses, etc., at two points. In Canada arrangements are being made for the chartering of a large St. Lawrence River steamer, which will accompany the tour, and will be used as a floating hotel.

Regarding possible congestion on the road and the danger of unpleasant dust conditions, members of the party which recently surveyed the road state that from Montreal to Bretton Woods there is practically no dust on the roads, on account of the prevailing heavy dews.

On account of the necessity of making the day's runs as nearly equal as possible the touring committee has decided that the first night's stop from Buffalo shall be at Auburn and the second night's stop shall be at Utica. Elaborate preparations are being made by the city of Auburn and the Auburn A. C. for the entertainment of the tourists, and at Utica there will also be special festivities on their account.

Arrangements are now being made for a path finding car, which will precede the tour by about three days, and will thoroughly mark the entire route with arrows or other indicating signs, and will also carry a transportation agent, who will attend to the registration of the members of the party in each town. By these means the tourists, on their arrival at each night's stop, will find their rooms ready for them.

The committee will also institute a system of checking along the line, checkers being dropped by a patrol car at at least three points on each day's journey. These checkers will record the time that each car passes their checking points, the plan being to arrive at conclusions with regard to regularity of running throughout the tour. A second patrol car will follow the last tourist, and will not only pick up the checkers left along the route but will also act as a relief car, carrying word of possible breakdowns to the nearest towns, and arranging for spare parts or tows, if there should be any necessity for these.

E. H. Cutler, president of the Knox Automobile Company, Springfield, Mass., has offered a 2,500 pound baggage wagon, and it is understood that other baggage wagons or trucks will be offered. It may thus be possible to handle the entire baggage of 400 or more tourists by automobile. It is likely that a car will go about three days in advance of the tour for the purpose of marking the route with arrows, and placing notices along the roads warning residents to keep their children within doors on the day the tour passes, as well as to restrain their domestic animals.

The customs problem will be handled by the committees without expense to the tourist.

The superintendent of the tour is in receipt of numerous inquiries each day regarding the event, indicating a most widespread interest in the tour, and the probabilities of a heavy entry list.

The following entries have been received in addition to those published last week:

No. 7.—Geo. Otis Draper, Hopedale, Mass. Saratoga to Bretton Woods. (Will not contest for Glidden Trophy.) Two in party.

No. 8.—Ezra. E. Kirk, c. o. E. R. Thomas Motor Company, 1200 Niagara street, Buffalo, N. Y. Thomas car of 50 horse power. Five in party. Buffalo A. C.

No. 9.—George M. Davis, c. o. E. R. Thomas Motor Company, 1200 Niagara street, Buffalo, N. Y. Thomas car of 50 horse power. Five in party. Buffalo A. C.

No. 10.—C. A. Coey, 1424 Michigan avenue, Chicago, Ill. Thomas car of 50 horse power. Four in party. Chicago A. C.

No. 11.—Albert A. Pope, Hartford, Conn. Pope-Toledo car, 35-40 horse power. Three in party. A. C. A.

No. 12.—Albert L. Pope, Hartford, Conn. Pope-Hartford car, 25 horse power. Three in party. A. C. of Hartford.

No. 13.—Walter C. White, Cleveland A. C., 18 horse power White steamer (pilot car and will not contest for Glidden trophy).

No. 14.—Philip S. Flinn, A. C. of Pittsburgh, 28-32 horse power Pierce car.

S. H. Burns Wins First Prize in Long Island A. C.'s Economy Run.

S. H. Burns was the winner of the first prize in the economy run of the Long Island A. C. to Poughkeepsie and return last Saturday and Sunday, carrying five passengers in his 24 horse power Packard at a cost of 89 cents per capita. The first prize is a silver loving cup donated by Dr. C. B. Parker, who won the club's economy run in 1905.

The second prize was won by Alfred Wilmarth, president of the organization, who carried five passengers in his 40 horse power Royal Tourist at a cost of $1.13 each.

The round trip railroad fare is $3.02 a passenger, which was the basis upon which the awards were to be made. Both of the two leading cars made the two days' journey without trouble of any sort in spite of the storm of Saturday, which left some of the roads in very bad condition.

The others who finished the run and conformed to the rules were E. W. Messereau, 24 horse power Autocar, per capita cost $1.15; F. Lampe, 28-32 horse power Pierce, $1.20; V. F. Parker, 15-20 horse power Locomobile, $1.33, and Dr. C. B. Parker, who competed for a certificate only, with a 24 horse power Packard, $1.24.

Four other cars which took part in the run were disqualified for not complying with the rules. One of these was the 40-45 horse power Pierce, entered by J. E. Bristol, which carried six passengers, three being children. This car led into Poughkeepsie, covering the 84 miles in four hours forty-five minutes, actual running time, and was the first back to the clubhouse, in five hours forty minutes. Mr. Bristol injured his wrist recently and the car had to be driven by his chauffeur, which caused the disqualification, as the rules required owners to drive. This car made the best record of 81 3-5 cents per passenger.

Dr. Butler's 24 horse power Frayer-Miller, which won the second prize in the 2 gallon efficiency test of the Automobile Club of America on May 5, was disqualified because Dr. Butler did not drive. The car used only 5 gallons of gasoline on its outward trip and but 4¾ coming home. It

had two punctures and made the run at a per capita cost of 86 cents.

W. T. Wintringham's 20 horse power Stevens-Duryea made the journey at a per capita cost of 81 cents for oil and gasoline, but broke a spring, which was not replaced. Raymond Healy did not accompany his 50 horse power Zust, which resulted in the car being disqualified.

The run was for members only, and the distance to Poughkeepsie and return from the clubhouse, 360 Cumberland street, Brooklyn, was 173 miles.

New York Garage Regulations.

Following are resolutions adopted at a meeting of the Municipal Explosives Commission, held at the headquarters of the fire department, city of New York, June 14, amending the regulations of the Municipal Explosives Commission:

Sec. 21 of the garage regulations of the city of New York was amended to read as follows:

"Filling stations shall be located at least 20 feet distant from the entrance to the garage, shall have a tight, unpierced cement or other approved fireproof floor, graded to a centre, and unconnected with the sewer or drainage system of the building. The floor shall be kept free from volatile inflammable liquid by sponging or swabbing."

Sec. 26 of the garage regulations of the city of New York was amended to read as follows:

"No volatile inflammable liquid shall be (1) used in a garage for cleaning or for any other purpose whatsoever other than filling the tanks of automobiles; (2) allowed to run upon the floor or to fall or pass into the drainage system of the garage; (3) put into or removed from the tank of an automobile while any light or fire on the same is burning; (4) carried or kept in open vessels. (5) All volatile inflammable liquids and oils recovered from the oil traps or by swabbing or sponging up spilled liquid shall be placed in an approved safety can of not over 5 gallons capacity. And all quantities in excess of 5 gallons shall be returned to the underground storage tank or removed from the premises forthwith."

Section 6 of the garage regulations of the city of New York was amended to read as follows:

"Licenses shall

"1. Be issued (*a*) by the fire commissioner, (*b*) subject to all the conditions of these regulations, and such further restrictions as the fire commissioner may deem necessary, (*c*) for the term during which all the conditions and restrictions are strictly observed, for the period of one year.

"2. Terminate immediately on any violation of these regulations or the restrictions imposed by the fire commissioner.

"3. Be revoked by the fire commissioner should he deem that the interest of public safety so demands.

"4. Not to be issued for a building (*a*) occupied in any part as a dwelling, a hospital, a theatre, a church, a school, or as a boarding, lodging, or tenement house—the only exception to this provision is that a license may be granted for a private garage in a building occupied in part as a dwelling by the family of an owner, a lessee, or an employee; (*b*) where, at any one time, more than ten people congregate in a portion of the building that is outside of the garage and is not separated therefrom by unpierced approved fire walls and floors; (*c*) where all sewer connections from washstands and sinks are not provided with an approved oil trap with a glass gauge pipe and a draw-off cock in a readily accessible place.

"5. Not authorize the keeping of more than (*a*) 10 gallons of volatile inflammable liquid in approved safety cans; (*b*) 1,375 gallons (25 barrels) of volatile inflammable liquid in underground storage tanks; (*c*) 120 pounds of calcium carbide in air tight containers.

"6. Be issued for a garage at an annual fee of $10, and may authorize (*a*) the keeping of (1) automobiles carrying volatile inflammable liquid; (2) volatile inflammable liquid; (3) calcium carbide; (*b*) the sale of (1) volatile inflammable liquid for filling the tanks of automobiles by transferring such liquid from the underground storage tanks into the tanks of automobiles on the premises of the garage; (2) calcium carbide.

"7. Be issued for a private garage at an annual fee of $2 and (*a*) may authorize the keeping of (1) automobiles carrying volatile inflammable liquid, provided that all such vehicles are used for the licensee's individual use, and are neither rented out nor used to carry passengers for hire; (2) volatile inflammable liquid for use in such automobiles; (3) calcium carbide for use in such automobiles; (*b*) shall not authorize the sale of (1) volatile inflammable liquid; (2) calcium carbide."

A resolution making smoking in garages a misdemeanor was not adopted.

Close of the Herkomer Competition.

The Herkomer contest, which ended at Munich on June 12, was won by Dr. Rudolph Stoess, of Zwickau, who drove a 20 horse power Horch car made in Zwickau, Saxony. Curiously enough, Dr. Stoess had been No. 155, or the last to start. The second prize was awarded to Emil Neumaier, of Stuttgart, who rode in a 40 horse power Benz. Herr Willi Poge, of Chemnitz, who drove a 60 horse power Mercedes was third. Neither Percy P. Pierce, the only American competitor, nor Prince Henry of Prussia was among the first ten. Prince Henry received a gold medal as a souvenir of the competition. It is reported that Percy Pierce met with a deplorable accident near Handheim, in the vicinity of Frankfort-on-Main on June 18, when his car collided with a carriage containing two men, one of whom was fatally injured. The automobile was much damaged.

Patents Issued May 29, 1906.

821,628. Process for Making Conducting Films.—Thomas A. Edison, Llewellyn Park, N. J. Filed May 26, 1905.

821,632. Self-Lubricating Loose Pulley.—Lyman O. Goodwin, Worcester, Mass. Filed February 19, 1906.

821,656. Roller Bearing.—Charles S. Lockwood, Newark, N. J. Filed November 30, 1904.

821,679. Tire for Vehicle Wheels.—John Thomson, Invercargill, New Zealand. Filed April 27, 1905.

821,702. Ball Bearing.—Robert Conrad, Berlin, Germany. Filed August 13, 1904.

821,703. Ball Bearing.—Robert Conrad, Berlin, Germany. Filed May 12, 1904.

821,751. Mud Guard for Motor Vehicles.—Charles Schmidt, Detroit, Mich. Filed March 10, 1905.

821,828. Muffler.—Lucius J. Phelps, Stoneham, Mass. Filed April 10, 1905.

821,858. Pneumatic Tire.—Hans L. Christiansen, Boston, Mass. Filed May 24, 1905.

821,871. Cushioned Pneumatic Tire.—David B. Hislop, Aberdeen, Scotland. Filed September 16, 1905.

821,915. Lubricating Device for Internal Combustion Engines.—George J. Altham, Swansea, Mass. Filed July 17, 1905.

822,021. Tire for Vehicles and the Process of Making the Same.—Thomas C. Sanderson, West New Brighton, N. Y. Filed July 14, 1905.

822,045. Oiler.—Daniel Herrmann, Guttenburg, N. J. Filed August 19, 1905.

822,104. Motor Car.—Michael Ehret, Philadelphia, Pa. Filed December 30, 1905.

822,162. Motor Vehicle.—Charles Stumma, Brandon, Iowa. Filed August 11, 1905.

822,177. Protecting Cover for Pneumatic Tires.—Eugene Bardou, Louis Clerc, and Bernard Desouches, Paris, France, Filed November 14, 1905.

Patents Issued June 5, 1906.

822,307. Pneumatic Tire Protector.—William W. Scarborough and Charles E. Schultz, Knoxville, Tenn. Filed February 4, 1905.

822,319. Portable Potential Indicator.—John B. Taylor, Schenectady, N. Y. Filed June 10, 1905.

822,322. Engine.—Elihu Thomson, Swamscott, and Augustus A. Ball, Jr., Lynn, Mass. Filed May 19, 1902.

822,323. Thermostatic Control.—Elihu Thomson, Swampscott, Mass. Filed October 1, 1904.

822,324. Governing Mechanism for Elastic Fluid Turbines.—Elihu Thomson, Swampscott, Mass. Filed September 30, 1905.

822,326. Water Jacket.—Frank H. Tryon, Utica, N. Y. Filed October 3, 1903.

822,372. Tube for Radiating, Cooling and Condensing Apparatus.—John G. A. Kitchen and Ludlow P. Perkins, Lancaster, England. Filed February 12, 1904.

822,439. Tire Construction.—William F. Ellis, Stamford, Conn., and Edwin C. Davis, New Brunswick, N. J. Filed August 9, 1904.

822,453. Transmission Gear.—William H. Hollopeter, Fostoria, Ohio. Filed January 26, 1905. Renewed November 16, 1905.

822,454. Friction Clutch.—Henry De F. Hubbard, Avalon, Pa. Filed July 11, 1904.

822,496. Friction Clutch.—Edward H. Waugh, Chicago, Ill. Filed July 5, 1904.

822,784. Automobile.—Jacobus Spyker, Trompenburg, Netherlands. Filed October 16, 1905.

822,786. Elastic Wheel Tire.—Wilhelm Struck, Berlin, Germany. Filed August 22, 1905.

822,833. Friction Clutch.—James F. Duryea, Springfield, Mass. Filed December 12, 1904.

822,853. Universal Coupling.—Herbert C. Chase, Oakmont, Pa. Filed November 13, 1905.

MINOR MENTION

F. Rossel & Co., the French automobile makers who recently established an agency in this country, have just brought out a six cylinder car.

The Reo Motor Car Company have removed their New York offices and salesrooms from 138 West Thirty-eighth street to 36-40 West Sixtieth street.

Motorists would be well to be on the lookout for police traps at Darien, Conn., and on the White Plains road, near Scarsdale, Westchester County, N. Y.

Gray & Davis, manufacturers of automobile lamps, Amesbury, Mass., have recently leased a four story factory that will increase their capacity 100 per cent.

The Silent Knight Motor Company, Chicago, have leased the second and third floors of the garage at 1238-40 Michigan avenue, just completed by Avon Von Glahn.

In regard to the rumor which has been circulated in the trade that the Olds Motor Works, of Lansing, Mich., were to move back to Detroit, the company inform us that the report is entirely without foundation.

P. G. Avery, of Milwaukee, Wis., has sold his interest in the Prest-o-Lite tank, which he originated, and connected himself with the Avery Portable Lighting Company, Milwaukee, to manufacture his new gas tank for lighting automobiles, known as Autogas.

The New York automobile dealers will meet under the auspices of the New York Automobile Trade Association at the Hotel Empire, Broadway and Sixty-third street, June 21, to discuss the project of asking the manufacturers for a larger commission allowance.

Owing to repeated complaints the police of Columbus, Ohio, are trying to enforce the speed ordinance, and have selected Bryden road, a fashionable thoroughfare, as the scene of their operations. Postmaster Harry Krumm was arrested and fined $25 and costs. The police have been equipped with speedometers.

During the month of May no less than 1,863 automobiles were registered in the State of New York, 116 of which, or about 6 per cent., were of foreign construction. The two American makes of which the greatest number were registered are the Cadillac and Maxwell, while the list of foreign makes is headed by the Mercedes and Panhard.

The New York Motor Club has postponed its second annual economy tour from New York to Albany, Pittsfield and Springfield until Wednesday, Thursday and Friday, August 29, 30 and 31. These dates will be more convenient for many manufacturers, and the committees in charge believed that it would be better not to detract from the interest in the Glidden Tour at the present time. The tour was to have been held Wednesday, Thursday and Friday of this week.

The C. H. Blomstrom Motor Company have occupied the new addition to their factory at Detroit, Mich.

The 1907 Stoddard-Dayton model was turned over to the testing department of the Dayton Motor Car Company last week.

The Chicago A. C. gave an outing to 600 orphans June 12. About 400 had to stay at home because there were not automobiles enough to go around.

The A. C. of France has notified the A. C. A. that it will take no part in organizing a French team to compete in the Vanderbilt Cup race.

The Hicks Speed Indicator Company and the Hicks Automobile Company, Brooklyn (N. Y.) agents for the Reo cars, have moved to 920 Union street.

Hinde & Dauch, Sandusky, Ohio, are manufacturing a commercial car weighing 1,400 pounds and having a carrying capacity of 1,000 pounds and a speed of 4 to 12 miles per hour.

The Upton Motor Car Company, of Lebanon, Pa., have built a powerful eight cylinder runabout for J. R. Harding, of Providence, R. I. The motor consists of two four cylinder motors joined lengthwise.

The A. M. C. M. A. are about to issue a handbook, giving illustrations and details of seventy-seven different types of cars manufactured by members of the association. Copies will be mailed free to any address by writing to the association, 29 West Forty-second street, New York.

The awards in the hill climb of the Worcester (Mass.) A. C., held May 24, are still held up. The club directors have tried hard to have the mixup straightened out, but the continued absence of President Louis Speare, of the Massachusetts A. A., who was referee of the climb, has prevented action up to this writing.

T. F. Russell, manufacturers' agent, 22-24 Lincoln street, Boston, has made arrangements with the National Sales Corporation, of New York, factory sales managers for Connecticut coils, "Geecee" storage batteries, "Soot-Proof" plugs and Dodge lubricators, whereby he will look after the sale of these appliances in Boston and the surrounding territory.

Success of the project to build a 12 mile boulevard on the mainland opposite Atlantic City, N. J., is assured, as a result of a meeting held last week at which the mayors of five shore towns through which the proposed highway will pass agreed to every proposition of the promoters of this boon to automobiling and driving. The road will extend from Absecon to Somers Point and there connect with the new bridge to be built across Great Egg Harbor Bay.

A New York party now touring Continental Europe in two large cars are carrying a bath tub along on the roof of one of the cars, as touring motorists are frequently in need of a bath, and the ordinary country hotel abroad does not boast of such conveniences as bath tubs.

A. J. Winslow, of Kalamazoo, Mich., is authority for the statement that an automobile factory will be built in that city.

The number of motor cars registered with the Indiana Secretary of State is 3,211. Since January 1 500 cars have been registered.

The E. R. Thomas Motor Company inform us that they have opened an engineering office in Paris, which forms, apparently, a section of their designing department.

The Macbeth-Evans Glass Company, of Pittsburg, Pa., are installing in their immense plant at Charleroi a complete set of machinery to be used in the manufacture of lenses for automobile lamps.

About 100 members of the Bay State A. A. went to Rye Beach, N. H., on their annual run last Saturday, returning Monday. E. A. Gilmore, Roy Faye and A. H. Barnard were the committee in charge.

At the plant of the Overland Automobile Company, Indianapolis, which was reorganized about three months ago by Claude Cox, experiments are being conducted for a touring car to be brought out early next season.

The Columbia Electric Manufacturing Company, who make the Leader cars, are being reorganized with Indianapolis capital and the factory will be moved to Noblesville, Ind., some time next fall. The name, it is reported, will also be changed. There will be little change in 1907 from this year's models.

Automobilists from Plainfield, N. J., have plans to incorporate The Owners' Garage of New Jersey, with $25,000 capital stock. Garages will be built at various points in the State, and members will be accommodated in preference to non-members. It is claimed that charges for repairs can be much reduced. The first garage will be built at Plainfield.

The second annual tour of the Albany A. C. will start at 8:30 a. m., June 21, from the Albany City Hall and proceed to Rutland, Vt.; Keene, N. H.; Boston and Springfield, returning to Albany the 26th. It is expected that twenty-five cars will participate. In a reliability contest, open to members of the club, the record is to be made on honor. There will be no official watchers. Certainly this is a new feature in automobile contests.

A Detroit patent lawyer is promising for 1907 an eight cylinder car with an emergency transmission similar to the "gearless" transmission—"emergency transmission because no transmission is necessary, except on rare cases, as the speed of the car ranges from 4 to 100 miles per hour in stock models, the engine being sufficiently powerful to be used continually direct connected." It would seem to us that a 100 mile per hour car is not quite suited to our present roads. Recent legislation also does not seem to have favored the use of roads by such cars.

Garage Notes.

A new garage is to be built on Newbury street, Boston.

E. R. Cuddeback has opened a garage and repair shop at Fremont, Neb.

A garage is to be erected at the Templeton Inn, Gardner, Mass., this summer.

The Marshall House, York, Me., has a garage that will accommodate thirty motor cars.

Henry M. Kolb is to build a garage in the rear of 1726 West Tioga street, Philadelphia, Pa.

Charles White and C. D. Bibbins, Spokane, Wash., are planning to erect a $50,000 garage in that city.

C. A. Moeller will build an addition, 40x98 feet, to the University Garage on Olive street, New Haven, Conn.

The Johnson Auto Company, of El Paso, Tex., have just sustained a loss of $21,000 by fire. They will rebuild soon.

Edward Taylor, formerly with the Taylor Company, Albany, N. Y., has opened a garage on Jay street in that city.

A company has been organized to build a forty room hotel, clubhouse and garage at Ft. Lauderdale (near Miami), Fla.

David K. Boudreau, automobile repairer, Attleboro, Mass., has filed a voluntary petition in bankruptcy. He owes $3,084.

The Redlands Auto Company, Redlands, Cal., will erect a garage at West Citrus avenue and Fourth street in that town this summer.

F. A. Clark has opened the Buckeye garage and repair shop at Main and Ninth streets, Zanesville, Ohio. It has 6,400 square feet floor space.

The Rarig Auto Garage at San Francisco, which was destroyed by fire, is now temporarily located at Oakland until a new building is constructed.

The Pittsburg Auto Tire Repair Company have plans for increasing their facilities, including a number of machines for the repair of solid tires.

Fred Unkrich has opened a garage in the Schaefer block, Galion, Ohio. H. G. Amick and Harold Davis have also opened a garage in the same town.

The Auto Electric Company, 41 County street, Attleboro, Mass., of which H. A. Brown is the manager, have erected a three story garage and repair shop.

The Hi-land Auto Company have occupied their new garage on Center street. The vacated Hi-land garage has been turned over to the Pittsburg branch of the Winton Motor Carriage Company.

The Mineola Motor Car Company, Mineola, Long Island, have opened a garage and repair shop on Jericho turnpike, opposite Krug's Hotel. P. P. Easton is president and R. L. Hall manager.

An unnamed automobile company has leased for a long term of years the Metropolitan Garage, which is to be erected at 147-151 West Forty-ninth street and 148-152 West Fiftieth street, New York.

Joseph T. Monfort, who handles the Reo car in Cincinnati, Ohio, has moved into a garage at 510 Sycamore street, which was remodeled for his use. There is a repair shop in connection with the garage.

J. Frank Mohler, of Mohler & De Gress, City of Mexico, has sold out his interest in Stevens & Mohler, the Guadalajara (Mexico) automobile firm. The new firm name is Fernandez Somellera & Stevens.

A garage and repair shop has been opened by Landlord Jennison, of the West Brookfield House, West Brookfield, Mass. It will be a great convenience to motorists using the road between Worcester and Palmer.

The American Automobile Company, the latest company to enter the Pittsburg field, are making preparations to rebuild on the site occupied by the structure which recently collapsed while undergoing changes. A brick garage, 80x115 feet, will be erected.

Charles C. Coddington, formerly general agent for the Buick Motor Car Company, Jackson, Mich., is the new vice president and general manager of the Southern Automobile Company, Nashville, Tenn. Duncan F. Kenner is the president. The company handles the White, Buick, Stanley, Cadillac, Oldsmobile, Franklin and Thomas cars.

The Motor Car Company of Baltimore, of which A. Stanley Zell and Howard W. Gill are proprietors, has opened a branch at 1314 New York avenue, Washington, D. C., next to the Central Garage. Stanley steamers, Stevens, Peerless, Thomas and Baker electrics are handled. A. L. McCormick is manager, with J. C. Johansen in charge of the accessories department.

The Albany (N. Y.) Garage Company have occupied their new garage, 28 and 30 Howard street. The building is a four story and cellar structure, with no woodwork except the sashes. It is as fireproof as it is possible to construct, the material used being rough red vitrified brick with granite trimmings, concrete and steel. The officers of the company are Matthew Van Alstyne, president; W. L. L. Peltz, secretary, and C. Sutherland Ransom, treasurer and general manager. A large number of other well known Albanians are interested.

Trade Literature Received.

Gray & Davis, Amesbury, Mass.—Circular, "Expansion Means Success."

Reo Motor Car Company, Lansing, Mich.—Booklet, "Reo, the Car That Does."

New York and New Jersey Lubricant Company, 14 Church Street, New York.—Booklet, "Non-Fluid Oils for Comfort and Security."

New Incorporations.

Pennsylvania Auto Motor Company, Philadelphia.—Capital stock, $50,000.

Buckeye Automobile Company, Cincinnati.—Capital stock, $10,000. By George F. Jung et al.

Motor Car Livery Company, New York.—Capital, $1,000. Directors, T. M. Keyser, A. H. Diehl, N. W. Trapsell, New York.

Italian-American Automobile Company, New York.—Capital, $2,000. Directors, D. H. Gaines, Clifford Longby, S. H. Jones, of New York.

Western Automobile Racing Association, Chicago.—Capital stock, $2,000; promote speed trials. Incorporators, William D. Duval, Charles Weinfeld, Samuel A. Ettelson.

Asheville Automobile and Transit Company, Norfolk, Va.—To operate passenger and freight automobile line in Buncombe County. Incorporators, D. G. Noland et al.

The Kissel Motor Car Company, Hartford, Wis.—Capital stock, $50,000. Incorporators, Louis, Adolph P., Otto P., William L. and George A. Kissel and H. K. Butterfield.

The Ostler & Zanes Company, Newark, N. J.—Capital stock, $100,000; to manufacture motor vehicles. Incorporators, Alexander Ostler, Delancy Zanes and W. Eugene Turton.

Turner Motor Transfer and Trucking Company, New York.—Capital stock, $100,000; trucking and stevedoring. Incorporators, W. F. Rawson, F. K. McCoun, W. W. Cantwell, New York city.

Mount Morris Garage, Inc., New York.—Capital stock, $5,000; store, manufacture, maintain, repair motor vehicles. Incorporators, A. G. Ibbeken, W. Cuttrell, E. L. Barney, all of New York.

Knickerbocker Automobile Station Company, New York.—Capital stock, $25,000; to store and repair vehicles, etc. Incorporators, Herbert L. Constable, C. F. William Reiss, Louis A. Fehr, all of New York.

Chesapeake Motor Car and Boat Company, Baltimore, Md.—Capital stock, $25,000. Incorporators, Dr. F. G. Taylor, Dr. Compton Riely and Messrs. H. Edgerton Riely, A. A. Torricella and T. Reginald Wise, of Baltimore.

Auto-Wheel Company, New York.—Capital stock, $10,000; to manufacture automobile wheels, etc. Incorporators, Walter S. Newhouse, No. 35 Nassau street; Arnold C. Weil, No. 198 Broadway; George A. Viehmann, No. 80 William street, all of New York.

Eagle Auto Supply Company, New York.—Capital stock, $500; to deal in automobile supplies. Incorporators, John G. Batzle, Jr., and Isidore Reymond, No. 239 Franklin street, Bloomfield, N. J.; William F. Mahoney, No. 228 West Forty-ninth street, New York.

Trade Personals.

Louis P. Mooers, formerly designer of the Peerless cars, is now manager of the Moon Motor Car Company, of St. Louis.

J. L. Aikenhead has succeeded A. E. Hoffman in the management of the Philadelphia branch of the Ford Motor Company.

George R. Bidwell, former Collector of the Port of New York, has become general manager of the Autocar Company at Ardmore, Pa.

J. S. Bretz, formerly sales manager of the Corbin Motor Vehicle Company, is the new sales manager of the Hartford Automobile Parts Company.

Henry J. Hill, for the past ten years master mechanic of the Electric Vehicle Company, Hartford, Conn., has resigned. His friends presented him with a thirty-second degree Masonic charm.

C. H. Collins has been appointed manager of the Detroit branch of the B. F. Goodrich Company on Jefferson avenue, which will soon be completed. He will succeed H. C. Miller, who has been appointed assistant sales manager of that concern.

W. B. Fewell, formerly manager of the Buffalo branch of the Goodyear Rubber Company, and A. M. Robbins, formerly branch manager for the Ford Motor Company at Buffalo, have been appointed assistant sales managers of the C. H. Blomstrom Motor Company, of Detroit.

New Agencies.

Havana, Cuba.—Angel Velo, Queen cars.

Auburn, N. Y.—J. C. Near, Queen cars.

Buffalo, N. Y.—J. A. Cramer, Queen cars.

Coldwater, Mich.—Walter Reed, Queen cars.

Bay City, Mich.—Buck Brothers, Queen cars.

Reno, Nev.—Davis & McKenzie, Dorris cars.

New Castle, Pa.—E. E. Hillman, Queen cars.

Milwaukee, Wis.—Solliday & Co., Queen cars.

New Orleans, La.—P. S. Jannery, Queen cars.

Charlotte, N. C.—O. L. Barrington, Autocars.

Columbus, Ind.—Benefield Brothers, Queen cars.

Lexington, Ky.—Thomas B. Dewhurst, Queen cars.

Newark, N. J.—The Motor Vehicle Company, Aerocars.

Boston, Mass.—Mt. Vernon Motor Company, Autocars.

Johnstown, Pa.—Johnstown Auto Company, Queen cars.

Little Rock, Ark.—Little Rock Auto Company, Queen cars.

Minneapolis, Minn.—East Side Auto Company, Queen cars.

Pittsburgh, Pa.—Atlas Automobile Company, Queen cars.

Attleboro, Mass.—Nerney & Co., 88 West street, Rambler cars.

Cincinnati, Ohio.—D. T. Williams Valve Company, Autocars.

Des Moines, Ia.—Iowa Auto and Supply Company, Queen cars.

Indianapolis, Ind.—F. A. Beck, 719 North Illinois street, Pope-Toledo cars.

Attleboro, Mass.—The Auto Electric Company, 41 County street, Reo and National cars.

Brooklyn, N. Y.—Coffin Brothers, 701 Quincy street, Pierce-Racine cars (Long Island agency).

Pittsburgh, Pa.—D. P. Collins (formerly with Banker Brothers Company), Columbia gasoline cars.

Brooklyn, N. Y.—Wayne Garage, 33 Grant square, Walter R. Hendricks and William H. A. Bruns, proprietors, Wayne cars (agency for Kings and Queens counties).

Indianapolis, Ind.—Gibson-Short Cycle and Auto Company, Premier cars (agency transferred from Fisher Automobile Company), Wayne, Ford, Reo, Marmon and Leader cars.

Brooklyn, N. Y.—The Eclipse Auto and Construction Company; showrooms, 1150 Bedford avenue; garage, 411 Berry street; F. W. Teves, president and general manager, Ford cars (Kings County).

The Chemistry of the Alcohols.

T. H. REARDON.

The term alcohol, originally limited to ıe substance, the spirit of wine, is at esent applied to a very large number of ganic compounds, many of which have ry little obvious resemblance to common ohol. They all have, however, an anal- ous constitution, having the composi- n of hydrocarbons, in which one or more the hydrogen atoms are replaced by a rresponding number of hydroxyl groups. lcohols may be compared with the metallic drOxides, not only because like these ey contain one or more hydroxyl groups it also because they form salts with acids, iminating water.

Ethyl alcohol, C_2H_5OH, is the alcohol de- ved chiefly from grain, and as it is the ost important it will receive attention first. thyl alcohol, in its chemical combinations, rms a numerous class of compounds, many f which are of the highest importance in ıe arts. To illustrate the chemical proper- es of alcohol we shall observe its deport- ıent with sulphuric acid, H_2SO_4, which is ıown by the subjoined equation:

$$2(C_2H_5) + H_2SO_4 = (C_2H_5)_2SO_4 + 2(H_2O)$$

Alcohol + Sulp. acid = Ethyl sulphate + Water.

By means of other reactions with numerous ther acids we obtain an endless variety of lcohol products, notable among which are uch substances as ethyl nitrate, ethyl nitrite, thyl chloride, ethyl acetate, bromides, odides, and phosphates of ethyl, and so on; n fact, we can obtain ethyl products of al- nost every character.

But it is not in its direct combinations vith acids alone that we obtain ethyl prod- ıcts, as the chemist can control processes n the laboratory so that a merely modify- ng action on alcohol can be obtained in- tead of bringing about its actual combina- ion with an acid. By this particular process ıf chemical manipulation such substances as he ethers are produced, and it is proper to emark at this point that the ethers are ully as numerous as the alcohols and acids rom which they are derived.

It was shown above that the reaction of al- ohol and sulphuric acid gives as products thyl sulphate and water, but by employing cid considerably more dilute than that used n the first operation we obtain ethyl ether, or lioxide of ethyl, instead of ethyl sulphate. Ethyl ether is the anesthetic that finds a vorld wide use in surgery. The method of ts preparation was discovered by Dr. W. T. G. Morton, of Boston, about 1847, and it nay be said that its discoverer conferred greater boon on humanity than any other nan who has ever lived.

In the preparation of ether sulphuric acid xerts merely a modifying influence on the lcohol, converting it into ether, but does ıot combine with the alcohol, and conse- luently does not enter into the composition ıf the finished product.

The theory of etherification is not thor- ıughly understood, but ether is produced by distilling dilute sulphuric acid and alcohol together at only a slightly elevated temperature; any departure from a certain range of temperature and concentration will result in the production of a different compound instead of ether. The formula of ether is $C_2H_5OC_2H_5$, and an inspection of the formula will show that the change is of a nature very similar to polymerization, i. e., two molecules of one compound fall together to form one molecule of a new compound. Wood alcohol treated in the same way will give methyl ether, or both alcohols may be used at the same time, which gives a mixed ether, methyl-ethyl-ether.

When alcohol is added to the boiling solution of a nitrate of silver mercury, copper, etc., a brisk effervescence occurs, and the precipitate, which slowly subsides and settles, constitutes that dangerously explosive class of substances known as fulminates, which are principally used for priming in percussion caps and exploders, and which, owing to their treacherous and uncertain character, have been the cause of many sad accidents.

Chloroform, or tri-chlormethane, $CHCL_3$, is obtained by distilling dilute alcohol with chloride of lime or bleaching powder. It is an important anesthetic in surgery, but not as extensively used as ether; it was discovered by Soubeiran and Liebig in 1831. Besides the alcohols thus far described, which contain but one "OH" group, there are several other alcohols containing from one to six or eight "OH" groups, and as each "OH" group can be replaced by an acid radical in chemical operations, the products of alcohols are almost unlimited as to number and character.

Glycerine, $C_3H_5(OH)_3$, is classed as a trihydric alcohol, because it contains three "OH" groups, and if it is caused to react with fuming nitric acid, or with a mixture of concentrated sulphuric and nitric acids (which gives the same reaction), the three "OH" groups in glycerine are exchanged for $(NO_3)3$, three molecules of nitric acid base, the compound formed being glycerl tri-nitrate, or nitro glycerine, the world's greatest explosive.

Mannite, or mannitol, is an alcohol containing six "OH" groups, and when treated as described above it yields mannyl hexanitrate, taking up six molecules of nitric acid base; it is a most violent explosive, very closely allied to nitro glycerine.

The ultimate products of all alcohols, if oxidation is allowed to proceed to its full extent, will be acids; thus grain alcohol, or the liquids containing it, will produce acetic acid (vinegar); wood alcohol (methyl hydrate) will produce formic acid.

In many operations in chemistry the oxidation is controlled for the specific purpose of obtaining a product that stands intermediate between an alcohol and the acid which it would yield as an ultimate product. Ethyl aldehyde, or acetic aldehyde, stands between grain alcohol and acetic acid; methyl aldehyde, or formic aldehyde (known also as formalin), stands between wood alcohol and formic acid.

THE COMMERCIAL PRODUCTION OF ALCOHOL.

The industrial production of alcohol is governed by a great variety of circumstances and conditions, which tend to place its manufacture on a different basis in different localities. As the selection of raw materials for its production marks the first step in the process of its manufacture, the most important sources from which it is derived will first be considered. The sources of alcohol may be divided into three classes, as follows:

First Group—Fluids in which alcohol is present already formed, such as wine, beer, cider, etc.; from this group the alcohol is obtained by simple distillation.

Second Group—Substances, either solid or liquid, which contain sugar, which may be either cane sugar, dextrose or levulose; in this group are included such substances as sugar cane, beet root, carrots, maize stalk, sorghum, apples, cherries, figs, etc.; the molasses of cane and beet root sugar manufacture, the marc of grapes and the refuse grain of beer making.

Third Group—All substances which originally contain neither sugar nor alcohol, but which contain substances that by appropriate treatment may be converted into sugar and dextrose. The most important articles in this class are potatoes, rye, wheat, barley, oats, maize and rice.

PREPARATION OF A VINOUS MASH.

As the description of the manufacture of alcohol from grain will be illustrative of general principles and as a clear conception of this process will give a very fair idea of the manufacture of spirits in general, descriptions of the processes of manufacture from other raw materials will be considered beyond the scope of this article. Generally, more than one kind of grain is used, for experience has shown that wheat and barley or rye and barley will give a better yield and better results in general than either of these substances used separately.

BRUISING AND SOAKING THE MATERIALS.

The first step in the process is the bruising of the materials. The malted and unmalted grain is thoroughly bruised. As it is not essential in the manufacture of spirits that a clear wort should be prepared the grain is broken up very finely, as by this means the formation of sugar is rendered much more complete.

The operation of mixing with water is carried out in a manner very similar to that employed by brewers, except that the distiller aims at the conversion of the entire starch into glucose, while the brewer does not desire complete conversion, desiring some dextrine. One matter that requires attention, however, is that the quantity of water used must not be diminished below a certain amount, or a loss of spirit will result.

COOLING AND FERMENTATION.

When the saccharification is complete the mash should be rapidly brought to the proper temperature for fermentation by being placed in cooling vessels operated on refrigerating principles. The temperature to which the mash is reduced varies with other conditions, but in general it is approximately 73° Fahr. The fermentation vat is frequently made of wood, though sometimes of stone. Either beer yeast in its fluid condition or dry yeast is used to set up the fermentation. Of the former about 1 per cent. of the volume of the mash undergoing treatment is used. After standing from three to five hours the temperature of the mash will be some 55° or 60° higher, Fahr. scale. Carbon dioxide is given off and the heavier matters settle to the bottom of the vat. The yield of alcohol is better, however, if the temperature is kept down to about 65° Fahr.

DISTILLATION.

After the fermentation process has reached completion, which will generally be the case at the end of about ninety-six hours, the clear supernatant liquid in the vat is ready for the final process of distillation. The fermented liquid consists essentially of water and alcohol, and as water boils at 212° Fahr. and alcohol boils at about 95° Fahr. it will be readily seen that when heat is applied the alcohol will have a strong tendency to pass over first in the process of distillation. It must not be assumed, however, that the separation is particularly easy and simple, for such an idea is very erroneous. Alcohol has a very considerable affinity for water, and this particular property renders its separation from water so difficult that it cannot be completely effected by the process of distillation unassisted by other processes. It is stated on excellent authority, however, that the perfected still of the present day can deliver 95 per cent. alcohol in commercial operation.

For removing the last traces of water and delivering anhydrous or absolute alcohol, the alcohol vapor must be compelled to pass over powerful dessicating agents, such as fused calcium chloride, caustic lime or other substances that have an equal affinity for watery vapor. Absolute alcohol is something for which there is no particular use outside of the laboratory, but in calculating the thermal value of alcohol in connection with its use for power it should be borne in mind that it is the percentage of absolute alcohol in a gallon that is to be considered.

DISTILLING APPARATUS.

The principle of all distilling apparatuses is the same, the idea being to convert the volatile product sought into vapor, and it follows from a consideration of the principles involved that there must be a large difference in the boiling points of the liquids that are to be effectually separated by such a process. While a large amount of water is vaporized and rises with the alcohol vapor, yet in the condensing spiral (technically termed a worm) a large portion of this water is condensed and runs back to the still. The still is usually constructed of copper, and is essentially a steam boiler, provided with ingress and egress passages of sufficient size to permit the introduction and removal of the different substances which are to be treated in it. A large copper pipe rises from the still and continues to the point at which it enters the cooling apparatus or condenser. The condenser may derive its cooling power from a constant circulation of cold water, or any of the artificial methods of refrigeration may be successfully employed. The object to be accomplished is the condensation of the heated vapors to the liquid condition and the further cooling of the condensed liquid to a point which will reduce loss by re-evaporation to a minimum.

The condensed spirit, with such a percentage of water as it contains, passes on to the receiver, from which it is drawn later to receive such further treatment in the matter of concentration and rectification as the purposes for which it is intended seem to justify.

REMOVAL OF VOLATILE IMPURITIES.

By causing the vapor from the still to pass over or through layers of quicklime, or some such dehydrating agent, the last traces of water will be removed and such substances as acetic acid in the distillate will be fixed and retained by the alkaline base; for the removal of fusel oil, which is a very objectionable impurity in spirit obtained from the potato, filtration through animal charcoal seems to be productive of the best results.

YIELD OF ALCOHOL FROM VARIOUS PRODUCTS.

The percentage yield given below is taken from a standard reference:

100 parts starch yield 56.78 parts alcohol.
100 parts cane sugar yield 51.10 parts alcohol.
100 parts dextrose yield 51.01 parts alcohol.
100 parts barley yield 22.32 parts alcohol.
100 parts barley malt yield 27.4 parts alcohol.
100 parts wheat yield 24.61 parts alcohol.
100 parts rye yield 22.90 parts alcohol.
100 parts potatoes yield 9.16 parts alcohol.

The figures are interesting and instructive, because, knowing the cost of raw materials, we have a very important factor in estimating the probable cost per gallon of alcohol with no tax.

PRACTICAL TESTS OF STRENGTH OF ALCOHOL.

The most commonly applied test for ascertaining the strength of alcohol is the hydrometer test, based on the specific gravity of the liquid. While this test is the only practical test that can be made by the non-technical, it is not in any case an absolute index of purity.

The specific gravity of absolute grain alcohol is given at .7938, and that of wood alcohol as .8142. This difference is so small that it is very doubtful whether the addition of 15 or 20 per cent. of wood spirit, as an adulterant, could be ascertained by means of an hydrometric determination especially by those who are not experts in such matters.

Wood alcohol will probably be used as a denaturizing agent, as it is very much employed for that purpose at the present time, so the characteristic odor of wood alcohol would be wholly without significance when it came to detecting its presence as an adulterant. It may happen, however, that the prices of both articles will be so nearly alike that there will be no incentive for such a practice. A very slight difference in specific gravity represents a relatively large difference in the percentage strength of alcohol. A specific gravity of .8418 represents 82.62 per cent. while specific gravity .8228 corresponds with 90 per cent.

WOOD ALCOHOL.

Wood alcohol is probably always obtained as a by-product; the yield is so small and the products with which its manufacture is associated are so much more important that it is generally the third article in rank in plants in which it is produced.

The destructive distillation of wood is a process generally applied to secure the charcoal which the wood will yield; the volatile products that are driven off consist mostly of tarry matter and acetic acid, with about 1 per cent. of wood spirit; that is, for example, 100 pounds of oak wood is said to yield 1 pound of wood alcohol.

The acetic acid is neutralized with lime and is marketed to manufacturing chemists in the form of calcium acetate; here it is subjected to dry distillation for the production of acetone or distilled with sulphuric acid, which liberates the acetic acid that it contains.

The crude wood alcohol is recovered by distilling the aqueous solution in which it is contained, but as the solution contains a considerable quantity of acetone, which has very nearly the same boiling point as the alcohol, distillation alone will not furnish it in a state of ordinary purity.

The crude wood spirit may be obtained in a reasonable state of purity by treating it with calcium chloride, with which it forms a crystalline compound; the crystals are drained and afterwards distilled with water. The dilute spirit obtained in this way can be concentrated by distillation, and finally be dehydrated over quicklime.

The use of wood alcohol as a fuel in vapor engines is not likely to assume any great commercial importance—at least not in the near future; its calorific value is very much lower than that of grain alcohol, as will be shown by subsequent calculations, and another thing against it is its comparatively low yield from the raw materials from which it is derived, coupled with the fact that much time, labor and expense must be considered in connection with its purification, which must at least come up to commercial standards. The use of such a prod-

uct for power purposes will of necessity call for a higher standard of purity than that which may be entirely satisfactory when it is employed as a solvent in the manufacture of varnishes, etc. If grain alcohol proves successful in vapor engine practice, both technically and commercially, it will furnish valuable data which will enable power users to predict what may be expected from wood alcohol similarly employed without any special experiment.

HEAT VALUE OF ALCOHOL.

There are two methods for determining the heat units in fuels. The first one employed consists in burning an accurately weighed sample of the particular substance and arranging things so that the total heat evolved would be taken up by an accurately weighed quantity of water, the temperature of the water being noted at the commencement and also at the end of the operation, so the number of degrees through which the temperature rose, multiplied by the weight of the water used in the determination, gave the number of heat units evolved by the combustion of a given weight of the substance. All details in such determinations are executed with that high degree of refinement that is absolutely essential to scientific accuracy. In this way the thermal value of carbon, hydrogen and many other substances has been experimentally determined.

Chemical science premised that if the heat values of the elements had been established by the processes of calorimetry the thermal value of a compound could be calculated from the data afforded by quantitative analysis. The matter was made the subject of experimental investigation by such eminent men as Dulong and Pettit, and the result is that today calculation of the heat value of fuels from the results of a chemical analysis is considered as accurate and as trustworthy as the results obtained by the most elaborate operation in calorimetry. One matter that requires particular mention is that it has been found that when a combustible substance contains combined oxygen and also hydrogen the full value of the hydrogen is not available.

CALCULATION OF THERMAL ENERGY.

The formula of ethyl alcohol is C_2H_5OH, and after taking off the H_2O, which does not give any heat, we have left C_2H_4. From this and the atomic weights of carbon, hydrogen and oxygen we find that the available fuel elements in a pound of alcohol are 52.17 per cent. carbon and 8.69 per cent. hydrogen. The heat units which are liberated on the combustion of these elements are as follows: $(14,500 \times .5217) + (62,500 \times .0869) = 12,995$ H. U. This is equal to $12,995 \div 2,545 = 5.106$ horse power-hours. The energy in one United States gallon (= 231 cubic inches) of alcohol is equal to $5.106 \times 6.58 = 33.60$ horse power-hours.

The formula for wood alcohol is CH_3OH, and after taking away the unavailable H_2O there remains CH_2. The heat value of this alcohol is therefore

$$\frac{(14,500 \times .375) + (62,500 \times .0625)}{2,545} = 3.675$$

horse power-hours.

The heat energy of one United States gallon of wood alcohol is $3.675 \times 6.78 = 24.91$ horse power-hours.

The above calculations are presented for comparative purposes only, and are based on the stated quantity of absolute alcohol used. The heat values determined are the energy contained in the alcohol and not the available energy, as in practice there are large unavoidable losses.

Operation of Gasoline Motors at High Altitudes.

By Albert L. Clough.

It is not uncommon to hear complaints from users of gasoline motor cars in high altitudes as to difficulties experienced in securing proper gasoline mixtures and concerning the low gasoline economy which they obtain. Perhaps it may not be without interest to such automobile owners to consider some of the causes of the troubles which they experience.

VARIATION OF BAROMETRIC PRESSURE.

At sea level a cubic foot of air at a temperature of 60° Fahr. weighs about .076 pound, assuming a barometric pressure of 30 inches. At an altitude of 5,000 feet above sea level the average barometric height is about 24.7 inches, and at 60° Fahr. a cubic foot of air weighs about .063 pound. Ascending to an altitude of 10,000 feet above sea level, at which height the barometer stands at about 20.5 inches on the average, the weight of a cubic foot of air at the above temperature becomes .052 pound, and at 14,000 feet above the sea, where the barometer commonly registers 17.6 inches, air weighs .045 pound per cubic foot.

There are a great many points in this country, especially in the Rocky Mountain plateau region, where automobiles are used at altitudes of 5,000 feet or over, and there are some considerable mining communities, such as Leadville, Col., which are situated at 10,000 feet above sea level. The "Climb to the Clouds" up Mount Washington carried the competing cars to an altitude of over 6,000 feet, and the proposed climb up Pike's Peak would, if it had been held, have involved an altitude of over 14,000 feet.

REDUCTION OF CHARGE.

At an elevation of 5,000 feet a gasoline engine, with its throttle wide open, will draw into its cylinder per stroke only about 83 per cent. as large a weight of air as it will at sea level. At 10,000 feet elevation this ratio is reduced to 68 per cent., and at 14,000 feet altitude it becomes 59 per cent. As a certain weight of air will properly consume a certain definite weight of fuel and no more it is evident that a gasoline engine, in order to work with an economical mixture at an altitude of 5,000 feet, must not be fed with more than 82 per cent. of the weight of gasoline per stroke that it would require at sea level. At 10,000 feet elevation the supply of gasoline must necessarily be reduced to 68 per cent., and at 14,000 feet it must be cut down to 59 per cent.

It is not at all strange that the carburetors of cars adjusted to run properly at the factory (located at but a few hundred feet above sea level) should be very far from correctly adjusted if the cars are used at elevations of 5,000 feet or over. The factory adjustment will almost always give too rich a mixture at low throttle, and generally throughout the whole throttle range. Moreover, not every carburetor on the market possesses a range of adjustment sufficient to properly compensate for the rarefaction of the air. The needle valve of the spraying nozzle can usually be adjusted to meet the changed conditions, but a change of the spring used to seat the auxiliary air admitting device may have to be resorted to in order to allow of the entrance of a sufficient volume of air at full throttle opening. A car may be used for some time at a high altitude with the over-rich gasoline mixture produced by the factory adjustment, and during such time it will be very wasteful of fuel and very troublesome in other ways. A proper mixture can always be secured in time, if sufficient pains be taken in adjusting the spraying jet and the auxiliary air inlet.

Even when the correct mixture is obtained it is to be observed that a gasoline engine, when used at an altitude of, say, 5,000 feet, is running under somewhat disadvantageous conditions. With its throttle fully opened the quantity of fuel taken into its cylinder during each suction stroke is no more than that which the same engine would draw at sea level when throttled 17 per cent. If it were used at 10,000 feet elevation with throttle fully opened it would be under the same conditions as if used at sea level throttled about one-third, and at 14,000 feet altitude, with wide open throttle, it would be drawing the same charge by weight as it would if running with throttle nearly one-half closed at zero altitude.

SPECIAL FUEL ADJUSTMENT REQUIRED.

The operator who drives a car at high altitudes is virtually in the position of being unable to open his throttle beyond a certain fraction of its full opening. The maximum power of his engine is thus reduced approximately in proportion to the decreased weight of fuel which it can burn per stroke. This reduction in maximum output is in the vicinity of 17 per cent. at 5,000 feet elevation, and as high as 41 per cent. at 14,000 feet altitude.

The reduction in output of fully one-sixth, as suffered by a car being transported from sea level to an altitude of 5,000 feet, is quite readily perceptible in respect to its reduced hill climbing capacity. If the car will just climb on the high gear a 12 per cent. grade at sea level it will surmount no more than a 10 per cent. hill at the altitude

spoken of, and at 10,000 feet elevation it would be incapable of negotiating more than an 8 per cent. grade.

REDUCED COMPRESSION.

If an engine is intended to operate at a compression pressure of 75 pounds per square inch with full throttle, it will when removed from sea level to an elevation of 5,000 feet show a maximum compression pressure of about 62 pounds with wide open throttle. At 10,000 feet above the sea the same engine will show about 51 pounds compression, and at the summit of Pike's Peak the maximum would be about 44 pounds.

Thus a gasoline engine, when operated at a high altitude, not only takes in what is virtually a very considerably throttled charge, but it is also operating at a low degree of compression even when run with open throttle. So far as the compression pressures realized are concerned, a gasoline engine operating at high altitudes is to be compared with a partly throttled motor at sea level, and it is known that mainly on account of the low compressions attained a throttled motor is less efficient than the same motor when run "wide open." This fact accounts to some extent for the low gasoline economy reported by users of gasoline motors at high elevations.

While it is impossible to prevent the reduced fuel capacity of a gasoline engine cylinder at high altitudes from resulting in a diminution in its output, it is possible, by decreasing the clearance space back of the piston, to so increase the pressure at compression over the amount which it would otherwise attain as to bring it to its intended absolute value.

The efficiency of a motor so modified would be considerably better than if employed as designed for use at sea level. A materially higher ratio of compression could be used in a motor intended to be operated at a high altitude than in one to be employed at sea level. The difficulties in the way of self ignition, vibration and stresses upon moving parts would not be increased over what they would be at sea level.

SPECIAL FEATURES OF DESIGN.

It would seem that manufacturers who send cars to high altitudes ought to equip them with special long pistons in order that the compression pressure with full throttle attained under the peculiar atmospheric conditions existing where these cars are to be run should be as high as that realized at sea level. Cars sent to highly elevated localities should be equipped with carburetors having a very wide range of adjustment. In some extreme instances cars to be used in very high parts of the country might well be geared lower than otherwise, on account of the reduced output to be expected from their engines.

LOWER BOILING POINT OF WATER.

Another difficulty that the user of a gasoline car in high altitudes has to contend with is the fact that the circulating water boils at a considerably lower temperature than at sea level. At an altitude of 5,000 feet water boils at about 202° Fahr. instead of 212° Fahr., and at 10,000 feet it boils at about 193° Fahr. At 14,000 feet elevation 186° Fahr. marks the boiling point. If the cooling system of a car is so designed that the water is carried very nearly at the boiling point when the car is used at sea level, it may happen that when employed at a considerable altitude the water will rapidly evaporate.

Strength of Materials for the Designer.

By E. J. B.

The cars on the market at the present time, as a rule, show clearly that designers are devoting more attention to refinement in design of the various parts than has been the custom heretofore. Surplus stock is removed wherever possible within the limits of manufacturing cost, so that the car will be of minimum weight. In many cases better material is used in the important details which are subjected to the hardest usage, thus allowing the designer to combine lightness and neatness with strength and durability. In other words, saving weight is becoming more and more one of the objective features in up to date design as the demand increases for more powerful and faster machines.

That this general tendency denotes progress in automobile design is undoubtedly true. Such refinement in details, however, increases the work of the designer to quite



TEST SPECIMEN.

an extent, inasmuch as it obliges him to know more accurately and depend more absolutely on the tested strengths of the materials he has at his command. Without this knowledge in a form on which he can depend he cannot design parts strong enough to do the work without making them excessively heavy. To design his details light and at the same time strong enough to fill their place means that the average designer must not trust his sense of proportion or experience with other similar parts too far, but must depend more on calculated stresses and strains in at least the more important places. I do not mean by this that he should bury himself under a multiplicity of figures, should he have a natural fondness for mathematics, but rather make a judicious use of his slide rule or whatever method of calculation is most convenient to him, determining within reasonable limits the forces and strengths with which he has to deal. In this manner he should be able to save many pounds weight in the complete car and have his parts amply strong. This saving will be more noticeable, of course, if he uses high grade material.

If the designer has done his work wisely and well it would seem as though his troubles should be over with the completion of the design, but probably he will have many more coming to him as the parts are manufactured and put in service.

One of these troubles is inaccuracy in shop work, which is naturally more noticeable when the parts are designed to be made the safe limit of strength. This is particularly true if high grade materials are used, as what would be perhaps a comparatively thick shell of one metal would be a thin one of the other, and a little variation in machining would never be found in the former but might weaken the latter to the breaking point. This would hardly be a fault of the designer, should the part fail in service, but it might keep him pretty busy explaining why it was not if he was unable to point out the defective machine work. The only remedy for this is either more allowance for variations or more accurate shop work.

Another trouble which is occasionally brought to the notice of the writer is making parts from weaker material than the design contemplated. For instance, a certain part may be properly designed to be made from a material of a certain strength, but later in the season, from some of many possible causes, the strength of the material from which the piece is made may be considerably less, and the piece fail in service. Nothing but a test of the material last used, showing it weaker than it should be, will satisfy the "powers that be," who hold the destiny of the designer responsible for the part in question.

Tests of the strength of the materials used seem to be the only sure way of knowing just what is going into the cars being manufactured, and the more often accurate tests can be made the better check they will be. To facilitate these tests on castings and be sure that the test specimens are of the same grade of metal as the castings a test coupon of about the dimensions shown in the sketch should be cast on the important castings, that it may be detached and tested at any time with the least trouble. The thickness of this test coupon should be that of the main section of the casting to which it is attached.

A handy way to specify this is to furnish the patternmaker with a sketch of the coupon and allow him to attach it to the pattern where most convenient when the drawing of the part specifics a test specimen. The presence of this test specimen might also act as a hint to the foundryman that tests were to be made of the castings he was furnishing.

In the case of parts made from bar stock or forgings the stock should be frequently tested to see that it is up to the required standard.

Another safeguard for the designer, and a reminder to all interested, is to specify

on the detail drawings of the important parts the least elastic limit and ultimate tensile strength in pounds per square inch which the material specified is to have.

Different manufacturers procure their materials from different sources, and, of course, each should make tests from the actual materials used. This can be easily done, however, and the results are of value from both the designing and manufacturing standpoints.

Limousine Body Construction.

By F. E. Watts.

Few casual observers realize the strains to which an automobile body is subjected, nor the strength and toughness which it must have to withstand these strains. The portion of the frame on which the body rests varies from 60 to 110 inches in length, and from 24 to 36 inches in width, in different types of cars, and forms therefore a platform of such size that it cannot be kept nearly plane, as the wheels travel over uneven streets, now dropping into holes, now rising over obstructions. Distortion of the frame is certain, whatever form of spring suspension may be used, and bodies must be so built as to resist this distortion without injury.

Frames of channel section pressed steel as now built possess considerable stiffness in themselves against warping under spring action, and every part bolted to the frame helps to resist distortion, particularly the body, because of its great height. This means that these constant strains are partially transferred from the frame to the body and must be resisted by it.

In an inclosed body of any type these strains start at the bottom and pass to the top, where they would be most severe, if it were not for the slight flexibility of the upper portion. They are localized in the corners, and poorly constructed bodies often open at these points, allowing moisture to enter the framing, which quickly destroys the body.

A good sized touring body must carry four to seven passengers, who will average 160 pounds each, making the total passenger weight 640 to 1,120 pounds. The larger portion of this weight is carried on the seats at a height of, say, 20 inches from the frame. In starting and stopping suddenly, and when swaying from side to side, the inertia of this weight must be overcome by the body, and although the cushions reduce the severity of the effect produced, the remaining strains are considerable. If we add to these strains the effects from the weight of the upper part of a closed body, and the strains due to wind pressure at high speeds, we will readily see that the best body which can be produced is none too good for the work, and that extra first cost will be more than repaid by the additional wear obtained.

Of the different methods of construction —pressed steel, sheet metal with a metal frame, sheet metal with a wood frame, cast aluminum and all wood—each has its advantages, and all are good if well made. The particular body the construction of which I am about to describe is the latest type of limousine made by the Packard Motor Car Company in their factory at Detroit. It is a sheet aluminum body with hardwood frame.

The wood used for framing is second growth ash, with the exception of one or two pieces where the shape is such that whitewood is preferable. Some mahogany is used for window frames, trimmings, etc. This wood is of the best quality, carefully selected. All lumber is kept in a drying room in pieces of such size that the finished parts are thoroughly and evenly seasoned. From the drying room it goes to the saw room, where each piece is sawed, planed and shaped to correspond with standard templates.

The aim in frame construction is to provide for all stresses, and to produce a thoroughly substantial body. Wherever two pieces are joined, they are lock jointed, secured by glue and held by screws, making joints which are practically as strong as the solid wood. Nails are seldom used, and only in unimportant places.

The window slides, the whorl at the bottom of the coupé pillar, and the ornamental beading are all cut out of the solid wood.

The method of assembling is as follows: The two side sills are taken first; these, with the short uprights which go from them to the bottom of the seats, also the horizontal pieces connecting their tops, are mortised together and secured in place by glue and screws. When these assembled side frames are "set," they are mounted upon special stands which are used in all the succeeding operations. They are now clamped to templates, which hold them in the proper relation to each other, and the cross pieces are fitted and secured in place, leaving the rough frame below the bottom of the seats complete. The outside of this under body framework is smoothed, and the aluminum sheets for the back and sides are fastened in place. The top of this framework, upon which the bottom of the seats rests, is now surfaced off to straight edges, and all is in readiness for putting the top in place.

Four uprights, which form the door and coupé posts and act as the central supports for the top, are now secured in position; these are solid posts extending from the top to the bottom of the body. The two front posts, together with the framing for the front windows, have been previously assembled, and this assembly is carefully fitted to the under body frame. Fig. 1 shows the frame at this stage, without the aluminum sheets, however.

Upon the four uprights now in position is placed the frame for the top. This frame has been separately assembled, and consists of a rim of ash, reinforced by light but stiff cross pieces of the same material.

The back and arms for the front seat are now secured, and the bottom of the rear seat is fitted and screwed in place. Four rear posts are next put in, and cross pieces which form the lower sills for the windows at back and side. Also short uprights from these cross pieces to the bottom of the seat, and curved pieces which determine the shape of the rear corners. Fig. 2 shows the frame at this stage.

The form of the body is now completely outlined, but considerable work must still be done before the frame is ready to receive the aluminum sheets. Corner pieces must be fitted here and there, and iron braces added wherever they are necessary. All the parts that are to be covered by the metal must be brought down to a uniform surface that they may support the alu-

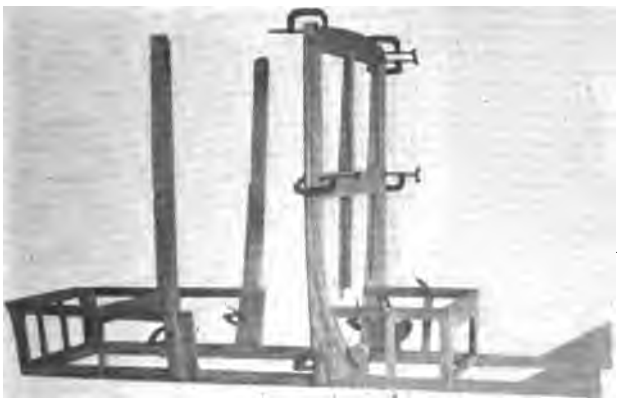


Fig. 1.

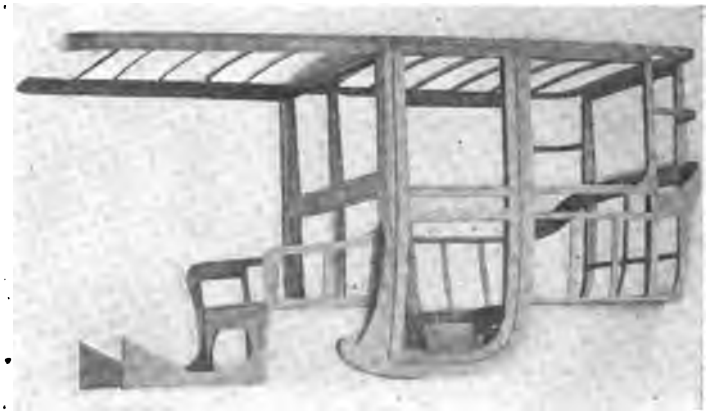


Fig. 2.

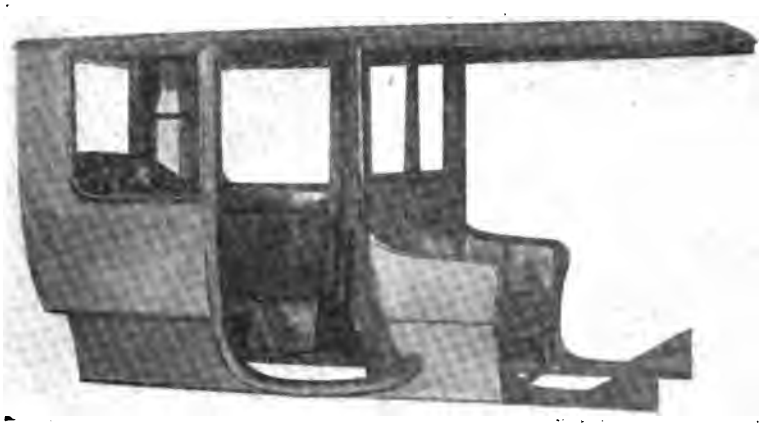


FIG. 3.

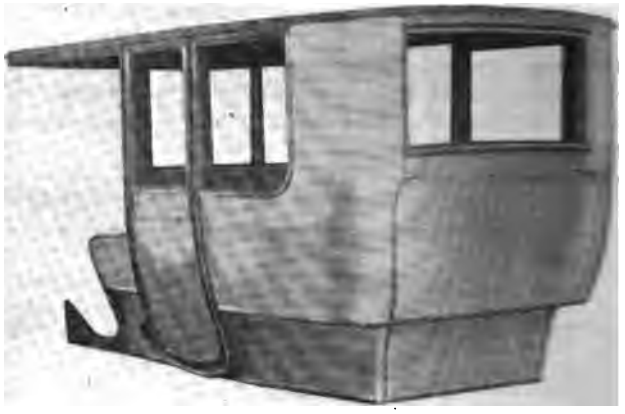


Fig. 4.

minum and keep it in shape. The care with which this is done helps to determine the wearing qualities of the body.

After this surfacing the entire frame work is treated with a waterproofing solution to prevent any possibility of its swelling from moisture. Fig. 2 shows the frame work ready for covering.

In the aluminum covering seams are avoided wherever possible, and when it is necessary to join two sheets this is done along the lines of least strain; thus there are no seams at the corners, but the metal is brought around and joints are made on the heavy timbers close by. The aluminum sheets are beaten over iron forms until they take the required shapes, then are carefully fitted to the body on which they are used, so that each separate sheet rests easily in its proper place wholly without springing, straining or bending of any kind.

The metal is of unusual thickness, about 1-16 inch, and this permits the use of countersunk head screws in fastening it to the frame. Wherever the edge of the aluminum joins the wooden frame, the frame is recessed to bring it flush with the surface of the wood, so that the heading may be readily applied. These hammered sheets are, of course, rubbed down to a perfectly smooth surface, after they are fastened to the body, to obliterate the little dents left by even the smoothest possible hammer work.

All joints between aluminum and wood, or between two abutting sheets of aluminum, are covered with heavy half oval brass beading, which is procured in special shapes to suit the different seams. It is fastened in place by countersunk head screws, and in the final finishing of the surface these are rubbed down so smoothly they cannot be seen even before the painting begins. The screws which hold the aluminum are locked in place by the beading, while the screws in the beading are securely held by having the fibres of their heads rubbed into the beading and vice versa, during the finishing just described.

The doors are hung on what are known as "inside hinges," which are not visible either from the inside or the outside when the doors are closed. Each door is fastened by a heavy bolt, while on the door jamb are two bronze sockets, made tapering to receive bronze guides on the door. All windows slide down and the wind shield slides up so that the vehicle may be operated as an open car. The window sashes are of mahogany, and the glass is held in deep grooves cut in the solid wood.

The top or roof is a three layer veneer; the bottom layer is mahogany and the two upper layers are whitewood. It is covered with canvas, heavily filled, painted and worked perfectly smooth. The entire floor is removable, boards being doweled to each other with brass dowels, and held in place by a special locking device.

Each body is fitted to a standard frame, kept in the body shop for that purpose, so that touring and limousine bodies are interchangeable.

The painting and upholstering of a limousine body require great care and skill. To the layman seventeen coats of paint and varnish may seem ridiculous, but nevertheless seventeen coats are applied. The resulting finish is well fitted to withstand the weather and the wear and tear of travel. The best quality of broadcloth is used in the inside upholstering, and the standard Packard "Richelieu" blue leather in the driver's seat. Every possible precaution is taken to prevent the least trace of dampness entering any joint, for this causes the wood to swell, loosens the fastenings of the aluminum and destroys the body.



FIG. 5.

All usual conveniences, such as electric lights, speaking tubes, foot rests, pockets for toilet articles, etc., are provided. The inside seating capacity is five, and the two extra seats fold out of the way when not in use.

Some idea of the time required to perform all these different operations may be gathered from the fact that ninety days is the minimum time allowed for making and finishing a limousine body, while 100 days is preferable.

It may be well in closing to remark that in the building of automobile bodies of sufficient strength to last for a reasonable length of a time, as compared with bodies for horse drawn vehicles, many difficulties had to be overcome. A horse drawn vehicle travels from 20 to 35 miles per day, at from 6 to 10 miles per hour, while an automobile may go 75 to 200 miles in a day, and its speed may range as high as 50 miles per hour. If we remember that the wear on the body is substantially proportional to the distance traveled, and to the square of the speed, we will see that one season's use of an automobile body is equal to several seasons' use of a horse drawn vehicle.

At the agricultural motor tractor trials promoted by the Suffolk Agricultural Association, held on June 8 at Ipswich, the first prize of £15 and the diploma of merit were won by the Ivel agricultural motor for the best combination of machinery for plowing by power, other than horses. The test for the motor plow was hauling three furrow Ransom plows, 8 inches deep. The weather was quite favorable for the test, which was witnessed with great interest by a large crowd of countrymen from all parts.

Cover missing ?

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...EVERY WEDNESDAY...

Devoted to Motor Interests

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Compressed Air As An Auxiliary Power on Automobiles.

Among the accessory apparatus which is now extensively offered for attachment to automobiles is the compressed gas storage system intended to furnish a store of energy to be used at will for pumping tires, blowing the signaling device, and, most important of all, operating the brakes. The means adopted to fill the storage reservoir with gas under pressure may be a small reciprocating air compressor driven by friction from the motor flywheel, or a small, direct acting piston compressor operated from the explosion pressure tapped from one cylinder of the motor. By both of these methods a supply of compressed pure air is secured, while as an alternative meth-ed the exhaust gases under their natural pressure are sometimes allowed to pass into a pressure storage reservoir, through a non-return valve, and are thus confined there for future use in tire inflation, horn blowing or braking.

It is no doubt a very handy thing to have a reservoir of compressed air "on tap" at all times, in case a tire requires pumping, and some motor car owners evidently regard the cost, weight and complication entailed by an air compressor and storage system easily compensated for by the convenience and satisfaction which they afford.

It is doubtless very convenient to handle one's car by means of an air brake, as the braking action can be regulated by means of a valve controlled by a very small, lightly moving lever located upon the steering post. Perhaps, too, there may be an element of safety in the use of so powerful a brake which may be reached and put into action so easily. In some extreme cases, too, the braking of a heavy car by hand power may become positively tiresome. On the other hand it should not be forgotten that there is no means of braking so reliable as the simple manually or pedally applied mechanical brake. It is a fact that depending for braking action upon a source of pressure, a valve, a cylinder and piston, in addition to the regular operating linkage, involves a certain element of uncertainty—that inevitable element of unreliability which is introduced with an increase of complication. Compressed air or electricity may properly be utilized in preference to a direct mechanical connection for effecting mechanical motions which are quite remote from the point of control or require a very large amount of energy. In other cases a simple mechanical linkage is generally preferred on grounds of reliability. The braking of a railroad train offers ideal conditions for the use of compressed air, as the points of application are numerous and too far apart for any mechanical connection to be practical. In the case of an ordinary pleasure automobile it is not apparent that the air brake is specially applicable, as no question of distance is involved and the braking effort can easily be produced by muscular force.

If motor car users install air brakes upon their cars, as one more of the many luxurious accessories with which the modern automobile is supplied, or, perhaps, one may say, burdened, it is to be hoped that the greatest care will be taken to secure the utmost measure of reliability of action. It is further suggested that existing mechanical brake applying levers or pedals be retained in service, even after the installation of the air brake, and that the air brake cylinder be so applied as not to prevent the free manual or pedal application of the brake. Even railroad cars retain the old screw brake, although depending for ordinary service upon compressed air.

Compressed air is also being exploited as a means of automobile clutch operation, but it is not yet apparent wherein its great advantage over a direct mechanical connection is to be found. It is a pretty good maxim that the most direct way is the best; the

method of indirection and complication must present some very decided advantages in order that it shall prove superior.

Automobile Stages and Liveries in Connection With Summer Hotels.

In another part of this issue will be found an article on the present situation and future prospect of automobile application in connection with summer hotels. Establishments of this kind are very numerous along the Jersey coast, in Massachusetts, New Hampshire, Maine, northern New York, northern Michigan, etc., and if the major portion of the railroad station and livery service of these hotels could be converted to motor propulsion during the next few years, it would mean a great deal of business for the commercial automobile industry. Our inquiry among the hotels shows that, although at present the use of motor vehicles for this purpose is limited, a great deal of interest in the subject is being manifested by hotel proprietors, and a large number of installations will be made the present summer.

There are openings for the automobile in connection with summer hotels along three distinct lines, viz., as stages for effecting the service between the hotel and the railroad station, and also possibly for excursions in the vicinity; as baggage wagons handling the baggage of customers, and as livery vehicles for the private use of customers. At the present time, ordinary touring cars for livery purposes are probably used most extensively, being found particularly at establishments catering to the wealthy. Motor stages would undoubtedly now be in much more extensive use if the number of suitable machines on the market was not so limited. Most of the hotels are located in the mountains, and very steep grades are encountered on the way from the railroad station. Powerful machines are therefore required, and we note that in some cases the cars used have been found wanting in this respect. For carrying twelve to twenty people over a mountain road, a four cylinder motor of from 30 to 50 horse power will probably be found none to big.

It will perhaps not be amiss, now that the introduction of motor stages, etc., into the summer hotel business seems to be advancing rapidly, to issue a word of warning with respect to the class of drivers that should be employed. There are additional dangers involved in driving on mountain roads, and extra responsibilities rest upon the proprietors of a public service, hence it is obvious that only the most skilled and careful drivers should be put in charge of such vehicles. The manufacturers are equally interested in seeing this business conducted on a basis ensuring the greatest possible safety of the passengers, as a few serious accidents might immediately check further development along this line.

Exposed Location of Vehicle Lamps.

Considering the close attention which is paid to the lamp equipment of automobiles it seems rather curious that so little regard is had for the location of these costly accessories where they shall be measurably free from danger of damage. The average pleasure car carries a pair of expensive gas lamps at the extreme front end of the chassis, in some instances even forward of all other parts of the car. If these lamps were intended for buffers rather than for purposes of illumination, they could not be more appropriately placed. That they too often act as "shock absorbers" of a very expensive kind is known to every motorist. In case of a collision the lamps are usually the first part of the car to come into contact with an obstruction, with the result of shatterihg the lenses and battering the metal of the lamp into an unrecognizable mass.

Many lamps are smashed through carelessness in manœuvering cars, under power, in garages or elsewhere where space is limited. The aggregate loss of money through lamps damaged on account of their very vulnerable position must be very considerable. It is extremely common to see cracked and dented lamps which have been damaged either by some other cars backing into them or in some similar manner. When mounted at the sides of the radiator, forward of all other parts of the car, lamps are not only so placed as to court destruction, but they seriously interfere with the operation of cranking, especially when they are hot. At all times they constitute obstructions with which some portion of the operator's person is likely to come into painful contact, unless cranking is performed with great circumspection.

There seems to be no advantage gained in so placing automobile lamps that they shall be the most forwardly projecting parts of a car. The rational location for lamps would seem to be on the sides of the dash. They are there properly protected against damage by accident. However, the brackets upon the sides of the dash have, in general, become appropriated to the oil lamp equipment, and the relatively expensive and fragile gas lamp equipment has by common consent been relegated to the exposed position over the forward spring hangers. It is quite convenient for a car to carry both a pair of oil lamps and a pair of gas lamps, the former being used to "clear the law" in city driving, and the latter to be employed when actual road illumination is required. These two pairs of lamps, with the common addition of an adjustable gas searchlight, mounted at the middle of the dash, and the necessary oil tail lamp make a total equipment of six lamps for an ordinary pleasure vehicle. Is this not rather overdoing the lamp question? Perhaps it is not strange that some of the lamps are forced into situations where they are exposed to the vicissitudes of the road.

A recent development in automobile illumination is the combined gas and oil lamp. This lamp is provided with an oil reservoir and burner, but a gas burner is carried in the tool box, which is adapted to be slipped into the lamp over the oil burner, a gas connection being made from a separate generator A pair of these combination gas and oil lamps, mounted upon the sides of the dash, should answer all legitimate demands and preclude the necessity of placing a pair of lamps forward of the radiator. A gas searchlight upon the top of the dash might be used as a supplementary source of illumination.

Care of Tires in Hot Weather.

It is well known among experienced motorists that when cars are driven in unusually hot weather the heating and consequent increase in pressure of the air within the tires are likely to damage them. The tires become heated not only from contact with the hot road surface, but also from the internal friction of the parts when in use, and it is found necessary when touring in hot weather to stop at intervals and either cool the tires by pouring water over them or allow some of the air in them to escape. A safety valve for permanent attachment to the tires was placed on the market some years ago, but does not seem to have come into general use. Those who use a tire pump with safety valve attachment can easily stop and release the pressure in the tires to the point for which the valve is set. In general it is to be recommended to pump the tires up not quite so hard during hot weather as in winter.

Commercial Applications

Automobiles at Summer Resorts.

The opening of the present summer season has brought with it renewed interest on the part of summer hotel proprietors in the possibilities of the automobile as a practical vehicle for use in their business. The subject has been considered in a desultory fashion for several seasons past, but actual experiments have been few up to the present. Most of these, however, appear to have met with a degree of success somewhat unexpected even on the part of their promoters. The vehicles have stood up to the work required of them, and hotel guests have greatly appreciated the service. For which reasons it seems quite certain that the present season will see a substantial increase in the number of motor vehicles used at pleasure and health resorts at the seashore, in the mountains and along lakes and rivers.

The automobile is a boon to the mountain hotel especially. It is usually located at some distance from the railroad station, and the road to it generally is a good, long climb, which is a severe tax on the strength of horses. The automobile can make much better time as well as save the horses. Many proprietors believe there will be a great saving in expense when they have paid the initial cost of the machine and trained their operators.

Proprietors are influenced by a diversity of considerations in adopting the automobile. With some it is an advertisement pure and simple on account of its novelty for this use; with others increased profit is the attraction, as a motor bus line between the hotel and the railroad station generally gains more patronage than a horse bus line. And then if the hotel is situated a long distance from the station the automobile is the most practical vehicle that can be used for all transportation purposes.

There are two ways in which the summer hotel proprietor finds it possible to derive a revenue from the automobile. One is by having a number of machines in his garage to rent out to his guests by the hour or day, if the hotel is located in a country favorable for motoring; the other is by the operation of a motor bus line between the railroad station and the hotel. It is this latter use that has presented itself to most proprietors as wholly desirable. It does not require unusual foresight to predict that within a few seasons the motor bus will be a familiar sight at summer resorts all over the country.

THE HORSELESS AGE has made diligent inquiry to ascertain what is being done and what is planned. While not many were found in actual use at the present time, many proprietors are planning to introduce them, and genuine interest was manifested by all. We purpose to present the results of our investigation in this and a succeeding article.

THE BRIARCLIFF HOTELS, WESTCHESTER COUNTY, N. Y.

These hotels, located only 30 miles from New York, in a country traversed by excellent roads, have always been quite popular with motorists. Henry H. Law, of the Briarcliff Farms Corporation, says:

"We have experimented with the motor vehicle in a small way. We used a 16 horse power Maxwell car for about six months, having it carry guests to and from the railroad station, besides renting it out to them. We have felt well enough pleased with the results to place an order for two four cylinder cars, and are organizing a regular auto and garage department."

THE GRAND, MONT VERNON, N. H.

George E. Bates, proprietor of the Grand, Mont Vernon, Hillsboro County, N. H., says that a twelve passenger Rapid wagonette has been contracted for to carry passengers between the railroad station at Milford and the hotel on the crown of Prospect Hill, 5 miles distant, the highest point of land in that part of New Hampshire. The hotel has an elevation of 1,000 feet, and is 600 feet above the Milford station, yet the roads leading to it are not very steep, and on the mountain top are several quite level roads, offering excellent opportunities for motoring. The hotel built on the brow of Prospect Hill, overlooking the village of Mont Vernon, commands a magnificent view in northern Massachusetts and southern New Hampshire.

The wagonette will make four round trips daily to the station at Milford, and a fare of 50 cents each way will be charged. A garage has been established and leased to a Mr. Saunders of Boston, who will put in two 35 horse power National touring cars for hire to guests.

BAY OF NAPLES INN, NAPLES, ME.

George H. Davis, proprietor of the Bay of Naples Inn, Naples, Me., says:

"Although we don't run our own motor bus line, a twenty passenger bus is operated by private parties between Portland and the inn, a distance of 30 miles, and has given satisfactory results, except that its speed has not been enough to suit the general public. This is accounted for by the fact that it is driven by a 16 horse power engine, which is hardly enough for so large a vehicle, even when geared down to low speed. What is needed is a 40 horse power twenty passenger bus that will take the road at a speed of from 15 to 20 miles per hour. That kind of a vehicle will find an enormous sale in Maine. I am a firm believer in the power bus for bare ground in this part of the country. In fact I know that it will be the popular vehicle before very long. We expect to put in another twenty passenger car right away. We take care of a great many automobiles of all makes in our garage."

THE JOCELYN, PROUT'S NECK, ME., AND THE MT. LOOKOFF, SUGAR HILL, N. H.

Almon J. Smith, treasurer and general manager of the Eagle Rock Company, Kennebunk Beach, Me., says that his company has endeavored without success to arrange with owners of automobiles for train service at the Jocelyn, Prout's Neck, Me., and at the Mount Lookoff, Sugar Hill, N. H.

"The expense and repair bills seem to be in excess of horses," he adds.

THE OCEANSIDE, MAGNOLIA, MASS.

George A. Upton, proprietor of the Oceanside, Magnolia, Mass., says:

"We have never had any automobile connected with the running of this hotel, but as we have many cottages I have felt for some time that I would buy one for use between them and the hotel. I should be very glad to know of some manufacturer who makes something light and durable for this work; say in the shape of a light wagonette which would take six persons in the back part—three on each side facing one another, with room for two more; it may be with the chauffeur in front. I would prefer gasoline and not a steam or electric vehicle."

THE TOWERS, HOLDERNESS, N. H.

F. Joseph Pease, manager of the Towers, Holderness, N. H., says that they have no automobiles at present, but have been looking up the matter this season.

"We are 7 miles from the railroad station at Ashland, and the roads are very good for this region. I think an excursion bus around the lake would be a very good investment. We are building a new garage, as we have many auto parties during the season."

HOTEL WENTWORTH, PASADENA, CAL.

M. C. Wentworth, proprietor of Wentworth Hall and Cottages at Jackson in the White Mountains, N. H., says that while he doesn't make use of automobiles there, he is building a new fireproof hotel at Oak Knoll, Pasadena, Cal., to be known as the Hotel Wentworth, and there he purposes to make use of motor buses for conveying his guests from the railway station to the hotel, and also motor baggage wagons as well. The distance is a little less than a mile, and the roads are level and smooth. It will probably be necessary to make ten or fifteen trips a day.

GLENWOOD HOTEL, GLENWOOD, CAL.

William Martin, proprietor of the Glenwood Hotel, Glenwood, Cal., says that the Knapp Manufacturing Company, San José, Cal., have just completed a motor vehicle to be used in his hotel business. It is constructed especially for hill climbing, as the hotel is located on a large fruit farm in the heart of the Santa Cruz Mountains.

AT BRETTON WOODS.

Anderson & Price, proprietors of the Mount Pleasant and the Mount Washington at Bretton Woods in the White Mountains, have established an automobile livery and garage, which is in charge of B. A. Lemont, Worcester, Mass. Last

season a gasoline baggage truck was operated for a time between the hotels and the railroad station, three-quarters of a mile distant. It was so successful that the porters didn't want to go back to the horse trucks.

GARAGES AND LIVERIES AT FOUR WHITE MOUNTAINS HOTELS.

The Barron, Merrill & Barron Company, proprietors of the Crawford House, the Fabyan House, the Twin Mountain House and the Summit House (Mt. Washington), N. H., have established automobile garages and liveries at each of their hotels, the repair station being located at Fabyan House.

CONGRESS HALL AND STOCKTON HOTEL, CAPE MAY, N. J.

These hotels would be glad to establish a motor bus line, although they are using horses at present. One is located three city blocks from the railroad station, and the other eight blocks. They require two cars of fine appearance, one holding twelve to fifteen passengers, and the other eight or ten passengers. A 25 cent fare is charged on the present horse line, which includes transporting baggage as well.

HOTEL LA FAYETTE, CAPE MAY, N. J.

John Tracy & Co., proprietors of the Hotel La Fayette, Cape May, N. J., say that there is plenty of room for a good car, if properly run, for service between their hotel and the railroad station, as well as for letting out to private parties.

THE SAGAMORE ON LAKE GEORGE, N. Y.

T. Edmund Krumbholz, proprietor of the Sagamore on Lake George, Sagamore, N. Y., says, while he doesn't operate an omnibus, a garage and livery has been established in connection with the hotel for the accommodation of guests and visiting parties of automobilists. A Cadillac touring car is kept for rental. The roads are rather hilly, but good.

THE ALGONQUIN, LOWER SARANAC LAKE, N. Y.

John Harding, proprietor of the Algonquin on Lower Saranac Lake, in the Adirondacks, N. Y., operates a horse stage line between his hotel and the railroad station, a distance of 2 miles. He has considered the possibility of substituting the motor bus.

AT LOON LAKE.

The Loon Lake Hotel Company, Loon Lake, N. Y., will use automobiles as soon as the commercial cars are made to meet their requirements. The distance from the hotel to the railroad station is 3 miles over rather hilly and sandy roads.

ELMWOOD PARK HOTEL, FOX LAKE, WIS.

Murphy Brothers, proprietors of the Elmwood Park Hotel, Fox Lake, Wis., say that they are planning to use a sixteen passenger bus between their hotel and boat landing, one-half mile distant. They will make four round trips daily and charge a fare of 25 cents, besides carrying baggage.

THE MORAINE, HIGHLAND PARK, ILL.

F. W. Cushing, manager of the Moraine, Highland Park, Ill., says that he made an unsuccessful attempt last winter to arrange for a motor bus service between the hotel and railroad station. Another year he will consider the question more seriously.

AT MOUNT DESERT ISLAND, ME.

As most motorists are aware, automobiles are not allowed on Mount Desert Island, Me., the natives having voted last summer and the present season to exclude them. When the ban is taken off, as it undoubtedly will be eventually, there will be opportunity for introducing the automobile for hire to the hundreds of summer residents as well as motor bus lines.

BARTLETT PLACE HOTEL, LAKE MINNETONKA, MINN.

E. D. Bartlett, proprietor of the Bartlett Place Hotel, Lake Minnetonka, Mound, Minn., says that he operates a horse bus to the railroad station, three-quarters of a mile distant, over gravel roads. It makes twenty trips daily, carrying from twelve to sixteen passengers, who pay a 15 cent fare. Baggage also is carried. It is regarded as a good opportunity for the installation of a motor bus.



WATERING CART MOUNTED ON ATLAS TRUCK.

OUANANICHE LODGE AND SUNSET CAMPS.

W. G. Rose, treasurer and manager of Ouananiche Lodge and Sunset Camps, Cold Lake Stream, Washington County, Me., says that the question of establishing a motor bus line in connection with his establishment has often been considered. The lodge and camps are situated 13 miles from their railroad station and 3 miles from a steamboat landing over good roads, but quite hilly. An automobile capable of carrying six persons and baggage, allowing a trunk and hand bag to each passenger, is needed. The fare to the steamboat landing charged at the present time is 50 cents per person. A motor bus would make the railroad station, 13 miles distant, much more accessible.

SOME OF THOSE INTERESTED.

Among those who have expressed an interest in the proposition may be mentioned the following:

The Northfield Hotel Company, East Northfield, Mass.; F. Henry Otis, general manager Hotel Ausable Chasm, Ausable Chasm, N. Y.; H. W. Dunklee, proprietor of the Ocean View, Pigeon Cove, Mass. (1 mile from station over fairly good roads); Albert Bachelder, proprietor of the Little Boar's Head, Little Boar's Head P. O., N. H.; the Ocean Avenue Hotel, Patchogue, N. Y.; the Tolchester Hotel, Tolchester Beach, Md.; Harvey S. Denison, Watch Hill House, Watch Hill, R. I.; Lyman & Campbell, The Glen Cove, Seal Harbor, Me.

The Atlas Watering Cart.

The Knox Motor Truck Company, manufacturers of the Atlas gasoline motor trucks, Springfield, Mass., have recently delivered to the Metropolitan Park Commission of Massachusetts a watering cart mounted on one of their 3 ton truck chassis, and which is now in use in the Revere Beach Park reservation. This is the first gasoline watering cart ever used in this country.

We are informed that a demonstration of this watering cart when filled at a large supply pipe has shown that it will do the work of three to four horse drawn watering carts, watering evenly a street 30 to 35 feet wide. It will cover a distance of 200 miles on its gasoline supply without replenishment.

Municipal Sightseeing Cars Planned for Baltimore.

With the purchase of an automobile by the park board of Baltimore, Md., a plan of development of a system of seeing Baltimore's parks by automobile has been projected. Mayor Richard M. Venable, president of the Park Commission, has announced his belief in the practicability of the city operating such a system, but the scheme will not be put in effect until at least one connecting boulevard is completed, which will be in a year.

The park board has one member—ex-Mayor Latrobe—who will not ride in the

car, but he favors a public automobile service for the park.

The municipal ownership plan seems to have met with great favor. Druid Hill, Wyman and Clifton parks will be joined by a boulevard in a year or so, a large part of the recent $1,000,000 park loan going for this purpose. Mayor Venable's idea is to have stations and regular schedules across the northern end of the city, which is at present without a crosstown trolley.

The scheme is a good illustration of the widespread interest in motoring in Baltimore.

Motor Buses in Berlin.

Berlin is well provided with trolley lines, and the only manner in which omnibus lines have been able to secure patronage has been to accept 5 pfennig fares for short rides, the trolley fare being 10 pfennigs. The public preferred the trolley mainly because it was faster than the horse omnibus. This superiority of the street car has vanished with the introduction of motor omnibuses, and the omnibus companies have therefore immediately raised the fare to 10 pfennigs. The public seems to have taken a fancy to the new motor buses, which are well patronized, and the Berlin General Omnibus Company is adding to its "fleet" of buses as quickly as conditions allow. At present eighteen buses are in service on the line Hallesches Tor-Chausseestrasse, and it is rumored that an order for 200 of these buses has been placed, which are to be delivered within a short period.

Commercial Vehicle Notes.

J. Frank Black, president of the Chester Coach Company, Chester, Pa., informs us that they will be unable to operate their proposed motor bus line on the Darby Pike between Philadelphia and Chester this year.

We are informed that the Camden and Atlantic Automobile Company will be unable to start their motor bus line from Camden to Atlantic City, N. J., before the spring of 1907. They had intended to have a freight and passenger line in operation from Camden to Atlantic City by July 1.

The Chesapeake and Potomac Telephone Company, of Baltimore, Md., have replaced three two-horse supply wagons with one large gasoline truck, which has been in service about a month. The company will also use motor trucks in Washington.

The Automobile Outing Company, of Baltimore, is operating four sixteen passenger cars in Druid Hill Park and uses one week days for a double sightseeing trip. A 25 cent fare is charged for a half hour tour of the 750 acre pleasure ground.

The East Jersey Motor and Transportation Company have purchased five Knox machines, three of sixteen passenger capacity, and two of thirty to thirty-five passenger capacity. The three smaller machines arrived last week and have already begun running from Rahway to Roosevelt.

Commercial Vehicle Tires.

By E. S. Foljambe.

Since the first introduction of the rubber tire for pleasure vehicles, the weights which they have had to sustain have been gradually increased as the touring cars were made larger, heavier and higher powered. Pneumatic tire manufacturers were sorely pressed to devise a combination of rubber and canvas and a fastening device which would stand the tremendous strains incident to their use upon the large cars. With the advent of the commercial motor vehicle the weight to be carried was suddenly doubled and trebled, so that the pneumatic tire, which up to this time had been the only satisfactory device owing to the speed at which pleasure vehicles were driven, had to be abandoned.

A few users who objected to the extreme cost and the annoyances attendant upon the use of pneumatics had already abandoned them for the less resilient and more durable solid rubber tire. These were found in a measure satisfactory if the springs were properly proportioned and the vehicle always driven at moderate speeds. The tire question up to this time was more a matter of the comfort of the occupants than a necessity. However, with the commercial vehicle the case is entirely different, comfort being either a secondary matter or left out of consideration altogether, the tire now being an absolute necessity. A truck must have a tire for the purpose of giving it proper traction to transmit the power from the wheel to the ground without slipping, to prevent undue destruction of the surface of the roadbed, and in a minor degree to absorb the shock and vibration, and thus in a measure protect the power plant and prevent crystallization of the parts. In the case of the pleasure vehicle the cost per ton mile is practically never considered, as it is not a business proposition but a matter of pleasure. With the commercial vehicle, however, the cost of tires per ton mile is of the first importance, so that a tire to be successful must not only have all the requirements previously stated, but in addition must have good wearing qualities and low cost.

As the solid rubber tire had been used successfully for some time on carriages and light pleasure vehicles, manufacturers naturally turned to it for the solution of this new tire problem. Tires were built and tested under various conditions, when it was found that one of the greatest difficulties to be overcome was in obtaining a satisfactory method of attaching the rubber to the rim, so that in starting, skidding and when the brakes were suddenly applied the rubber would neither creep nor be torn from the felloe. The method almost universally adopted for penumatic tires, that is the clincher rim, was practically abandoned, as in its ordinary form it was found inadequate, largely owing to the extreme width of the new solid tires which were made necessary by the tremendous weights to be carried. The methods now employed usually consist of wires, hoops, bands or wire mesh which are imbedded in the rubber of the base of the tire and held mechanically at their edges either by side wires, hooks or retaining flanges. Even with many of these devices the strains are so great that the metal parts become loosened and gradually chafe the rubber with which they are in contact until the entire lower portion or base of the tire is severed from the upper portion or tread. In most cases where this action has taken place it has occurred before the tire was materially worn on the surface. In every case the expense to the user has been so great that it has led to many experiments in the endeavor to substitute some material instead of the rubber which would, although less resilient, have such increased wearing qualities and reduced initial and replacement cost as to make it commercially successful. A few of the devices which have been tried will be described and illustrated before discussing the more recent developments in the solid rubber tire, as notwithstanding the extreme cost rubber still holds the field.

EXPERIMENTS WITH WOOD AND METAL TIRES.

Perhaps the most extensive experiments have been carried on by the American Express Company, who are operating some thirty electric vehicles and have been trying different types of tires with the hope of determining upon some combination which would work satisfactorily on the heavy wagons used, and which would be much less expensive than solid rubber. In our Commercial Vehicle Number three of these combinations were shown. One consisted essentially of an iron rim through which protruded the ends of bolts for traction purposes, but these they were prohibited from using owing to the damage done to the pavement. Various kinds of woods in the

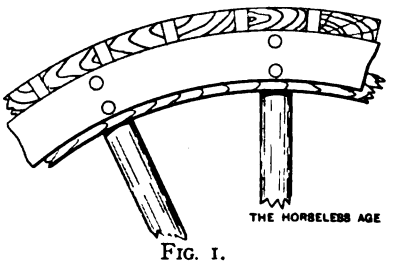


Fig. 1.

form of blocks and held by different methods were tried with fairly good results. The wood was prepared by soaking it in creosote and raw linseed oil, but it was ascertained that this was a useless expenditure, as the blocks wore out long before they had a chance to be affected by moisture or rot. In some cases a layer of leather was placed between the wood blocks and the felloe, and in experiments which are now being made a thin layer of rubber is placed in this position to give a slight cushioning effect. For better tractive effect thin sheets of steel were also tried which ran crosswise between the blocks (the grain of which should be in the opposite direction from that shown). The arrangement of the steel is shown in Fig. 1. All kinds of American

and some foreign woods were used, including oak, hickory, palmetto and pipperige, which is known in the South as the black gum tree, and the conclusions drawn were that rock elm was best suited for such service. When covering an average distance of 25 miles per day over all kinds of city pavements it was found that, although the traction and non-skidding qualities were very good, the blocks would be split at the edges and worn down so that their replacement was necessary in approximately three months. As it is impracticable to allow the blocks to project very far above the metal rim at the edge, owing to the fact of their splitting, the amount worn off before replacement becomes necessary is actually not very great. However, although the best solid rubber tires give three times this mileage, covering a period of about nine months, the cost of replacing such tires is from $110 to $130, and in a few cases as high as $200 per tire, while the replacing of the wood per wheel, including labor, is only in the neighborhood of $3.40; and even this expense can be greatly reduced when wood tires are made in large quantities. Steel tires were tried and found impracticable during slippery weather, but otherwise were very satisfactory. Cast steel tires were also experimented with; they were made in sections which rested over and were bolted through the felloe. The surface of these tires carried calks set similar to herringbone gear teeth, to give better traction. It was found that these calks in icy weather so shattered and broke up the ice that there was a tendency to slip until the wheels worked through to the ground beneath, where under similar circumstances the rubber tire would have simply crushed the ice to a certain extent and obtained sufficient traction. A very novel type of tire experimented with is that shown in the accompanying sketch, Fig. 2. It consisted of cast steel shoes in which were dovetailed grooves running lengthwise of the surface of the tire, filled with carborundum for the purpose of obtaining better traction. These shoes were placed on in sections and were held through bolts, but the real value of the trial was annulled by the fact that the castings were not of proper material and section to have the necessary strength under the 6 ton load with which they were tried, and were shattered. The method of fastening to the rim was also found inadequate.

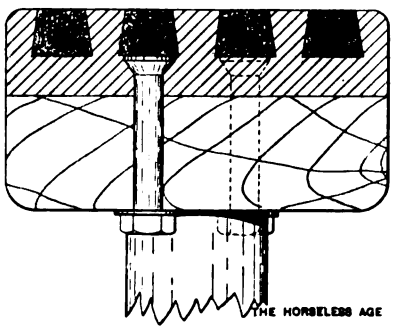


FIG. 2.

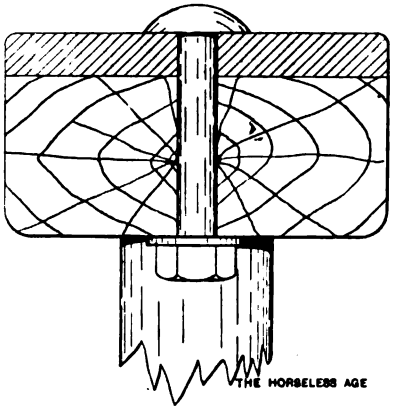


FIG. 3.

The Colgate Soap Company, of Jersey City, N. J., are operating two heavy electric trucks, the larger of which weighs empty 12,000 pounds and has a carrying capacity of 6 tons. It is fitted with ordinary heavy truck wheels and plain solid steel tires. The rear wheels are 5 inches in diameter. The smaller machine weighs empty 9,110 pounds and carries a normal load of 2 tons, but will easily carry 3. Steel tires are used on the front wheels and Diamond solid rubber tires on the rear. No special provision is made for protecting the batteries from vibration. In each case they are placed on one-quarter sheets of rubber matting, which to a slight extent removes the jar, but is intended only as an insulating material. These trucks average about 25 miles on a charge, and cover almost that distance daily. The steel tires will wear in the neighborhood of three years and are very inexpensive as compared with the rubber tires; and so far the difference in the life of the battery when used with steel tires, or when used with rubber tires, has not been found appreciable. The larger car is equipped with twenty-one M. V. Exide batteries, which have been in use without renewal of the plates for about nine months. These trucks are practically useless during the very slippery winter season, and in the fall, when the pavements are in a greasy, slimy condition, it is found necessary to use some device to obtain better traction in starting. For this purpose three or four soft round headed iron bolts five-eighths inch in diameter are placed through the tire and felloe with their heads on the outside, as shown in Fig. 3. Another device which has been used to advantage in slippery weather and is applied to the ruber tires is that shown in Fig. 4. It consists of three or four links of chain, according to the width of the tire, with curved side pieces A and B, through the loops at the lower end of which a bolt is passed, as shown, which clamps the device securely to the rim of the wheel. Another device used for the same purpose is that shown in Fig. 5, which consists of a strip of heavy leather belting of the width of the tire and 2 inches in breadth, to the top of which a small patch about 1 inch in width is held by rivets. At one end of this two straps with buckles at the end are fastened, and at the other end is riveted a sheet of metal bent in the form shown and forked at the end so that when strapped in position the forked end straddles a spoke and effectively prevents the device from moving.

Practically any tire under ordinary circumstances when the vehicle is moving gives sufficient traction, but when a heavily loaded vehicle is at rest and power is applied to the wheels for starting, they will slip continuously unless a cleat, spike or roughened surface of some kind is provided at least at one portion of the rim, which will prevent this slipping, so that it has been found necessary to apply only one of these devices to each rear wheel in very bad weather. The same applies to placing the soft round headed bolts through the steel tire, so that only two or three are found sufficient. It is conceded by all that the solid rubber tire wears better than anything yet tried with the exception of steel or iron, but the expense of up-keep is so great as to be almost prohibitive.

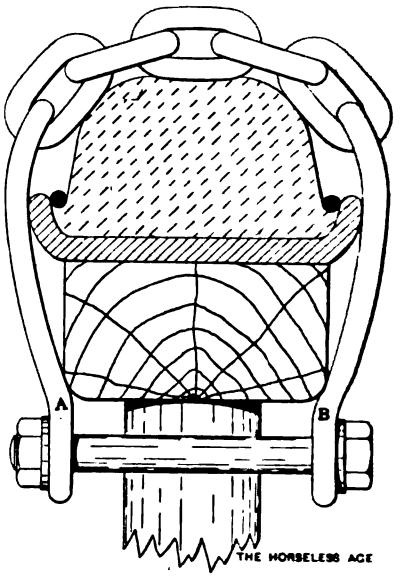


FIG. 4.

PNEUMATIC TRUCK TIRE.

Up to the present time it has been considered impossible to make a pneumatic tire which could be successfully used on vehicles weighing over 2 tons, but the R. & P. Traction Tread Tire Company claim that their tires can be made for all kinds of heavy commercial vehicles, and to prove their statements they are now manufacturing a pneumatic tire similar in general respects to their pleasure vehicle pneumatic

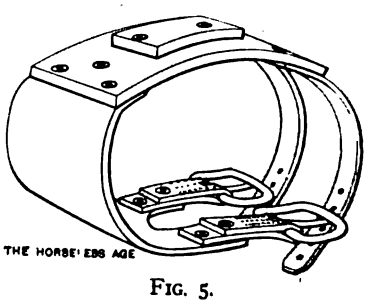


FIG. 5.

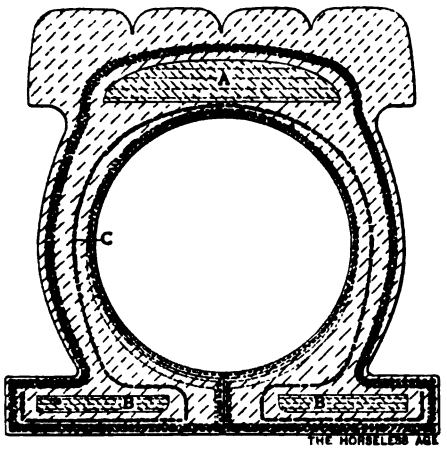


FIG. 6.

tire, but much larger, which is to be fitted to a gasoline truck which weighs approximately 3½ tons and is to carry a maximum load of 10 tons. If this experiment proves successful all previous ideas on the tire question will certainly be shattered. The makers claim that these tires will stand a load of 4 tons each, or a total of 16 tons. Each tire is tested to 500 pounds per square inch and a working pressure of approximately 150 pounds is to be used. Fig. 6 shows a section of this truck tire which will be fitted to a heavy clincher rim. The tread will be made up of four or five corrugations, and will be 7 inches. The diameter of the tire is practically the same as the tread, and the depth from the tread to the rim is also 7 inches. The darkened portions of rubber at A and B are of different material from the rest of the tire and are very dense and nonelastic. The portion inserted at A is intended to resist puncture. In addition to the ordinary weight fabric, one line of very heavy fabric is inserted, as shown at C. A suitably heavy inner tube is to be used. The makers seem to have all faith that this tire will stand up under such extreme conditions, and it is certain this experiment will be eagerly watched not only by the makers but by all those interested in the subject.

DEVELOPMENTTS IN SOLID RUBBER TRUCK TIRES.

As very little is really known as yet about the use of tires other than solid rubber for

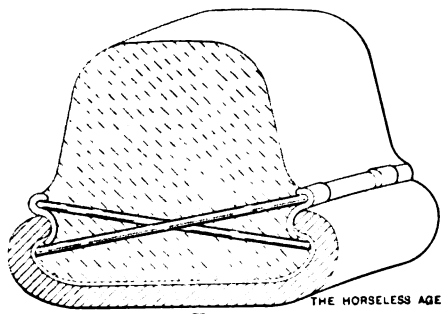


FIG. 7.

heavy commercial automobiles, and as nothing has yet been found which gives the cushioning effect combined with the same length of wear, nearly all the manufacturers of rubber tires are turning their attention to some form or other of solid rubber tire, and as any development is usually a progressive growth step by step, these solid rubber tires partake naturally of the style and method of fastening of the tires previously made by these companies for other purposes. Usually this is the basis upon which experiments are made until it is found what changes are necessary to meet the new conditions. In many instances it has been found that a fastening which is perfectly satisfactory for solid rubber tires of light weight is entirely inadequate to meet the needs of a fastening for heavy commercial vehicle tires, even though increased in the proper proportion. In other cases the same method of fastening has been shown to be well adapted for heavy work. So that in almost every instance these heavy tires show a marked resemblance to those from which they originated. In Fig. 7 is shown a cross section of the Motz heavy vehicle clincher tire, which is practically the only tire for this purpose which fits an ordinary clincher rim. The method of fastening this tire, as shown, consists of cross wires, imbedded in the rubber. One end of each hooks under the clincher portion of the rim,

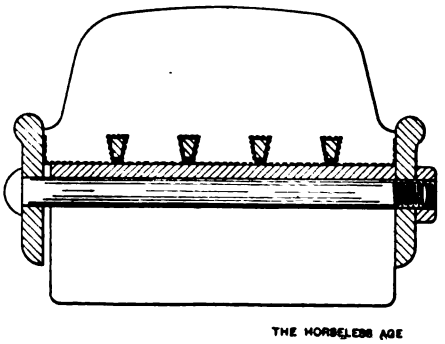


FIG. 8.

while the other end is slipped under the end of one of the small S hooks, the lower portions of which are held under the flanged edge of the clincher rim. There are as many of these separate S hooks on each side as there are ends of the wires to be held. The wires are made of special steel, and the general arrangement of the fastening is intended to firmly hold the tire and yet have as small a volume of rubber confined within the rim itself as an anchor for the tire as possible; working on the principle that the resiliency of the rubber confined in the base is practically wanted. These tires are made in sizes up to 8 inches. In Fig. 8 is shown a section of the Kelly-Springfield endless tire. This tire is of solid rubber with endless steel wires or rings of V shaped section used as retainers. These V shaped retaining rings are electrically welded and are spirally wrapped with friction cloth. They are inserted in V shaped grooves in the base of the tire and more friction cloth and canvas is then placed across the bottom of the tire and for a short distance up the sides where the rubber would otherwise come in contact with the metal retaining flanges. The whole is then vulcanized, which makes the rubber of the tire adhere to the canvas and friction cloth winding. The canvas across the bottom of the tire is the only material between the retaining rings and the iron felloe of the wheel. As shown in the section, the tire is slightly wider than the wheel rim, and is compressed to the proper width by the side retaining flange when the bolts are tightened. These tires are made up to 7 inches tread and have a carrying capacity per wheel of 4,680 pounds.

(*To be continued.*)

The Milan Gold Cup Contest.

This endurance and regularity contest was participated in by forty-eight vehicles belonging to eighteen firms, and of these vehicles only eighteen belonging to eight firms covered the whole distance of 4,000 km. (2,500 miles), maintaining, according to the rules, a speed above 30 km. p. h. and as near as possible equal to 40 km. p. h.

The route was divided into ten stages, but the test itself was substantially continuous so far as the vehicles were concerned, because the latter were kept in a closed park from the time of arrival to the time of the next start, where nobody was allowed to approach them under any conditions. One firm which started three vehicles as a team saw all three of them finish, while another firm which started eight vehicles had only two come in at the end. Aside from 24 horse power cars, which triumphed in this touring car test, there arrived in very good condition two six cylinder, 40 horse power cars with synchronized ignition, which fact may be interesting in a comparison of types.

In connection with this contest is to be mentioned an incident which may prove instructive to many drivers. Shortly after the start one vehicle was thrown out of operation because having emptied its radiator in the run it was refilled with cold water, which on contact with the overheated cylinder walls caused the latter to crack.

Novel System of Air Cooling.

The Standard Motor Company, of Coventry, England, have built to designs of W. H. Bradburn a six cylinder motor embodying a novel system of air cooling. The crank chamber of the engine is open to the atmosphere through an annular slot surrounding the cylinder, and carried about halfway up, so that oil cannot be splashed up over the engine. Round the upper part of the cylinder and over the head are cast ribs, and over these ribs are copper jackets, so that air is almost constantly being drawn over the cylinders and through into the crank chamber. By a simple arrangement, a current of cold air is led through to the underside of the piston, the temperature of which is thereby kept low, and to this Mr. Bradburn attributes his success.

At Paducah, Ky., the other day a motorist used a match to find out whether the drain cock of his gasoline tank was stopped up. He did not pay any attention to which end of the match he used for poking it, and the consequence was that in withdrawing the match the head got scratched and became ignited, and the fire did not stop until all combustible parts of the car were consumed.

NEW VEHICLES AND PARTS.

The Mason Car.

A five passenger touring car with double cylinder, horizontal opposed motor has recently been placed on the market by the Mason Motor Car Company, 100-102 S. E. Fifth street, Des Moines, Ia. The motor cylinders are of 5 inch bore and stroke respectively, and the motor is rated at 22-24 horse power. The carburetor is of the automatic type, and ignition is by jump spark, secured by means of a Pittsfield double coil on the dash and an enclosed roller contact timer. The cylinders are water cooled, water being secured by means of the positively driven rotary pump on the end of the engine shaft through a radiator of the company's own design. Lubrication is by means of a force feed oiler, with one feed to each bearing.

The change speed gear is a planetary device of the "all spur" type, giving two forward speeds and one reverse, and operating in an oil bath. The drive to the rear axle is by a roller chain. The rear axle is of the standard live axle type with Hyatt roller bearings. The wheels are 30 inches in diameter, alike in front and rear, the front bearings being ball bearings. The body frame is supported by full elliptic springs in the rear and on semi-elliptic springs in front. Steering is accomplished by means of a solid oak hand wheel on an inclined column through an irreversible mechanism. The speed of the car is controlled by a change gear lever at the right hand side of the driver's seat, which gives the low gear forward and the direct drive, and two pedals are provided for the reverse and the brake respectively. Thumb levers for the throttle and spark are conveniently arranged on top of the steering wheel. The brake is a double band brake acting on the differential. The car has a wheel base of 90 inches, and a standard 56 inch thread. Its weight is given as 1,750 pounds. We are informed that in a recent test the car was driven up the steps of the State Capitol in Des Moines.



THE MASON CAR.

The Michigan Storage Battery.

In the design of this battery the following objects have been aimed at: High charging rate without injury to the plates; a grid construction which shall retain the active material even after long use over rough roads; methods of connection which prevent corrosion of the wires; a power output for a given weight equal or superior to that of other makes.

The grids are of the staggered type, with crossbars of triangular section. Toward the middle of each rectangular opening in the side of the grids one corner of this section is prolonged into a thin hook. These hooks serve to hold the active material in place, and prevent large particles of it from falling out even after long continued service. Experience has shown that when the positive and negative plates are of the same thickness the latter will wear out two sets of the former. Hence the positive plates are made twice as thick as the negative, which increases the wearing capacity for a given weight. The grids undergo an electro-chemical treatment to render them porous and capable of holding a charge; thus adding to the weight efficiency of the battery.

Each set of plates forming a single cell is inclosed in a hard rubber jar with a sealed hard rubber cover, furnished with a 1 inch vent plug screwed into the centre. Over all the cells is placed a common cover of hard rubber, which affords additional protection. This collection of cells is placed in a substantial wooden box with close fitted cover and flexible rubber handle. Above the cover project the vent plugs and binding posts. These latter are of a non-corrosive alloy, of large size, and threaded and fitted with hard rubber caps. The connecting wires pass through holes in these posts, and the caps clamp them perfectly tight and insure good contact. The electrolyte can only be spilled by inverting the battery, but can be readily tested by removing the vent plugs.

The foregoing description applies to sparking batteries which are made in nine standard sizes, 4, 6 and 8 volts, with either 35, 55 or 72 ampere hours capacity. These batteries are claimed to be the result of a number of years of research and experiment, and are just being placed on the market in quantities. They are manufactured by the Michigan Storage Battery Company, Detroit, Mich., who will also furnish power batteries.

New Lambert Runabout.

The Buckeye Manufacturing Company, Anderson, Ind., manufacturers of the Lambert cars, are at work on a runabout to be brought out next season, which will be built along original lines, and will weigh less than 1,000 pounds when fully equipped. It will be fitted with a two cycle, 25 h. p. engine which has just been completed and has stood satisfactory tests. A distinctive feature will be ignition by means of a push button instead of by cranking, making it possible to start the engine from the seat. As in the case of the other Lambert cars the runabout will be of the friction shaft-driven type, which the firm will continue in their 1907 models.

The New "Watson Conover."

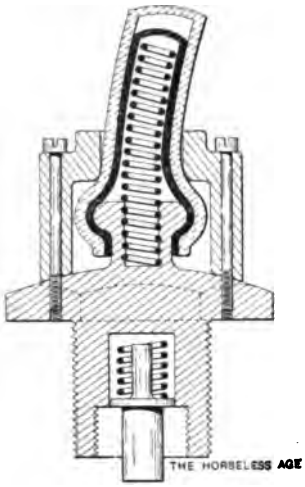
The Watson Machine Company, of Paterson, N. J., will place a new touring car on the market next year. The first model is practically completed. It is constructed along approved touring car lines, has a wheel base of 103 inches, is fitted with a Rutenber engine, three speed sliding gear transmission operated on the selective system, has shaft drive with Spicer universal joints, and a floating rear axle is used. Ball bearings are used throughout, and the cars are fitted as part of their regular equipment with the Truffault-Hartford shock absorbers. The distinctive features of the car will be the method of operating the change speed gear and the accessibility of the part.

The Herz Distributor.

The increasing adoption of synchronized ignition on multiple cylinder engines has led Herz & Co., of New York city, to bring out a combined circuit breaker and high tension distributor, as shown in the cut. The whole device is enclosed in an outer hard rubber casing which carries all the binding posts, which are stationary.

The primary circuit breaker consists of a revolving tool-steel disc bearing the cams, and a stationary tool-steel plunger. The number of cams on the disc corresponds with the number of cylinders. The primary contact is broken under oil or grease and can be watched through a plate glass cover. The tool-steel cam is placed on the end of the hollow steel spindle, the middle part of which bears the secondary distributor proper.

The distributor consists of a polished steel ring embedded in the surface of a re-



HERZ DISTRIBUTOR TERMINAL.

volving rubber cylinder. The secondary spring contacts slide on the surface of this peculiarly shaped steel ring. The body of the distributor is supported by a swivel and the whole device is designed for the fastening on the dashboard of the car.

The contacts are protected by rubber hoods, which prevent moisture from getting into the device. These hoods admit flexible connections through their openings, which are built up from spiral springs and insulated by a double coat of rubber tubing These connections, it is claimed, may be bent to the smallest angle without any inconvenience.

The unique feature of the device is said to be its sparklessness. The contacts overlap each other in such a way that burning off by sparking is entirely avoided.

The Harding Hydraulic Clutch.

John T. Landis, of Nashville, Tenn., sends us a prospectus of the Harding hydraulic clutch, which is applicable to automobiles and other power installations where a friction clutch is ordinarily used. The hydraulic clutch has the advantage over the friction clutch that there is practically no wear and no injurious heating when the clutch is allowed to slip for a considerable period, and Mr. Landis believes that this type of clutch will hasten the advent of the gearless car, tests having convinced him that such a degree of flexibility can be obtained that, with a motor of sufficient power, resort to a change speed gear is entirely unnecessary.

The clutch consists of a cylindrical chamber A, bored out eccentrically and having inserted in its bore, concentric with its outer contour, a block B, which is an extension of the driving shaft C. One end wall of the chamber A is integral, while the other one, D, is bolted in place, and has a disc, E, bolted to it, which may be a flange integral with the driving shaft F.

The block B is slotted through its centre, as shown, to receive four sliding vanes, V V V V, that bear against the inner cylindrical wall of chamber A. Cut in the wall of chamber A is a passageway G, at the middle of which there is a butterfly valve H, that can be controlled by the operator by means of a lever I, a sliding collar J, a link K, and an arm L. The sliding collar when moved along the hub of casing A is also caused to rotate, owing to spiral grooves cut in the hubs, into which extend pins fastened into the collar.

When the clutch is assembled it is filled with oil, and when the valve G is closed the oil forms a lock and prevents the relative rotation of chamber A and block B. When valve H is opened, however, the oil that is set in motion by the vanes V has a free passage around the clutch chamber, and rotation of the driving member will not result in rotation of the driven member. By closing the valve H partly a slipping effect can be produced, and as there is no tendency to grip, as in a friction clutch, the hydraulic clutch can no doubt be controlled to a nicety.

The prospectus contains the results of some tests made with this clutch, but these tests were not in relation to its application on automobiles.

The De Jarnette Spring Wheel.

James F. De Jarnette, of Omaha, Neb., has invented a spring wheel for automobiles and has tested it for a considerable period on a Rambler touring car. The Eby Manufacturing Company, Omaha, has been incorporated with a capital stock of $100,000 to manufacture this wheel. As will be seen from the illustration, the elasticity is secured by means of ten coiled springs interposed between the hub and the felloe. The wheel has five extensible spokes, consisting of radial steel rods cast integral with the outer hub plates, the outer ends of which slide in ball bearings in a steel socket fastened to the rim. The tension of the springs is adjustable by means of a pipe wrench, as the springs are screwed on short blocks extending from the hub and the felloe, respectively. The blocks are pivoted on brackets fastened to the hub and the felloe. The rim is made of six thin steel plates, instead of being made solid, in order to reduce weight. As at present constructed, the wheels weigh about 100 pounds each, but it is expected to reduce the weight considerably. The wheel here shown, which is built for city use, is shod with a solid rubber tire, but it is proposed to fit the wheels with ordinary steel tires for country use.

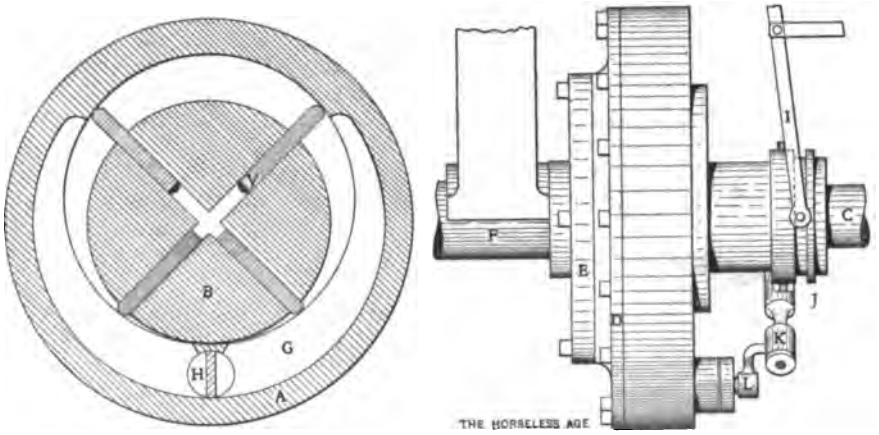
It is hard to see what is to give the wheel the very necessary strength in the direction perpendicular to its plane, to enable it to withstand the enormous shocks when striking the curb in skidding, etc. Besides, there would appear to be chance for considerable friction at the sliding joints owing to the torque transmitted through the spokes.



DE JARNETTE SPRING WHEEL.

A Luxurious Touring Body.

The Reading Metal Body Company, of Fleetwood, Pa., have recently completed a sheet aluminum body for one of the biggest touring cars in use in this country—an 80 horse power Rochet-Schneider belonging to E. N. Dickerson, a New York lawyer. The car is over 15 feet in length, and weighs 4,200 pounds, its maximum carrying capacity being ten persons. The body is of special design, and can be used in different ways according to the weather and the number of occupants, either entirely closed or open, with the glass sides removed and the roof forming a canopy, or



THE HARDING HYDRAULIC CLUTCH.

an extension top over the rear. The entire body is made of aluminum, 1-16th of an inch thick. The advantage of this metal over wood is claimed to be that there is no cracking or warping, and it would come out of a collision with much less damage than would a wooden body. It is also said to be fully 300 pounds lighter than the old type. The body is painted a royal blue, and the chassis or running gear is azure blue.

The interior of the cab, with its French bevel plate glass sides and front, is gorgeously finished and fitted out. All the woodwork is Dutch mahogany. It is upholstered in goat skin with morocco grain. The ceiling is satin, and black silk curtains hang at the windows. Three persons can sit on the rear seat, two on the front seat, and there are two revolving chairs. The fixtures include a card table, secretary, sideboard, hat rack, umbrella stand, toilet case, ash trays, clock, mirror, toilet articles, incandescent electric lights, etc. A handsome carpet covers the floor. Speaking tubes and enunciator permit of communicating with the chauffeur. The cab is 62 inches wide, 64 inches high and 96 inches long. There is a place for baggage on the roof, and a trunk rack is on the rear.

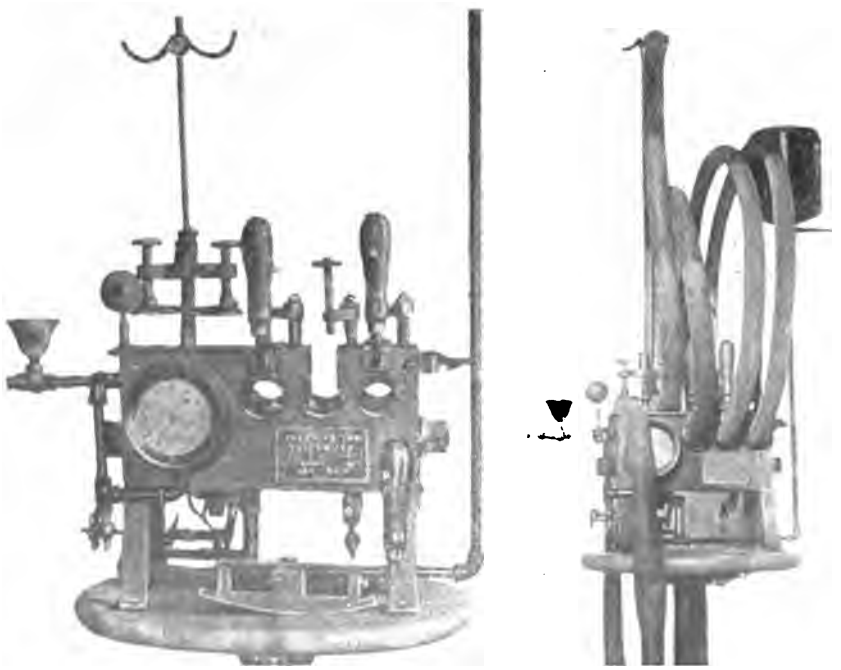
The Cain Steam Vulcanizer.

This vulcanizer, which is just being placed on the market by Frank Cain, 202 Fourth avenue, Detroit, Mich., has already been used in smaller sizes for bicycle tires. The body of the vulcanizer is filled with water by means of a permanently attached funnel. Heat is furnished from a burner underneath, the gases passing through a system of tubes in the tank, thus cheaply, easily and quickly heating the water. Either gas or gasoline may be used as fuel. A steam gauge shows the pressure, and the operator soon learns how long a time is required to vulcanize under a given pressure, since the heat is uniform.

There are molds for three sizes of tires, and two spaces where flat work may be done. The lower part of the mold, which corresponds to the tread and sides of the tire, is a single piece, so that no seams are left after the work is done. Also there is no danger of any of the covering getting pinched in the seam of the mold, which sometimes occurs when molds are divided along the tread. The removable part of the mold corresponds to the cylindrical portion of the rim, and is furnished with a wooden handle for handling it when hot. Swinging clamps are provided which fasten the removable portions of the molds in place.

It is to be noted that these molds extend for some little distance beyond the tank at either end. This then projecting portion is, of course, cooled by the air, so when a job of vulcanizing is finished there will be no sharp lines marking the ends of the vulcanized portion. Where these lines exist they are often the starting point of cracks, as the two different qualities of rubber meeting along a sharply defined line produce strains along that line when the tire is in use.

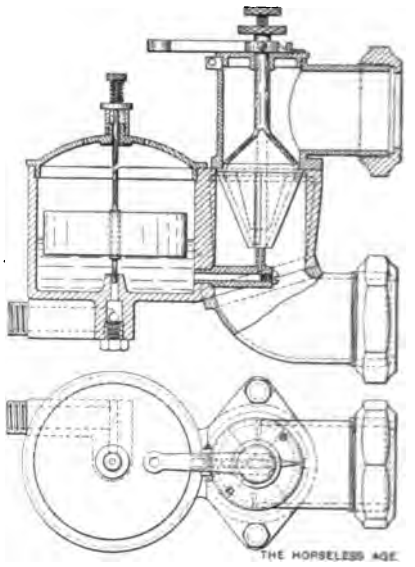
Another advantage claimed for this form of mold is that, since the removable part may be handled while hot, the tire may be readily put in place after the mold is heated, and where many tires are to be vulcanized considerable time may be saved. Safety valves, drain cocks, hangers for tires, etc., are of course provided.



THE CAIN STEAM VULCANIZER.

Buffalo Carburetor.

The Buffalo carburetor, constructed under patents owned by the Buffalo Carburetor Company, 889 Main street, Buffalo, N. Y., is springless and entirely mechanical in action, and every part moves positively, insuring, it is claimed, perfect control of the motor under all conditions; great flexibility, economy in consumption of fuel, and a perfect mixture at all speeds by the movement of a single lever, which is permanently adjusted.



BUFFALO CARBURETOR.

The gasoline enters the float chamber through a screen and passes into the mixing chamber through a needle point valve; warm air is admitted by a sliding cone valve, adjustable by the same lever which controls the butterfly throttle valve.

In adjusting this carburetor the needle point valve is set at the proper point for the motor running at its highest speed. This gives the necessary adjustment for all speeds. In case foreign matter gets into the nozzles the needle valve may be easily removed and the obstruction blown out. The carburetor is conected with the motor, with the butterfly valve and throttle wide open. The flat head binding screw on top of the carburetor is then tightened, which sets the sliding cone valve and gives the proper mixture for low speed. The butterfly valve is now readjusted if necessary, and then the carburetor is permanently adjusted for all speeds.

Benjamin Wireless Receptacle Charging Plug.

A new lamp cluster combined with a plug connection for charging small storage batteries from electric lighting circuits is manufactured by the Benjamin Electric Manufacturing Company, with offices at New York, Chicago and San Francisco. The cluster consists primarily of an insulated wireless base with two one-piece contact blades attached, each serving as terminal for all lamps in the cluster, each of which is provided with a binding screw and a removable casing of brass or aluminum supported by special porcelain rings or bushings. By obviating the necessity of wires in the cluster body, in thus combining the necessary elements of the sockets upon one

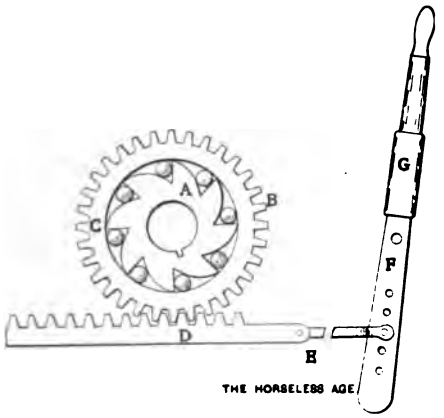


BENJAMIN WIRELESS CLUSTER RECEPTACLE PLUG.

base, the cost of installation is claimed to be materially reduced, and a neat, durable and well insulated cluster results. The charging cluster fits any Edison base. Three 32 C. P. lamps on a 110 volt circuit charge a battery at a 3 ampere rate; three 16 C. P. on a 110 volt circuit at a 1½ ampere rate. The removal of one or two lamps decreases the rate of charge proportionately.

Schultz Starting Device.

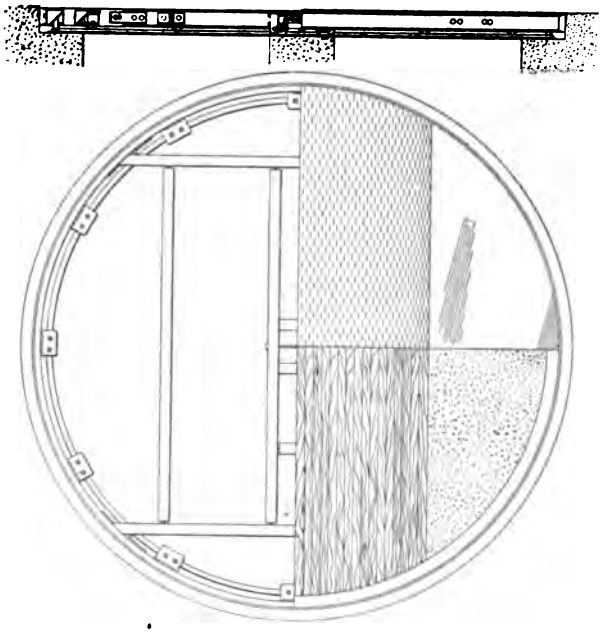
This device for starting gasoline engines by means of a lever operated by the driver from the seat of the car is the invention of William C. Schultz, manager of the Standard Garage, 1114 Main street, Buffalo, N. Y. A is an iron clutch wheel which is keyed to the motor shaft. When the engine is running this clutch wheel turns freely with the shaft, the roller B permitting it to revolve without engaging the outer toothed wheel C. When the rack D is drawn forward by the lever F G, the outer toothed wheel is turned in the direction indicated by the arrow, the rollers bind with the clutch wheel and the shaft is turned. One or two motions of the lever will turn the engine over, with less effort than is required to crank it by hand in the ordinary manner. This starting device has been tried on a number of small cars, and is said to be applicable to all types of cars. The upper part of the hand lever, all that portion that projects above the floor of the car, is of tubular form, the upper half telescoping into the lower half, so that the handle will not project above the dashboard and be in the way while driving.



SCHULTZ SELF STARTING DEVICE.

The Philadelphia Turntable.

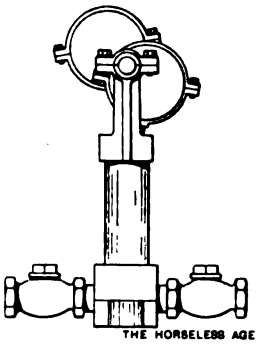
The automobile turntables made by the Philadelphia Turntable Company, Real Estate Trust Building, Philadelphia, are made entirely of steel, and are so designed that they do not prevent the space they occupy being used for other purposes. The turntable requires a space of only 6 inches in depth, and it is claimed that it can be installed by any ordinary mechanic. The load is carried on the conical roller pivot at the centre, and the circular track and wheels only serve to prevent undue tipping of the table. The pivots are designed on the same lines as the larger pivots used on the company's locomotive turntables. The turntables are fireproof as well as waterproof, and can be conveniently cleaned and lubricated. The pivot and end wheels are standard, and duplicate parts can be furnished. The entire space occupied by the turntable is floored over, either with checkered steel plates or with wood, as will best cover the user's requirements.



PHILADELPHIA TURNTABLE.

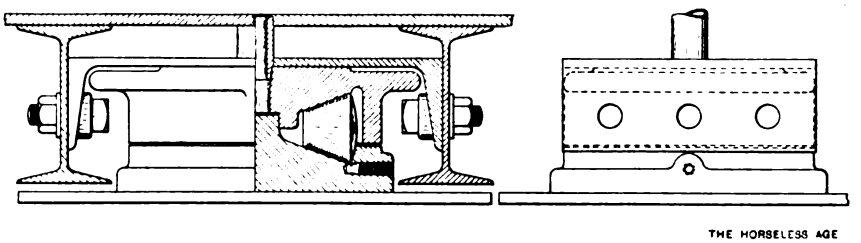
Reynolds Automobile Pump.

A new two cylinder automobile piston pump has been placed upon the market by L. G. Reynolds, 363 Marilla street, Buffalo, N. Y., and its construction is illustrated by the sketch herewith. The pump is intended for the water circulation system, and has two cylinders with a stroke of 1 inch each, giving a pumping capacity of 1 gallon per minute at 200 r. p. m. The two plungers act independently of each other, one forcing the water out of the cylinder while the other is drawing it in, thus insuring a steady flow of water at any pressure desired. The valves are ordinary stock check valves, and are readily accessible by removing the caps above them. The plungers, which are of the the bicycle pump type, capped with leather at the bottom, may be removed by taking off the metal caps over the bearings of the eccentric shaft on top of the pump. The advantages claimed for this pump are simple construction, reliability of action, great pumping capacity and great economy of power. Particular stress is laid on this latter advantage, which is claimed to render this pump superior to the rotary pump, though it is not directly obvious why the piston pump should be more efficient mechanically than the rotary pump, where only a small pressure is required; in fact, the direct opposite would be expected.



REYNOLDS AUTOMATIC PUMP.

Automobiles and motor boats have already made their way up to the far North, and it is expected that in the season now commencing the increase will be great. German, French and American makers, says British Consul Cooke, prevail at present. The bad roads are the great difficulty in the way of motorism in Finland, and they are not likely to be generally improved just now.



ROLLER BEARING CENTRE OF PHILADELPHIA TURNTABLE.



Kerosene Burner Control.

Editor HORSELESS AGE:

Referring to an article in your journal of the 6th inst., by Winthrop Waite, I would like to ask if Mr. Waite could give us any information as to kerosene burners controlled by thermostatic regulation, as is the gasoline burner of a well known make of steamer using the flash generator. I understand this company has experimented a great deal with kerosene, and prefers to cling to gasoline, because its regulation is so much more certain.

As Mr. Waite says, the gasoline burner needs only a very primitive vaporizer, which, being short, will not hold very much gas, and when the regulator valve closes, it is only a matter of a few seconds till the fire is out. When the valve opens the vaporizer quickly fills and starts the fire, the regulation being so sensitive that the steam pressure is very constant.

With kerosene the vaporizer must be quite long, and the regulator must be set so that after the valve closes the generator coils will still be cool enough that the gas remaining in the vaporizer will not overheat them. Of course the regulator must be set at a lower temperature than with gasoline. When the valve opens the generator coils are below this temperature, necessarily allowing the coils to furnish cooler steam, thus reducing the pressure and the water economy, and there is a sensible period required for filling the vaporizer before the fire starts, which allows the coils to cool still more, still further reducing the water economy and making the pressure very unsteady. At least this is the way it would seem to me. I have tried the kerosene, and even the crude oil burner, on fire tube boilers, but I have not as yet applied either of them to the flash system

Have thought that a set of small tubes, say about one-eighth inch internal diameter, arranged in parallel over a pilot. so that they would be kept at a temperature of about 700°, and all hot so that no oil could get through a tube at a lower temperature, and part of the length of these tubes over the main burner so that the heat of the burner would take care of the greater amount of oil passing through when the burner is in operation, would increase the heating surface of the vaporizer and decrease the amount of oil or gas necessary to fill the vaporizer, causing it to appear at the jet before the fire would come on. Have not had time to put this into effect as yet, but shall as soon as possible. Perhaps some of your readers may find something new in the idea.

Have handled a great many kinds of cars, but still cling to the little old stanhope, which has never failed me yet. There is no crystallization of metal in this car, and when this item alone is compared with the same trouble with gasoline cars, where the motor vibration is at all to be noticed, it will nearly make up for the larger amount of gasoline used And a successful kerosene burner will make the steamer the most economical of cars. C. D. STONE.

Hill Climbing Contest Formulae.

Editor HORSELESS AGE:

Referring to the various hill climbs which are now being held in all parts of this country and abroad, it is to be presumed that beside providing an interesting afternoon's sport they should demonstrate in some way the relative merits of the cars taking part in them. At present, however, I think that the value of these tests, so far at any rate as the public are concerned, is very considerably discounted by the different methods adopted in the classification of the cars. In some cases an arbitrary formula is used to determine the H. P. of the engine, and this system, if a really reasonable formula was arrived at to determine the engine power, if adhered to by every club throughout the country, would, I think, eventually lead to useful results, but at present the results are far from useful.

For example, take the case of a 40 horse power six cylinder car. At Frome Hill Climb the formula classed it as a 32 horse power car. If, however, the same car is run in the Birmingham Hill Climb it is only called a 30.47 car, and in view of the fact that the Frome Hill Climb does not take the least account of length of stroke, it is obvious that the formula is a thoroughly bad one.

The Birmingham formula, which takes the stroke into account, seems to me far and away the best and most useful hill climbing formula that we have at present, and if a fair formula of this sort could be adopted as a standard by the Automobile Club and used throughout the country for say a year, and then all the results carefully considered by the technical committee of the Automobile Club, I feel sure that modifications and suggestions could be brought into force from year to year that would make these hill climbing competitions really useful to the public and to makers of motors, and at the same time make handicapping by them really fair and interesting.

To still further show the extraordinary variation in the system of holding these hill climbs, we will just take South Harting, where the different horse power cars are classed according to price. Could anything be more futile than this, and last year, when this same competition was held under these conditions, I was actually told by an official in connection with the trials that the reason the price of the cars competing in this competition had been limited to £850 was because the promoters of the competition did not wish very powerful cars to compete. Could anything be more ridiculous than to suggest that a price of £850 for the chassis would prevent a powerful car competing? There are many cars of 50 horse power and more to be bought at this figure, so that the competition, although it makes an interesting afternoon's sport, is really useless as an educational competition to everybody concerned.

When we come to Aston Hill Climb, promoted by the Herefordshire Club, we have an even worse state of affairs. There appears to be no limit to the horse power, no limit to price, but the cars, it is stated, must be fully equipped touring cars. No indication is given as to how many people are to be carried, and what is a touring car is not defined.

Now it seems to me that this is bad, as it leads to protests and misunderstandings which never need arise if some good rating rule on the lines of the Midland Club was universally adopted, tried throughout a whole season, and then at the end of the season thoroughly criticised by the results and gradually improved from year to year, and directly cars were inclined to strike out into undesirable directions the formula could be so altered as to place at a discount this particular direction of development.

I trust that this matter may have some ventilation in your columns, and trust opinions from others may be given with the hope of getting something done before next year's competitions start, and that some competition be held during the present season under what might be considered ideal conditions at the moment. I feel sure the same difficulties exist in America, and might be ventilated with advantage.

S. F. EDGE.

Fuel Queries.

Editor HORSELESS AGE:

I have noticed advertisements of a new fuel for hydrocarbon engines for which great claims are made. This fuel goes under the name of "Energine," and not having had an opportunity to test same, it struck me that perhaps through the columns of your paper the experience of others who have used this fuel might be obtained. At this time, when the price of gasoline is advancing to a point where it is almost beyond the reach of a man of limited means, something of this kind, if the reports of its efficacy are true, is what we are looking for.

Is it also not a fact that abroad, and possibly in this country, in auto boat races, a few crystals of picric acid dropped into the carburetor just before the race produces large quantities of oxygen and consequent complete combustion, with a surprising increase in effective power? Would picric acid crystals introduced into

ordinary gasoline form a homogeneous mixture, or would it be likely to segregate, settle to the bottom and make a dangerous and uncertain article for one to carry around?

As before stated, it seems to me at this time, when the fuel question for automobiles and auto boats is becoming more important and pressing, matters of this kind could be discussed with advantage.

E. A. B.

The fuel "energine" was submitted to a test by one of our contributors when it was first placed upon the market, about two years ago. A gravity test showed it to be of a considerable density, between 64° and 65° Baumé, and this indicated that it consists chiefly of a heavy grade of naphtha. With the best possible carburetor adjustment on the car of our contributor the consumption of energine over a distance of 17 miles was greater than the consumption of gasoline. But this he considered due to the fact that his carburetor possesses no heating jacket. A friend of his, whose carburetor was heated, claimed to get increased power from energine.

The use of picric acid in gasoline involves great risks and should not be attempted.—Ed.]

Cause of Irregular Running at Slow Speed.

Editor HORSELESS AGE:

Replying to your favor of June 4 in regard to misfiring of my air cooled motor at low speed, would say that since writing you I find that my entire trouble came from weak exhaust springs. I changed these and can now run as easily at 5 miles an hour as at 25 miles an hour. I thought this was worth my writing to you about, as you state in your letter that owners of other air cooled motors have had the same trouble, and this may be the cause of it.

READER.

[The suggestion that the irregular running at slow speed might possibly be due in some way to the air cooling feature is therefore not entirely without foundation, for while the valve springs may become weakened on a water cooled engine they will certainly lose their temper easier when resting against the hot combustion chamber wall of an air cooled engine. It is quite easy to see how the weakening of the springs may cause the irregular action at low speed, for if the throttle is nearly closed there will be a very strong suction created in the cylinder during the inlet stroke, which will cause the exhaust valve to open if its spring is weak and draw some of the spent gases from the muffler back into the cylinder, resulting in missed explosions. It is therefore to be remembered that irregular running at small throttle indicates weakened exhaust valves.

We wish to thank our correspondent for having informed us of the cause of his trouble.—ED.]

Let Well Enough Alone.

Editor HORSELESS AGE:

To novices in the art of operating cars I would offer the following advice:

Do not tinker with your machine, that is, when something seems to be going wrong; do not tear down and modify this or that, hoping to in some way or other strike the right thing. If something is wrong with your car, you must modify that one thing, and that only, for the reason that the adjustments on a perfectly timed car are so minute that modifications must be made only when needed. We frequently have been called to assist where trouble arose as a direct result of improper adjustments. For instance, one operator was continually having trouble with tire valves leaking. The threads even were destroyed in the valve stem. On investigation we found that for some reason the top of the stem was in a collapsed condition. This was very likely the result of an attempt to tighten the dustproof caps. Remember that a valve that is right only needs to be made "hand tight," for by the use of the pliers to tighten, troubles are only increased, since, by unduly tightening down, the rubber caps are forced out of position, and often are ruined and most frequently will displace the air valve. Be careful what you do. Know your trouble, and remedy that only. Keep your machine clean and well lubricated, and see that your ignition is fed by good live cells.

A. MORRIS.

Freak Car for Vanderbilt Race.

Editor HORSELESS AGE:

I see in this morning's *Sun* an account of a twelve cylinder car designed for the Vanderbilt Race, and it has seemed to me that every time I pick up a paper I notice an account of some freak car being designed, built or entered for that race. Isn't it about time that such cars were barred out? While they may be all right in their way, as experiments pure and simple, they are certainly out of place in an international contest.

Does not the fact that all such races are won by foreigners who steer clear of such monstrosities as twelve cylinders, front drive and flash generators, convey any meaning to these alleged designers?

P. J. FAULKNER.

[None but a freak car is likely to win such a race.—ED.]

How to Talk Interestingly on Motor Cars Though Ignorant of the Subject.

The following suggestions are due to Barry Pain, and are from *Printer's Pie*, an English publication:

"When you are asked to come and have a look at the new motor car, much will depend on whether the asker is a lady, a male owner or the driver. If it is the driver, your right course is to say that you would have enjoyed it, but that you have not the time. If it is a lady, confine your remarks entirely to the body of the car. Speak of the color of the paint, the comfort and elegance of the upholstery, and the ingenuity of the electric light fitting. This is all that she cares about, and you can easily make her happy without showing your own hand. With the male owner an exactly opposite course must be taken. On no account must you say anything whatever about the body. Should he by chance, in a moment of forgetfulness, say anything about it himself, snub him, and tell him that kind of thing does not matter. Then he will respect you. Ask to see the engines. As they are being exposed to view, say, 'Anything special about your carburetor?' There is always something special about the carburetor. When he has finished his misstatements on the subject, you observe, 'Sounds ingenious.' Look long and carefully at the car's interior, and for some moments say no other word. Then get up brusquely, and ask him if he would mind starting her. If he can start her, say 'Excellent! Couldn't want anything better.' If he cannot start her, say, 'I was afraid so,' and leave hurriedly."

American Vehicles Ahead.

A New Zealand engineer and agent has addressed a letter to the British Empire Motor Trades Alliance, in which he says:

I am a great believer in British goods, but it is often much easier to buy from a foreigner, because he gives you lots of particulars and choice. It must always be remembered that it takes a colonial three months to send for particulars and get his reply from England, but only half that time from America. We do what we can for Old England here. We charge foreigners an extra 10 per cent. duty on cars complete and 20 per cent. on engines. Even so, I suppose the most largely sold car in the country is a 5 horse power American vehicle.—*Consular Report.*

Manufacturers and A. C. G. B. I. Affiliated.

The British Society of Motor Manufacturers and Traders, at a recent meeting of its council, almost unanimously decided in favor of concluding an agreement with the Automobile Club of Great Britain and Ireland whereby it is arranged that the trade, as represented by the society, shall be consulted and have a voice in the management of any trials held by the club. The club will be considered also in matters affecting the annual exhibition, a share of the profits of this show being handed over to the club in return for its patronage, which moneys that body will disburse in consultation with the society.

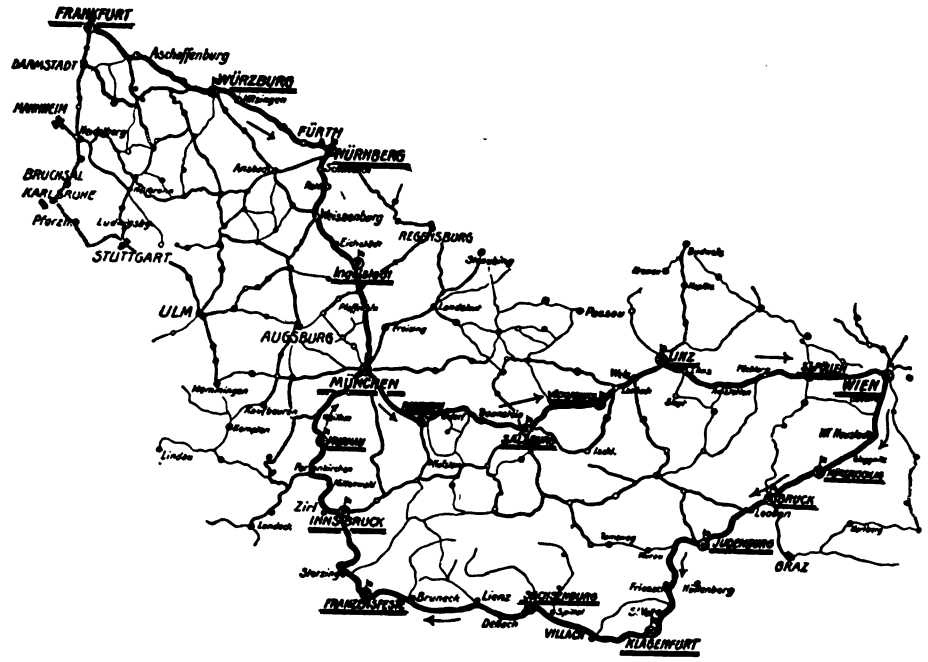
English automobilists are in hopes of eventually enjoying the advantages of a national source of gasoline supply, as petroleum springs have been found in the Island of Trinidad and also in Egypt.

OUR FOREIGN EXCHANGES

The Herkomer Trophy Contest.

What proved to be the largest touring car contest yet held came to a close at Munich, Germany, on June 13. The second annual competition for the Herkomer trophy was organized jointly by the German Imperial A. C., the Bavarian A. C. and the Austrian A. C., and started at Frankfort-on-Main on June 6. On the day previous the vehicles were inspected at Frankfort by the contest committee, to make sure that they complied in all respects with the regulations. The inspection took place in the Agricultural Hall on the outskirts of the city, a big building that also serves for cycle and automobile shows. All of the vehicles entered were passed, with the exception of three Fiats, one Mercedes, one Argus and one Hexe, the bodies of which were found not to possess the qualities of comfortable touring bodies, as required by the rules; the Fiats were fitted with ordinary racing bodies. The most emphatic protest against the admission of these vehicles was made by Prince Henry of Prussia, who demanded that the prescribed rules should be adhered to. Oberdorfer (Hexe) and Euler (Argus) got touring bodies fitted in time for the start, while the three Fiats and Hermann Weingand (Mercedes) started unofficially, the latter under protest against his disqualification. At a quarter past 6 o'clock 133 of the entered vehicles had received their numbers, and their drivers had been furnished with road instructions in suitably printed form, as well as with their insurance papers as required by the new German law. Despite the fact that there were protests and disqualifications, the proceedings, under the direction of Freiherr von Moliter, were carried through in a calm and business-like manner.

The start began at 5 o'clock on the morning of the 6th. The weather was fine, and 133 cars left in regular order at half minute intervals. An inspection of the entry list showed that the French industry was but slightly represented, there being less than a half dozen cars of French construction. Among the cars which started were 20 Mercedes, 15 Benz, 8 Adler and 12 English Daimler, and this large number of cars of leading makes shows that the contest was actually one of amateur drivers. Another somewhat unusual feature of the contest was that several cars carried lady passengers. The cars were started in the order of their engine capacity, and this starting order was maintained throughout the contest. This year there was no compulsory stop for lunch at noon, in which respect the rules also differed from last year's.



ROUTE OF HERKOMER CONTEST.

The method of scoring employed embodies some new ideas. The competition embodies really three separate tests—the tour, a hill climb and a level race. In the hill climb and level race, however, it was not the actual speed made by the car that counted, but the excess or deficiency of that speed in comparison with what would be expected from the car in view of its cylinder displacement. It is stated that preliminary speed trials had been made by the contest committee both up the Semmering Hill and on the level road in the Forstenrieder Park, with cars of different cylinder capacities, and with open and closed bodies respectively, and from the results of these tests two curves had been plotted giving the speed any car of a given cylinder displacement and form of body should develop. If a car exceeded this speed it was credited with marks in proportion to the excess of speed; if it fell below it, it was similarly debited. No account was taken in the construction of the curves of the weight of the cars, but as all cars were required to carry at least four passengers and to be fitted with regular touring body, there was no reason why one car should weigh much more or less than another with the same type of body.

The first day's route was from Frankfort to Munich by way of Nuremberg, a distance of 405 km. (250 miles). As the cars were mostly of high horse power, and the restrictions to legal speed were not taken very seriously, many of the competitors arrived at the end of the stage before the control was opened at 4 p. m. The first to arrive was Willy Poege, of Chemnitz, 60 horse power Mercedes; second, Edgar Ladenburg, 70 horse power Mercedes, winner of last year's Herkomer contest; third, Herr Sierke, Fiat. The cars arrived in rapid succession, and at one minute past 6 o'clock 100 cars had completed the stage. Of the 122 starters, 111 arrived in good order and started on the second stage the following morning. Percy Pierce, who was No. 57, and consequently started at 5.28 a. m., arrived at Munich at 5.08.

One serious accident occurred during the first day. Herr Kienle, of Munich, who drove car No. 132, ran against a tree near Neustadt, with the result that his official observer, Herr Schloer, of Munich, was pitched out of the vehicle and suffered a fracture of the skull. He died the next day. No further particulars as to the circumstances that led to the accident are to hand, but high speed was undoubtedly a factor. Another accident occurred to the 40 horse power Opel car of Fritz Werner, of Munich, who had a collision with another vehicle, and broke his axle, which forced him to withdraw. The first collision in the tour occured in Frankfort during the start when Herr Kuhn-Regniers' Berliet car ran into Edgar Ladenburg's Mercedes, damaging its body to such an extent that Ladenburg was obliged to drive his other Mercedes car.

The end control of the first stage was at the inn in Schwabing near Munich, where last year the Herkomer tour terminated. During the night the cars were housed in the garage of Beissbarth Brothers, where they were kept under guard.

The start the next morning began at 6 o'clock from the Beissbarth "Autohall" within the densely populated portion of the city, and the time intervals between starts were therefore increased to one minute, as otherwise, with the route lined with spectators, there would have been danger of collision in the narrow, curving streets. The route of the second stage was from Munich by way of Salzburg to Linz, 266 km. (166 miles). This day's run brought the tourists into Austrian territory. The roads were rather more difficult than on

ıe preceding day, and in the afternoon rain et in, which detracted from the pleasures f the drive through the rather magnificent cenery. Accidents were again the order of he day. M. W. Kroell, of Eltville, who lrove his 40 horse power De Dietrich, ran nto the car of the Freiherr von Born, with he result that Kroell's car was thrown gainst a tree, and he himself was thrown ɔut, but only slightly injured. Kroell is said to have a bad reputation as a reckless driver. He once ran over and killed a woman with a car, which netted him five months in jail, and on another occasion ran over and seriously injured a boy. After the collision with Von Born's car legal proceedings were at once instituted against Kroell, and the contest committee disqualified him from further participation in the tour.

As to the speeds which were maintained by the leading cars, an idea may be gained from the time of Dreher, the first to arrive in Linz, who started at 6 a. m. and arrived at 10.39 a. m., making 4 hours 39 minutes for a distance of 166 miles over poor Austrian roads. The car of Von Born had to be withdrawn from the contest because its axle was bent in the collision with Kroell, and thereafter it did not respond properly to the steering gear, and it ran into a road barrier. A De Dietrich car was also put hors de combat on this day, its mishap resulting from an attempt to turn out for a bicyclist.

It appears that many contestants, including Prince Henry, did not stop at the noon control, Salzburg, but drove right through to Linz. In Linz Prince Henry was received by the president, general secretary and several members of the Austrian A. C. The end control was at the City Turn Hall, which also served as garage for the night. Of the 122 starters in the second stage, 115 had arrived by 6 o'clock p. m., and the total



ALFRED HILLE ON A BERLIET.

number of contestants who eventually arrived in Linz was 118. The motorists of Linz had arranged an informal celebration in honor of the Herkomer tourists, but as the tour made great demands on the drivers and all were obliged to rise at 4 a. m., the gathering broke up at a comparatively early hour.

The start from Linz took place at 6 a. m. on Friday, and 118 cars began the run to the Austrian capital, a distance of 183 km. (113 miles). The inclement weather of the night before had given way to beautiful sunshine, and the contestants were mostly in good spirits. This stage was completed successfully by all of the competitors save one, who met his quietus at the Rieder Hill. The night previous announcement had been made that the district around Vienna had been flooded by the Danube, and that a change in route might have to be made, as bridges had been torn away. The roads were indeed in a very heavy, muddy condition. During this stage another accident occurred which resulted in a fatality. In the village of Melk a deaf and dumb person, fifty years of age, stepped directly in front of one of the competing vehicles, driven by Max Krone, an engineer. According to some accounts the wheels of the car went over his body, and broke several of his ribs, while, according to another version, the deaf and dumb person fell from sheer fright at the sight of the car and was dead in ten minutes. Krone is said to have driven at a slow speed, and to have thrown on his brakes immediately.

In Vienna, the cars were housed in the halls of the Agricultural Association in the Prater, and all of them were given a washing, which was very necessary after the muddy trip from Linz. Saturday was a day of rest, and the competing cars remained on exhibition in the Agricultural Association's Hall, however much some of the contestants desired to drive them out on a trip of inspection to the Semmering Hill, where the hill climb was to be held on Sunday. The route up the Semmering is a winding one, not particularly steep, but with many sharp turns known as hairpin corners in England, and it is therefore obvious that success in the hill climbing test was much dependent upon a thorough knowledge of the route and skill of the drivers in taking such corners at high speed. The automobile show was not very well attended, although the population went in large crowds out to the Prater—to visit the Buffalo Bill show adjoining the auto exhibition.

The timed hill climb up the Semmering on Sunday was included in the fourth stage, Vienna-Klagenfurt, 315 km. (200 miles). The day broke fine, and after the one and



PRINCE HENRY OF PRUSSIA DRIVING HIS 40 HORSE POWER BENZ.

one-half days' rest the contestants were in fine spirits. The Semmering course includes six sharp turns, and the third and fourth of these proved disastrous to some of the competitors. The roadbed is quite even, the maximum grade being 14 per cent., and the average 7 per cent. On the approach to the first sharp bend, two of the powerful English Daimler cars had their axles bent. Three serious mishaps occurred during the hill climb, but particulars are not available. Among those who made very good time up the hill was Prince Henry, who drove his car himself. It is said of him that he did not feel hurt at being overtaken by other competitors, and declined the honor offered him of being allowed to start first in all stages, though from the published lists of starts and arrival he overtook more often than he was overtaken.

The start from Vienna took place at 5 o'clock on Sunday morning in fine weather, 113 cars being started at intervals of one minute. A special announcement had been made that any car which exceeded a speed of 45 km. (28 miles) per hour (the Austrian legal limit) between Vienna and the Semmering would be disqualified. As the distance is about 60 miles, the hill climbing could begin only shortly after 7 o'clock. The competing vehicles did not stop at the foot of the hill, but had their time taken at the 80 kilometer stone and again at the 89, which stands at the summit of the Semmering, near the Hotel Erzherzog Johann. The Semmering proved one of the pièces de résistance of the contest and the Waterloo of nine contestants, including, according to a German report, six of the English contestants, two of which had a collision. The contest committee decided not to make public the results of the hill climb, as the contestants might have used these results for advertising purposes and created false impressions.



General View of the Start From Frankfort-on-Main.

The distance of the fourth stage, Vienna-Klagenfurth, is 316 km. (200 miles), and was covered by the first arrival, Lieutenant Spitzner (De Dietrich), in seven and one-half hours. At about 3 o'clock in the afternoon a rain set in which made the roads very muddy before the majority of the contestants reached the end of the day's journey. Prince Henry drove with his usual regularity, and arrived at Klagenfurth at 2:51. It is told of the prince that he made it a rule, when other drivers attempted to overtake him, to drive in the middle of the road at 45 km. per hour, the legal limit, and not pay any attention to their tooting. This action was made the basis of a protest, but those in charge of the contest upheld the prince in his contention that it was not only the privilege but the duty of every competitor to prevent fellow competitors from breaking the law. During this day the loyal town of Leoben was doomed to bitter disappointment. It had arranged for a solemn reception of the prince, with address of welcome, "maidens in white" and banquet, but the prince did not even stop.

By half past nine in the evening 104 cars out of 113 starters had arrived at Klagenfurth.

On Monday, June 11, the run was from Klagenfurth to Innsbruck, 180 km. (112.5 miles), through the Tyrolese Alps. Between Linz and Innsbruck the contestants were obliged to scale two mountain passes 2,400 feet in height. The start began at 6 o'clock, and 102 vehicles were dispatched on the day's journey. The rain of the previous afternoon had ceased, and a fine day greeted the contestants.

Owing partly, no doubt, to the very hilly nature of the route, a number of serious accidents occurred during the day. The Metallurgique car of Nellersen was demolished by running into a road barrier, and the driver suffered concussion of the brain while the official observer escaped with minor injuries. The Adler vehicle, No. 50, driven by Alfred Teves, ran over a fireman at Sterzing, and the driver was detained in Brunneck on account of disregard for public safety. In Austria the road was guarded mostly by volunteer firemen, and the authorities had posted numerous signs notifying the population of the tour. Of the 102 starters in this stage ninety-seven finished before 8 p. m., and two more later.

The start for the last stage of the tour, Innsbruck-Munich, 150 kilometers (94 miles), in view of the short distance, took place only at 8 a. m. One hundred and two cars started, the sky being overcast. During this run an extremely steep and difficult hill, the Zirlerberg, had to be climbed. This



Driving Through the Streets of Frankfort.

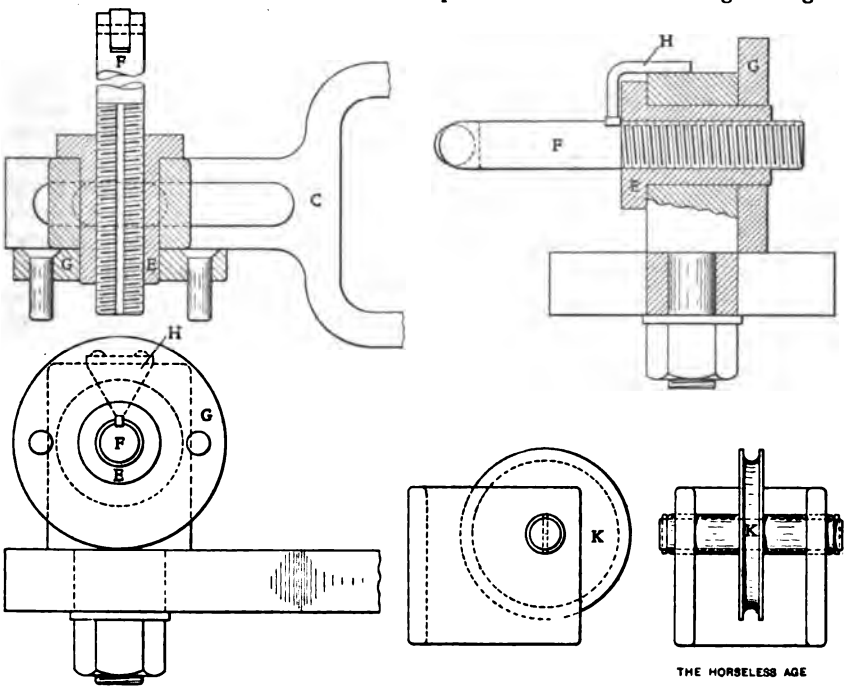
hill has an average gradient of 10 per cent., and a maximum of 27. Only two of the cars found it beyond their powers. The weather was inclement all day long, and in the afternoon there was a strong downpour. The tour concluded with speed trials in the Forstenrieder Park, over a level stretch 3½ miles in length. The best absolute time in these speed trials was made by Willy Poege on a 60 horse power Mercedes, viz., 3:08 minutes, but the performance was judged according to the cylinder volume and type of body, and on this basis the best performance was made by Dr. Stoess, of Zwickau, who drove a 20 horse power Horch car. This is a four cylinder shaft driven car with D. W. F. ball bearings throughout, even on the crank and cam shafts. In compliance with the rules the engine of the Stoess car was measured up by the committee after the performance. This performance decided the winning of the Herkomer trophy. There was considerable dissatisfaction with the method of scoring in the speed trials, as it evidently placed a handicap on the big cars, no account being taken of weight. Owing to the rain the finishing ceremonies in the Forstenrieder Park were less impressive than last year. The following exhibition of the cars that finished was well attended.

Of the 134 contestants who started from Frankfort ninety-eight finished the whole tour, including Percy Pierce, the only American competitor.

Fixtures for Turning Cam Shafts.

In *Der Motorwagen* of May 30 Ernst Valentin describes a set of fittings suitable for turning cam shafts that have the cams formed integral with them, though the same devices may be used for shafts on which the cams are fitted in place. The shafts are roughed out in a turret lathe, such as the Jones & Lamson flat turret lathe, to perhaps one thirty-second inch finished size. The cams are then turned to their exact size by means of the special fittings shown in Figs. 1-4, which are affixed to any ordinary lathe. The fork shaped piece C is fastened to the cross slide of an ordinary strongly built lathe in such a manner that the hardened roller at the end of the screw F comes exactly at the same level as the level of the lathe centre The roller presses against a template fixed to the lathe spindle, which template is an increased reproduction of the curve of the cam. To the lathe carriage is fastened a steel cable, which passes over a sheave K and has a heavy weight attached to its end, which presses roller F against the template. The cutting tool, which positively describes the curve of the cam during each revolution of the spindle, is adjusted by means of nut E and disc G, and the hook H, sliding in a slot in nut E, prevents any rotation of roller F.

In order that the cams of the individual cylinders may be properly spaced angularly (180, 90 or 120 degrees), the spider shown in Fig. 5 is used. A hardened driving pin secured to the face plate or spider of the lathe presses against a hardened surface of the three armed spider, and thus insures very accurate angular spacing of the cams with relation to each other. The illustration shows a spider for turning a cam shaft for a three cylinder motor.



FIGS. 1-4.

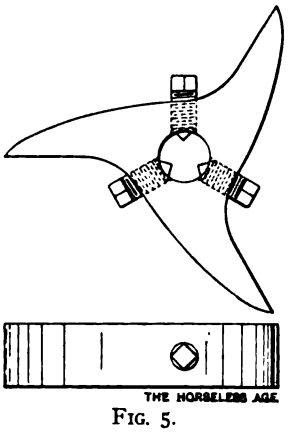


FIG. 5.

The Herrison Change Gear Lever.

The arrangement of the levers usually employed for operating the change speed gear on cars is not without its faults. It takes a considerable period of training before the driver learns to press on the handle of the latch which locks the lever in order to withdraw it from one notch of the quadrant, and immediately release it, that it may enter the next notch. M. Herrison, professor of mechanical engineering at the technical school of Bordeaux, has invented a lever which does not require the same careful manipulation as the ordinary lever and makes it impossible to "jump" a notch.

Referring to the two views of the lever herewith, the latch A enters the notches on the under side of the sector S, under the pressure of the springs R R. The latch is V shaped and embraces the sector, and against the upper ends of the latch rests a pointer D fulcrumed at O, which is acted upon by a coiled tension spring *r* tending to keep it parallel with rod F G. This rod F G carries the pivot O at its lower end and a connecting lug at its upper end, by which it connects to the lever K, formed by two flat pieces held together by bolts through the connecting lug G and a lug on the shifting lever.

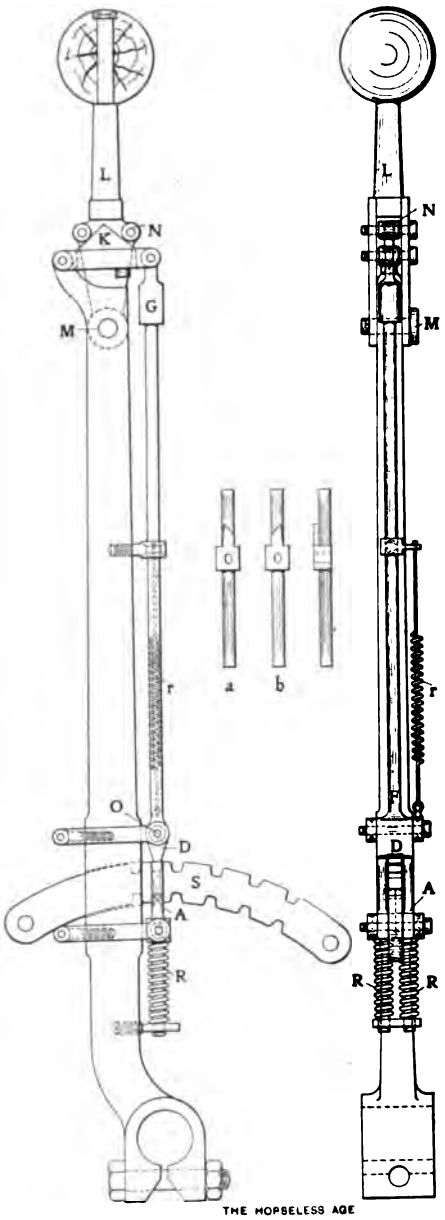
The handle L of the shifting lever is pivoted at M, and by means of steel rollers N N engaging the lever K may depress the rod F G. The sector S, in addition to the notches on its lower edge, into which the latch A may engage, has notches also on its upper edge, into which may engage the end of the pointer D.

The operation of the lever may now be easily understood. Suppose that the speed is to be changed. In pressing on the handle L—it does not matter in what direction—the pointer D is lowered, and, pressing on the upper ends of the V shaped latch A, forces the latter out of the notch in the sector. The shifting lever is now free and moves in the direction in which it is forced by the hand. But the pointer D, while being moved downwardly, engages into one of the notches on the upper edge of the sector, and the end of the pointer is thus held stationary while the lever moves. The result is that the pointer swings around its fulcrum O, against the tension of the spring *r*, and is soon out of contact with latch A. The latter is then only under the control of spring R, and in due time engages into the next notch on the sector S.

The change of gear is thus accomplished, and when the driver releases his hold of handle L it automatically assumes a position in line with the lever owing to the pressure of spring R R, at the same time permitting the pointer D

to resume its normal position, on top of latch A.

In order that the action of the latch may be absolutely certain, no matter what force is brought to bear on the lever, or what its velocity of motion may be, the latch is made of two pieces, *a* and *b*, each of which is formed with an inclined nose, the two noses pointing in opposite directions, and each is operated by a separate spring. During the period that the whole of one of these noses is opposite a notch, it always has time to



THE HERRISON CHANGE GEAR LEVER.

engage into the notch, and therefore is sure to lock the lever. For this reason the driver need not fear jumping a gear, and may press energetically against the shifting lever, thus avoiding noise and battering.—*La France Automobile.*

According to a report of the British consul at Monrovia, the construction of roads and the building of bridges are under consideration in Liberia. It is intended to run motor cars into the rich hinterland.

LEGISLATIVE and LEGAL

The Free Alcohol Law.

The committee of manufacturers formed to assist in securing cheaper alcohol for industrial purposes, 21 William street, New York, informs us that the satisfactory outcome of the movement carried on by them during the past three and one-half years was due to their success in securing the co-operation of the farmers of the country.

"It was only through bringing the influence of the farmers of the entire country to bear directly on their Senators and Representatives," say the committee, "that we were able to overcome the opposition of the antagonistic interests which have so long prevented action by Congress."

The committee will preserve its organization with a view to protecting the interests of the manufacturers affected by this legislation in matters connected with the administration of the law. They will reply to any inquiries for fuller information.

The new law as passed by Congress and signed by the President is in full as follaws:

FIFTY-NINTH CONGRESS, FIRST SESSION.

AN ACT

For the withdrawal from bond, tax free, of domestic alcohol when rendered unfit for beverage or liquid medicinal uses by mixture with suitable denaturing materials.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That from and after January 1, 1907, domestic alcohol of such degree of proof as may be prescribed by the Commissioner of Internal Revenue, and approved by the Secretary of the Treasury, may be withdrawn from bond without the payment of internal revenue tax, for use in the arts and industries, and for fuel, light and power, provided said alcohol shall have been mixed in the presence and under the direction of an authorized Government officer, after withdrawal from the distillery warehouse, with methyl alcohol or other denaturing material or materials, or admixture of the same, suitable to the use for which the alcohol is withdrawn, but which destroys its character as a beverage, and renders it unfit for liquid medicinal purposes; such denaturing to be done upon the application of any registered distillery in denaturing bonded warehouses specially designated or set apart for denaturing purposes only, and under conditions prescribed by the Commissioner of Internal Revenue.

The character and quantity of the said denaturing material and the conditions upon which said alcohol may be withdrawn free of tax shall be prescribed by the Commissioner of Internal Revenue, who shall, with the approval of the Secretary of the Treasury, make all necessary regulations for carrying into effect the provisions of this act.

Distillers, manufacturers, dealers and all other persons furnishing, handling or using alcohol withdrawn from bond, under the provisions of this act, shall keep such books and records, execute such bonds and render such returns as the Commissioner of Internal Revenue, with the approval of the Secretary of the Treasury, may by regulation require. Such books and records shall be open at all times to the inspection of any internal revenue officer or agent.

Sec. 2. That any person who withdraws alcohol free of tax under the provisions of this act and regulations made in pursuance thereof, and who removes or conceals same, or is concerned in removing, depositing or concealing same for the purpose of preventing the same from being denatured under Governmental supervision, and any person who uses alcohol withdrawn from bond under the provisions of Section 1 of this act for manufacturing any beverage or liquid medicinal preparation, or knowingly sells any beverage or liquid medicinal preparation made in whole or in part from such alcohol, or knowingly violates any of the provisions of this act, or who shall recover or attempt to recover by redistillation or by any other process or means, any alcohol rendered unfit for beverage or liquid medicinal purposes under the provisions of this act, or who knowingly uses, sells, conceals, or otherwise disposes of alcohol so recovered or redistilled, shall on conviction of each offense be fined not more than $5,000, or be imprisoned not more than five years, or both, and shall, in addition forfeit to the United States all personal property used in connection with his business, together with the buildings and lots or parcels of ground constituting the premises on which said unlawful acts are performed or permitted to be performed; Provided, That manufacturers employing processes in which alcohol, used free of tax, under the provisions of this act, is expressed or evaporated from the articles manufactured, shall be permitted to recover such alcohol and to have such alcohol restored to a condition suitable solely for reuse in manufacturing processes under such regulations as the Commissioner of Internal Revenue, with the approval of the Secretary of the Treasury, shall prescribe.

Sec. 3. That for the employment of such additional force of chemists, internal revenue agents, inspectors, deputy collectors, clerks, laborers and other assistants as the Commissioner of Internal Revenue, with the approval of the Secretary of the Treasury, may deem proper and necessary to the prompt and efficient operation and enforcement of this law, and for the purchase of locks, seals, weighing beams, gauging instruments, and for all necessary expenses incident to the proper execution of this law, the sum of $250,000, or so much thereof as may be required, is hereby appropriated out of any money in the Treasury not otherwise appropriated, said appropriation to be immediately available.

For a period of two years from and after the passage of this act the force authorized by this section of this act shall be appointed by the Commissioner of Internal Revenue, with the approval of the Secretary of the Treasury, and without compliance with the conditions prescribed by the act entitled "An act to regulate and improve the civil service," approved January 16, 1883, and amendments thereof, and with such compensation as the Commissioner of Internal Revenue may fix, with the approval of the Secretary of the Treasury.

Sec. 4. That the Secretary of the Treasury shall make full report to Congress at its next session of all appointments made under the provisions of this act, and the compensation paid thereunder, and of all regulations prescribed under the provisions hereof, and shall further report what, if any, additional legislation is necessary, in his opinion, to fully safeguard the revenue and to secure a proper enforcement of this act.

Electric Vehicle Patent Infringement Suit.

INDIANAPOLIS, Ind.—An infringement suit has been brought by Robert Hassler against the Pope Motor Car Company in the Federal court here, alleging infringement of patent and asking damages equal to the benefits derived by the defendant company from the alleged infringement. The answer in the case has just been filed, and in it it is contended that the improvement was invented while the plaintiff was employed by the defendant, during his regular hours of employment, and with the tools of the defendant company, and that it had been one of his paid duties at the factory to design improvements for the goods manufactured at the plant.

It further is alleged in the answer that prior to August of 1903, a month before Hassler resigned, he had made no demand for any compensation for the use of his improvement, and had given no intimation that he had applied for a patent for his improvement or contemplated applying for a patent. The defendant says that because of these alleged facts it has an irrevocable license to use the improvement.

Mr. Hassler was formerly engineer of the Waverley branch of the Pope Motor Car Company, and is now connected with the Marion Motor Car Company.

Automobile Law Readopted.

WINCHESTER, Va.—For the second time the board of supervisors of Frederick

County, Virginia, have adopted the Byrd automobile law, controlling the operation of automobiles in this county. The law did not become effective until June 13, and as a result the first action of the board in adopting the law was null and void.

New York Automobile Dealers Want Larger Commissions.

On the evening of June 21, at the Hotel Empire, New York, a conference was held in which twenty-six automobile concerns took part. This meeting was called to discuss ways and means of obtaining from the manufacturers a more liberal commission than is at present allowed. The consensus of opinion was that the New York dealers should be accorded more than a 20 per cent. commission, as it was pointed out that their expenses were very much larger than those of dealers in other parts of the country. It was brought out by one of the speakers that the New York agents did the most important advertising and bore the largest expense in entering competitions, the benefit of which was also reaped by the other agents and by the manufacturers without cost to them; that the success or failure of a particular make of car in this portion of the country was largely affected by its reputation in the metropolis.

A representative of a branch house declared that to pay commissions to chauffeurs and others introducing customers was bad policy, but it was also pointed out that it was almost impossible to get around paying such commissions. Several of the dealers were eager to enter into an agreement not to pay such commissions and publish this fact by advertising and by placing printed signs in their shops.

Another prominent dealer said that it was undeniable that in the past three years the expenses of doing business had increased at least twofold, while the commissions remained the same. Salesmen used to command from $15 to $17 per week and a 3 per cent. commission, and now they receive from $25 to $50 per week and 5 per cent. commission. He also said that mechanics' wages have advanced from $18 to $30, and that rents had increased anywhere from 100 to 200 per cent. It was also stated that although there are many more horse drawn vehicles sold in this city than automobiles, this trade was handled by from five to six concerns, while there were at least eighty representatives handling the numerous makes of automobiles; that the commission of 20 per cent. for automobile dealers was much less than that received by carriage dealers. The result of this condition of affairs, it was stated, makes it necessary for the dealer to overcharge on repair work in order to make a reasonable profit, and this is detrimental to the growth of the industry. The automobile trade is also peculiar in that there are long continued slack periods, during which the expenses remain the same.

To sum up, it was agreed by nearly all that under the conditions existing in the metropolis a reasonable profit on the money invested could not be made, and that if the situation was properly placed before the makers they would see the justice of the demands of the New York dealers for a larger discount. Acting on this, the chairman was directed to appoint a committee to confer with the makers informally, and to suggest at a future meeting some suitable course of action.

Gasoline Illegally Stored in Chicago.

It was accidentally discovered a few days ago that nearly all of the garages on Automobile Row, Chicago, had their gasoline storage tanks buried under the streets, sidewalks and alleys, contrary to the city ordinance prohibiting the storage of gasoline on public property. Superintendent of Streets Doherty reported that these tanks had either been constructed under fraudulent permits or without the knowledge of the city. It was estimated that more than 5,000 gallons was thus illegally stored on public property.

Last Saturday afternoon Superintendent of Streets Doherty and a force of twenty-five men began removing the tanks from their illegal locations, and as a consequence a number of Chicago garages were without motive fuel last Saturday night. Six tanks were uncovered during the afternoon. Several garage keepers dug up their tanks themselves rather than pay the city for doing it.

The first place visited was the White garage, 240 Michigan avenue. Here it was necessary to put five men to work, as the tank was built into a 24 inch concrete compartment and walled in by brick.

The capacity of this tank is 300 gallons. A Standard Oil wagon was summoned, into which nearly 150 gallons of gasoline was pumped from the tank.

The following violators in Automobile Row had their tanks uncovered and ordered removed:

Pardee-Ullman Company, 1218 Michigan avenue, 300 gallons.

Orlando F. Weber Company, 1320 Michigan avenue, 100 gallons.

Oldsmobile Company, 1328 Michigan avenue, 300 gallons.

Electric Vehicle Company, 1332 Michigan avenue, 280 gallons.

William Herrick Company, 1344 Michigan avenue, 300 gallons.

At Hubert's garage, 295 North State street, preparations were made quietly to remove the oil tank from the alley to a neighboring vacant lot ,but Building Commissioner Bartzen was informed of it and he ordered the police to stop the work at once.

Superintendent Doherty notified Commissioner Bartzen where tanks are on private property, and the commissioner is preparing to investigate them and see that only 50 gallons of gasoline are kept in the buildings, and that it is properly protected.

Manchester (N. H.) Hill Climbing Contest.

The Granite State Automobile Club of Manchester, N. H., held a hill climbing contest in that city on Saturday, June 23. Very unfavorable weather conditions detracted very seriously from the number of contestants who actually participated. A torrential rain commenced several hours before the scheduled time of the contest, and continued up to the starting time, many of the cars being sent away in a drizzle. A number of the entrants decided not to start on account of the rain and the washed and heavy condition of the course, and thus several of the events had to be cancelled. The contest was rather a friendly affair, being confined to the members of the club, and the participation of professional racers and special high powered racing cars was not sought. Under the circumstances no sanction of the contest was secured, the club considering that no real advantage would accrue to it in consideration of the money paid for this purpase.

The course upon which the contest was held is 1.33 miles in length, and involves a total rise of 270 feet, or an average gradient of about 4 per cent. The maximum grade is 12 per cent. The course follows Bridge street for several blocks at a gradient of about 8 per cent., and thence turns at a sharp angle by a parkway, through Derryfield Park, thence following the boulevard at a moderate gradient for a considerable distance and ascending by a roadway, involving grades from 5 to 12 per cent., to the observatory which marks the summit of the hill. The course is quite winding, but is a safe and good one.

On account of the very heavy condition of the roads, no very fast time was made. The timing was effected by official timers provided with stop watches, one of whom accompanied each car over the course. The police detail was ample to properly patrol the course, the rain preventing a large crowd from gathering. The list price method of classifying the cars was adopted, and ribbons were presented to the winners. The following are among the events run:

EVENT No. 2—CARS LISTED AT NOT LESS THAN $800 NOR MORE THAN $1,350.

No. 1—P. M. Robinson, 22 horse power Buick, 6m. 52s.

No. 2—Dr. Frederick Perkins, 18 horse power Rambler, 9m. 1s.

No. 3—Brodie Electric Company, 16 horse power Wayne, 11m. 49½s.

No. 4—M. E. Prescott, 16 horse power Reo, 12m. 58s.

EVENT No. 3—CARS LISTED AT NOT LESS THAN $1,350 NOR MORE THAN $2,000.

No. 1—G. M. Wetherbee, 24-28 horse power Crawford, 6m. 14½s.

No. 2—G. M. Wetherbee, 24-28 horse power Crawford (second car), 6m. 15¾s.

EVENT No. 5—CARS LISTED AT $3,000 OR OVER.

No. 1—C. M. Floyd, 50 horse power Thomas, 7m. 28s.

No. 2—W. F. Harrington, 30 horse power Toledo, 8m. 45s.

EVENT No. 7—OPEN TO ALL GASOLINE CARS.

No. 1—C. M. Floyd, 50 horse power Thomas, 4m. 45s.

No. 2—Byron Chandler, 34 horse power Peerless, 5m. 10s.

No. 3—Dr. A. E. Brownrigg, 20-25 horse power Pope-Hartford, 5m. 36½s.

No. 4—W. F. Harrington, 30 horse power Toledo, 5m. 45s.

The contest was under the management of President George A. Campbell, Secretary Edward H. Fogg and Albert L. Clough. Harry E. Loveren acted as clerk of the course. The club is considering the holding of another climb at a later date, when it is to be hoped more favorable weather conditions may be enjoyed.

Progress of Arrangements for Glidden Tour.

The entries for the Glidden tour, in addition to those already published, are as follows:

No. 15—William E. Wright, care of Knox Automobile Company, Springfield, Mass. Knox car of 35-40 horse power. Five in party. Springfield A. C.

No. 16—Robert B. Craufurd, Hotel Marie Antoinette, New York city. Stevens-Duryea car of 50 horse power. Five in party. A. C. of A.

No. 17—Henry Paulman, 1321 Michigan avenue, Chicago, Ill. Pierce Great Arrow car of 40-45 horse power. Five in party. C. A. C.

No. 18—Hart D. Newman, New Orleans, La. Packard car of 24 horse power. Four in party. New Orleans A. C.

The baggage wagon offered by the Knox Automobile Company, of Springfield, Mass., and the patrol car offered by the Packard Motor Car Company, of Detroit, have been accepted by the committee. The patrol car is one of two that will be placed at stated intervals along each day's run for the use of checkers, who will note the hour and minute that each car passes them.

Changes have been made in the rules to provide for this system of checking. Each entrant will be penalized one point for each minute he is behind time, and two points for each minute he is ahead of time, at each checking point. On most of the day's runs there will be three checkers, dividing the regularity record into four portions as nearly equal as possible. The regularity record will thus be based on the normal running of the cars for about forty-six sections, approximating 20 to 30 miles each.

All checkers will have their watches compared with the watches used by the garage officials, who pass the cars out in the morning and receive them at night, and thus the exact elapsed time in each checking section will be accurately kept.

Under this system it is believed that it will not be possible for any car to make what has been often called "a perfect score." The results will show the actual relative position of the car with regard to their running to schedule.

The entire route of the tour from Buffalo to Bretton Woods will be marked with confetti, the committee having contracted for 3,000 pounds, which is now being shipped to the various night stops. In addition arrangements are being made for a complete system of baggage checking by the touring management, and the entire capacity of all hotels along the line has been reserved. It will not be necessary for any participant in the tour to make his own hotel reservations, as this will be attended to in detail by a special official sent about a week ahead of the tour to complete arrangements. Many offers of entertainment from automobile clubs in the cities and towns where the tourists will stop over night have been received.

A complete guide book for the tour, containing running directions, final revisions of the rules and full information, is now being prepared and will be ready for distribution next week.

The Albany A. C.'s Annual Tour.

The third annual tour of the Albany A. C. started from the Albany City Hall at 9 o'clock last Thursday. The party consisted of fifty-six persons, of whom twelve were women. The automobiles numbered twenty-one, of all types, from a runabout up to the big 45 horse power touring cars.

The first day's journey ended at Rutland, where the night was spent. The second day brought the tourists to Keene, N. H., and the third stage to Boston, where Sunday was spent. Last Monday they proceeded to Springfield, and Tuesday they finished at Albany.

Automobiles Purchased for Military Manœuvres.

BY CAPT. F. P. AVERY, U. S. A.

The Quartermaster General has placed an order for three touring cars—a steamer, an air cooled car and a water cooled car—to be delivered by July 20, and to be used in the coming military manœuvres. A 4 ton air cooled truck has also been purchased, which will be sent to Mt. Gretna, Pa., for camp duty as soon as received.

This action will be instrumental in revealing the advantages and defects for military service of the motor cars at present manufactured in the United States. One of the Quartermaster General's aides helped bring about this action by sending the following letter:

WAR DEPARTMENT,
OFFICE OF THE QUARTERMASTER GENERAL,
WASHINGTON, June 14, 1906.

GENERAL—In view of the very general use of automobiles in connection with military operations and the obvious advantages that such means of transportation will have when armies are operating in territory where automobiles can be made use of, I have the honor to recommend that this department purchase three strong, high powered automobiles to carry not less than four passengers each and a driver. One of each of the following types:

1. One of the steam driven variety.
2. One air cooled motor of the explosive hydrocarbon type.
3. One with water cooled motor of the hydrocarbon explosive type.

Electric motors are not considered in the recommendation, for the reason that no facilities exist in the military service for charging the batteries with the frequency required.

The very general use that is made of motor cars and automobiles in the military service, as well as in civil life, all over the world, would seem amply to justify this small expenditure for the purpose of determining as far as practicable in time of peace the value of such vehicles for war.

It is believed that it would be advantageous to provide these cars in time to be used in connection with the manœuvres to take place during the coming autumn, if the Quartermaster General so wishes.

It is thought, however, that the three cars ought not to be distributed to different parts of the country, but that they should all be used at the same station in order that proper comparisons under the same conditions can be made, with a view to arriving at a decision as to the best types of vehicle offered for the army use, provided it should later be decided that such means of transportation possessed merit and would be of distinct use in military operations.

The Pass Over the Simplon.

The pass over the Simplon was conditionally opened to automobile traffic on June 25. Only duly authorized chauffeurs holding permits will be allowed to make the journey. No crossing of the pass by night will be allowed. Before traversing the pass notification must be made to the gendarmerie of Brigue on the Swiss side or to the gendarmerie of Gordo on the Italian side, who will give the applicants permits, on which the rules and conditions are printed. No automobiles will be allowed to cross the Simplon in less than four hours and a half, speed to be checked by officials at places en route.

Dealer's Commission.

A prominent manufacturer writes that the reason why many dealers do not make money is that they do not maintain prices, not even in New York city; moreover, many dealers run their places of business in an expensive way, their establishments lacking business organization. He knows men in the retail selling business who had hardly a dollar a few years ago, but who today are independent, and many others who have made more than a living.

On the occasion of the marriage of King Alfonso, of Spain, in Madrid recently, Spanish automobilists organized an automobile corso in honor of the royal couple. The procession consisted of 131 vehicles, and was led by S. Fernandez Duro. At the Palais Royal, King Alfonso in his 50 horse power car took the lead of the procession.

The fire department of the Paris Municipal Service has recently been provided with a motor ambulance, consisting of a special body designed by one of the fire chiefs, mounted on an 18 horse power Panhard chassis. The ambulance is to be used for the quick transportation of firemen (and presumably others) injured at a fire.

MINOR MENTION



President Diaz, of Mexico, has purchased 40 horse power Haynes car.

We have received a copy of a book of instructions entitled "How to Run the Ford Model K."

The A. C. of Iowa will hold a hill climbing contest on Indianola avenue hill, Des Moines, July 4.

Boston automobilists gave the orphans in city institutions an outing, June 26, at Houghton's Pond, Milton.

Huber Automobile Company, Detroit, Mich., will soon put on the market a 30 horse power sightseeing car.

The C. R. Wilson Body Company, of Detroit, are building 5,000 bodies for the Ford four cylinder runabout.

Century Auto Power Company, East Orange, N. J., will change their corporate name to the Kerosteam Company.

C. M. Ferrin, agent for the Northern cars in New Hampshire and Vermont, with headquarters at Concord, N. H., died recently.

A contract has been let for the construction of new machine shops and office building of the Western Motor Company, Logansport, Ind.

Dugald Clerk, of London, will sail for America early in July to testify for the plaintiffs in the Selden patent litigation. He is one of the best authorities on gas motors.

In reply to an inquiry in our columns recently, J. D. Teeter, 4007 North Eleventh street, St. Louis, Mo., informs us that he has all the patterns and can supply any repair parts for the J. A. Scott gasoline motor.

The Mitchell Motor Company, of New York, has succeeded to the business of the Mitchell Commercial Vehicle Company, formerly at 121 West Thirty-first street, New York. The new company is located at 1787 Broadway.

The new bridge over the Raritan River, between Perth Amboy and South Amboy, N. J. has been opened to the public. This will make the route to Jersey shore resorts 33 miles shorter.

The selectmen of the town of Leicester, Mass., famous for its constable traps, have voted not to allow reckless driving or excessive speeding this summer, but so long as motorists manifest a spirit of fairness they will be met in the same spirit.

We learn that the recent hill climbing competition of the Midland A. C. of Birmingham, England, was won by an 18 horse power White steamer from a field of thirty-four competitors, including gasoline cars of as high as 60 horse power.

The *American Machinist* of May 14 contains a description of "The Electrical Equipment of the Olds Gas Power Company, of Lansing, Mich." At this plant the power obtained from engines being "run in" and tested is used for operating the machine shop.

We have received a copy of a statement issued by Henry Ford to the effect that the recent action of Judge Lacombe against John B. Trevor, in contempt of court proceedings, has no bearing on the validity of the Selden patent.

After July 1 the Northern Manufacturing Company will be known as the Northern Motor Car Company. No changes in capitalization, officers or policy of the concern will be made. The company are contemplating building a large extension to their plant.

The Welch Motor Car Company, Pontiac, Mich., have leased the factory formerly occupied by the Freeman Stamping Company on South Saginaw street, opposite the Welch plant. Machinery will be installed at once and the capacity of the Welch plant considerably increased.

According to John L. Poole, of the Aerocar Company, there is a big demand for air cooled cars in Norway, Sweden, Denmark, Russia and Germany. Russia is a great field for the sale of automobiles, and will be a still greater one when the present political disturbances have quieted down.

A feature of the clubhouse being erected by the Indiana Motor Club of White City, near Indianapolis, will be an up to date garage for the use of club members and their friends. It will accommodate about twenty-five cars at a time, and will be placed in the charge of expert mechanics.

The roadway leading from Indianapolis to Broad Rippie Park on the north will be oiled during this summer. The roadway is 8 miles long, and the work will be an experiment, the estimated cost of $150 a mile to be borne by a subscription raised among the automobile dealers and owners of Indianapolis.

W. I. Fickling has purchased the entire interest of the Automobile Cover and Top Manufacturing Company, 154 East Fifty-seventh street, New York. The plant is being enlarged to accommodate painting and repair jobs on automobiles, together with all kinds of limousine, tonneau and automobile body work.

The third annual orphans' outing of the Worcester Automobile Club was held on June 23, forty-six cars belonging to members of the club participating. Two hundred and fifty of the city's orphans were guests of the club for the day. A halt was made at Pinehurst, where the different places of amusement were throw open to the children. M. P. Whittall was in charge of the outing.

Percy Pierce, of Buffalo, who went abroad for the purpose of driving his 40-45 Pierce in the great European touring contests, has been placed at the head of the list of contestants who received honorable mention for their performances in the recent Herkomer tour. This news arrived here Monday, but there was no information as to whether or not Mr. Pierce would try to win the Glidden trophy again this year.

Commissioner Hunter, of the Pennsylvania State Highway Department, has decided to use a portion of the revenue derived from automobile licenses to experiment with the various devices for keeping down dust on public roads. These experiments will be conducted the next thirty days on the public roads in the vicinity of the commissioner's home at Jenkintown.

The new automobile factory of the White Sewing Machine Company at Cleveland is nearing completion, and will be ready for the installation of machinery by July 1. The building is over 600 feet in length, with a "sawtooth" roof, giving ample light. It is of steel, cement and fireproof construction, and underneath each department is a subcellar, where will be stored the material and parts for that particular department.

Szisz Leads in Grand Prix.

François Szisz and his 105 horse power Renault upheld the supremacy of the French constructors, June 26, at Le Mans, France, in the first half of the Grand Prix of the A. C. of France over the Sarthe circuit. He completed the six rounds of the 62 mile course in 5 hours 45 minutes and 30 seconds, having traveled the 372 miles at an average speed of 107 kilometers (66.4 miles) per hour.

Albert Clement, the young son of the builder of the 125 horse power Bayard-Clement he drove so skillfully, finished in second place, his time being 6 hours 11 minutes and 40 3-5 seconds

Nazzaro, of Italy, who did so well for his country in last year's race for the Coupe Internationale, when he finished second to the great Théry, overshadowed his more famous compatriot, Lancia, by finishing in third place with his 135 horse power Fiat in 6 hours 26 minutes 5 3-5 seconds. Elliot F. Shepard, of New York city, was fourth with a 125 horse power Hotchkiss as a representative of France in 6 hours 30 minutes. His fastest circuit of the course was the fourth, which he made in 57 minutes 45 1-5 seconds. The following finished behind the leading quartet in order named: Barilier, 110 horse power Brasier, France, fifth; Richez, 105 horse power Renault, France, sixth; Dr. Weillschott, 135 horse power Fiat, Italy, seventh; Teste, 130 horse power Panhard, eighth; Lancia, 135 horse power Fiat, Italy, ninth; Hemery, 125 horse power Darracq, France, tenth; Rigoly, 100 horse power Gobron, eleventh; Mariaux, 120 horse power Mercedes, Germany, twelfth; Baras, 110 horse power Brasier, France, thirteenth; Duray, 130 horse power Lorraine-Dietrich, France, fourteenth; Piery, 110 horse power Brasier, France, fifteenth; Jenatzy, 120 horse power Mercedes, Germany, sixteenth, and Rougier, 130 horse power Lorraine-Dietrich, France, seventeenth.

Garage Notes.

F. A. Furbush will open a garage at Rumford Falls, Me.

R. R. Lamberson will open a garage at Ballston Spa, N. Y.

J. V. Dowd, Jr., has opened a garage at Ballston Spa, N. Y.

Dr. W. H. Eggleston has opened a garage at Warsaw, Ind.

P. L. Gregoire is building a garage in Varnum avenue, Lowell, Mass.

C. H. Winn is planning to erect a garage on South street, Peekskill, N. Y.

The Dudley Auto School Company have opened a garage at 250 Main street, Marlboro, Mass.

John S. Duer has purchased the agency and garage business of Scott & Powers, Hastings, Neb.

The Times Square Automobile Company's garage, 164 West Forty-sixth street, New York, was damaged by fire June 20.

Sid Black will open a new garage on Walnut street, near Seventh street, Cincinnati, in addition to his Ninth street garage.

A garage is being erected for the Huntsman-Shelden Auto Company, El Paso, Tex., of which J. L. Lawrence is the manager.

H. Paulman & Co., 1312 Michigan avenue, agents for the Pierce Arrow car, will move to their new building at 1432 Michigan avenue on August 1.

The Gibson Automobile Company, Indianapolis, Ind., are preparing to enlarge their garage to about twice its present area. The building will be done in the early fall.

Sears Brothers' automobile repair shop at Indianapolis, Ind., which was recently partially destroyed by an explosion of gasoline, has been repaired and is now open.

The Colorado Automobile Company, Denver, Col., has been sued for $8,000 damages because William Earl, a laundryman, was run down and injured by one of their automobiles.

Jordan & Davis, real estate dealers, are to erect a garage at Granby and Tenth streets, Norfolk, Va., this summer. It will have 5,000 feet floor space, and will cost $3,500.

S. S. Smith, one of the agents appointed by the New Jersey Department of Motor Vehicle Regulations and Registration, conducts a garage on St. George avenue, Rahway, N. J.

W. S. Morton and H. R. Simonetti have purchased the business of the Kline Automobile Company, 12-14 North River avenue, Harrisburg, Pa., and will continue the business under the same name.

The C. P. Warner & Co. have consolidated with the Twentieth Century Motor Car Company, and will do business under the name of C. P. Warner & Co. at 1421 Michigan avenue. Mr. Warner states that they will conduct an automobile livery, and act as local agents for the Grout, Moline and Crawford cars.

Trade Literature Received.

Knox Motor Truck Company, Springfield, Mass.—Circular, "Atlas Gasoline Trucks."

The C. H. B. Blomstrom Motor Company, Detroit, Mich.—Booklet, "The Queen, Model K."

The Duff Manufacturing Company, Pittsburg, Pa.—Catalogue, "The Duff Geared Ratchet Screw Jacks."

Orlando F. Weber Company, 1322-26 Michigan Avenue, Chicago, Ill.—Booklet, "Weber Service, a Square Deal."

Joseph Dixon Crucible Company, Jersey City, N. J.—Booklet, "Unions for Steam Pipes," by W. H. Wakeman, an expert steam engineer. (Reprinted from *Graphite*.)

H. W. Johns-Manville Company, 100 William Street, New York.—Booklets, "Asbestos Fire Felt Covering," "Tests and Practical Data Showing Economy in Transmitting Steam by the Portland Sectional Conduit System," "Coverings for High Pressure and Superheated Steam Plants," "Roofing Reasons as Applied to 'J-M' Asbestos Roofing," "Asbestocel Covering for Heating Systems," "Keystone Hair Insulator," etc.

Trade Personals.

H. A. Gill is to be the new general manager of the Autocar Company, Ardmore, Pa., instead of George R. Bidwell, as previously reported.

Max J. Helmes, M. E., formerly assistant manager of the Mack Brothers Motor Car Company, Allentown, Pa., will sail for Europe early in July.

Warren Noble, of London, England, an automobile manufacturer, with a large factory at Coventry, is in this country studying American methods of automobile manufacturing.

Raymond J. Youngblood, for some time connected with the Soules Motor Car Company's Detroit branch, has become associated with the Fisk Rubber Company's branch in that city.

New Incorporations.

Standard Motor Truck Company, Pittsburg, Pa.—Capital stock, $10,000.

Detroit Auto Sight Seeing Company, Detroit, Mich.—Capital stock, $15,000.

The Trenton Auto and Transit Company, Trenton, N. J.—Capital, $50,000. Incorporators, John M. Murray, Charles F. Weik and Charles D. Clayton.

The Triumph Automobile Company, Sandusky, Ohio.—Capital stock, $12,000. Incorporators, Leverette L. Curtis, Christian A. Rittman, John Whiteworth, Arthur M. Spore and Byron A. Crosier.

The Toledo Repair and Fittings Company, Toledo, Ohio.—Capital, $10,000. Incorporators, John V. Todd, Geo. R. Jaynes, Wm. F. Rabdone, Ed Beardsley and Mark Winchester, to repair and vulcanize automobile tires, handle fittings for automobiles and launches and deal in marine motors.

Central Automobile Exchange and Supply Company, St. Louis, Mo.—Capital stock, $10,000. Incorporators, Charles W. Shevlin, John W. Shevlin, Hy. H. Artz, Sylvanus Shevlin. General business in selling automobiles and maintaining repair shop.

Williams Automobile Company, Akron, Ohio.—Capital stock, $1,000,000, to manufacture automobiles under Williams patents. Incorporators, Harry Williams, George W. Phillips, Edward M. Grantham, Harvey Musser, Henry Robinson and John F. Townsend, all of Akron.

New Agencies.

Abilene, Tex.—Spalding Brothers, Queen cars.

Buena Vista, Col.—A. E. Wright, Jr., Reo and Moline cars.

Cleveland, Ohio.—H. S. Moore, 160 Crawford road, Queen cars.

Newark, N. J.—A. H. Humphreville, 237 Halsey street, Elmore cars.

Battle Creek, Mich.—American Motor and Cycle Company, White car.

St. Louis, Mo.—MacNish Auto Company, 3667 Olive street, Queen cars.

Marlboro, Mass.—E. E. Moore, the Lambert car; F. S. Dewey, the Buick; La France Auto Repair and Supply Company, the Maxwell.

Patents Issued June 12, 1906.

822,900. Lubricator.—John F. McCanna, Chicago, Ill. Original application filed June 15, 1903. Divided and this application filed December 1, 1905.

822,989. Nut Lock.—Clayton M. Schooley and Oden N. Casey, Leesburg, Va., assignors of thirty-five one-hundredths to said Schooley, fifteen one-hundredths to said Casey, and one-half to Julian H. Grubb, Leesburg, Va. Filed June 20, 1903.

822,996. Water Cooling Apparatus.—Arthur P. Smith, Springfield, Mass. Filed February 24, 1903.

823,016. Cooler.—Adolph P. S. Wohlpart and Philip Wohlpart, New York, N. Y. Filed August 11, 1905.

823,083. Roller Bearing.—William H. Russell, Douglastown, Canada. Filed April 27, 1905.

823,089. Repair Device for Tires.—John R. Vosburgh, Johnstown, N. Y. Filed December 7, 1905.

823,093. Wheel Rim.—Harry B. Williams, New York, N. Y. Filed February 3, 1905.

823,115. Muffler.—Benjamin A. Gramm, Chillicothe, Ohio. Filed December 8, 1905.

823,163. Headlight Control for Automobiles.—Jacob S. Detrick, Baltimore, Md. Filed September 9, 1905.

823,178. Frictional Power Transmission Mechanism.—Ivert Larsen and Robert Hardie, Chicago, Ill. Filed November 17, 1905.

823,185. Air Valve for Gas Engines.—Reuben Miller, Jr., Pittsburg, Pa., assignor of one-half to D. W. Dunlevy, Pittsburg, Pa. Filed January 2, 1905.

823,347. Valve Gear for Explosive Engines.—Albert C. Menges, Grand Rapids, Mich., assignor to William Harrison, Grand Rapids, Mich. Filed December 23, 1904.

823,369. Speed Gearing.—Frederick W. Schroeder, London, England. Filed October 1, 1903.

823,384. Spring Wheel.—Georgette Bardet, St. Leu-Taverny, France. Filed November 13, 1905.

823,450. Gas Engine.—Benjamin F. Stewart, Chicago, Ill. Filed February 10, 1905.

823,454. Vehicle Wheel.—Willard S. White, Chattanooga, Tenn. Filed July 29, 1905.

823,485. Carburetor for Explosive Engines.—William J. Steinbrenner and Godfried J. Mayer, Buffalo, N. Y., assignors of one-third to William H. Kreinheder, Buffalo, N. Y. Filed March 1, 1905.

823,487. Speed Changing Mechanism.—Charles C. Williams, Cleveland, Ohio, assignor, by direct and mesne assignments, of one-half to George E. Harbaugh and one-half to Webster F. Traver, Cleveland, Ohio. Filed January 16, 1904.

Patents Issued June 19, 1906.

823,522. Controlling Mechanism for Automobiles.—Benjamin A. Gramm, Chillicothe, Ohio. Filed November 17, 1905.

823,524. Differential Gear Casing.—Emmet P. Gray, Cincinnati, Ohio, assignor to Gray Manufacturing Company, of Detroit, Mich., a corporation of Michigan. Filed January 2, 1904. Renewed February 19, 1906.

823,529. Spring Wheel.—Edward V. Hartford, New York, N. Y., and August W. Scheuber, Hoboken, N. J., said Scheuber assignor to said Hartford. Filed June 22, 1905.

823,598. Valve for Acetylene Gas Generators.—Isaac W. Higgs and Hokon Hoyoss, Chicago, Ill., assignors, by mesne assignments, to Home Carbide Gas Company, Chicago, Ill., a corporation of South Dakota. Filed August 8, 1902.

823,608. Carbureter for Explosive Engines.—Jean B. D. M. Malezieux, Paris, France. Filed July 18, 1904.

823,677. Acetylene Generator.—Eugène Fonbonne, Antwerp, Belgium. Filed November 10, 1905.

823,680. Tire Cover.—John P. Gordon, Columbus, Ohio. Filed January 2, 1906.

823,742. Carburetor Control Mechanism for Motor Vehicles.—Charles Schmidt, Detroit, Mich., assignor to Packard Motor Car Company, Detroit, Mich., a corporation of West Virginia. Filed March 10, 1905.

823,811. Automatic Circuit Making and Breaking Device for Automobiles and the Like.—Andrew L. Riker, Bridgeport, Conn., assignor to the "Locomobile" Company of America, New York, N. Y., a corporation of West Virginia. Filed October 8, 1903.

823,829. Shock Absorber.—Oscar E. Vestal, Pittsburg, Pa. Filed August 24, 1905.

823,839. Tire.—William N. Wright and Elmer Carson, Beaver, Pa. Filed April 25, 1905.

823,876. Nut Lock.—William N. Keen, Avita Springs, La., assignor of one-half to Ph. Hanebrough, Avita Springs, La.

823,938. Wheel.—Matthew Dixon, Long Island City, N. Y. Filed July 29, 1905.

824,041. Implement for Putting on Pneumatic Tires.—Philip F. Pilliner, Philadelphia, Pa. Filed November 9, 1905.

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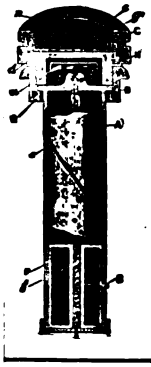
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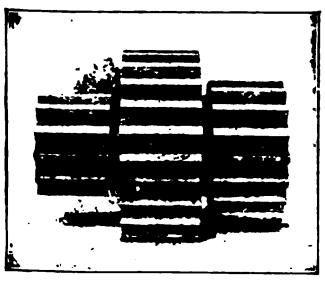
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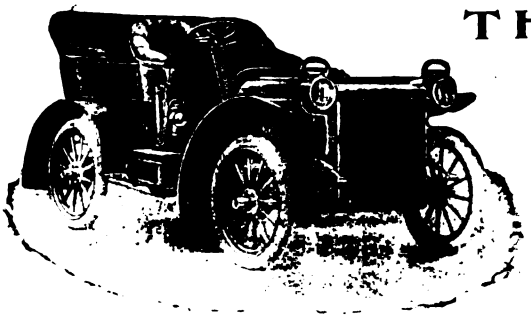
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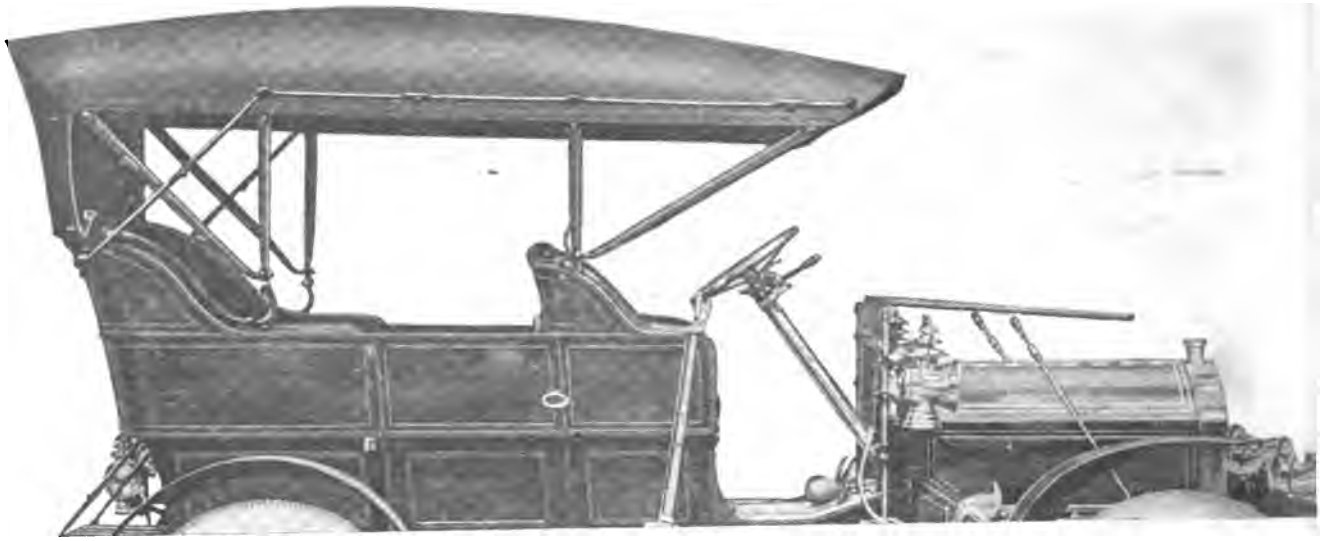
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The greatest obstacle to the ownership of an auto to many people is the cost of maintaining, not the ordinary garage charges, but the far greater expense of repairs, adjustments and the like. Even if you do not mind the cost of these, the annoyance and delay when a car breaks down take away from the pleasure of operating it.

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Baltimore, Md	Southern Auto Co., 2021 Maryland Ave.
Boston, Mass	J. W. Maguire Co., 745 Boylston St.
Buffalo, N. Y	The George N. Pierce Co., 752 Main St. (Retail.)
Chicago, Ill	H. Paulman & Co., 1321 Michigan Ave.
Denver, Colo	The George N. Pierce Co., 1643 California St.
Detroit, Mich	J. P. Schneider, 189 Jefferson Ave.
Geneva, N. Y	J. A. Place.
Hartford, Conn	The Miner Garage Co., 120 Allyn St.
Houston, Tex	Hawkins Auto & Gas Engine Co.
Kansas City, Mo	E. P. Moriarty Co., 1612 Grand Ave.
Los Angeles, Calif	Bush & Burge, cor. Seventh & Main Sts.
Louisville, Ky	The Zorn-Strauss Co., Inc.
Milwaukee, Wis	Hibbard Automobile Co.
Montreal and Ottawa	Wilson & Co., 142 Bank St.
New York, N. Y	Harrolds Motor Car Co., B'way, 58-59th Sts.
Oakland, Calif	The George N. Pierce Co., 1018 Clay St. (Wholesale.)
Philadelphia, Pa	Foss-Hughes Motor Car Co., 201 N. Broad St.
Pittsburg, Pa	Banker Bros. Co., Baum & Beatty Sts.
Portland, Me	J. A. Dowling.
Portland, Ore	Covey & Cook Motor Car Co.
Providence, R. I	The Shepard Co.
Rochester, N. Y	U. S. Automobile Co., 21 Plymouth Ave.
St. Louis, Mo	Western Auto Co., 4701 Washington Blvd.
St. Paul, Minn	C. P. Joy Auto Co., 868 Minnesota St.
San Francisco, Cal	Mobile Carriage Co., Golden Gate Ave. & Gough St.
Saratoga Springs, N. Y	W. L. Hodges, 16 Woodlawn Ave.
Scranton, Pa	Standard Motor Car Co.
Seattle, Wash	Broadway Auto Co.
Sheffield, Pa	C. H. Smith Co., Ltd.
Springfield, Mass	E. H. Clark Auto Co. 117 Lyman St.
Syracuse, N. Y	Amos-Pierce Auto Co., 109 S. State St.
Titusville, Pa	A. E. Lambert.
Toronto, Ont	Auto & Supply Co., Ltd., 24 Temperance St.
Troy, N. Y	Troy Auto Exchange, 22 Fourth St.
Utica, N. Y	Utica Motor Car Co.

